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Hydrogeological Investigation & Terrain Analysis
Proposed Newill Subdivision
2727 Carp Road
Ottawa, Ontario

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Submitted to:

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Hydrogeological Investigation & Terrain Analysis Proposed Newill Subdivision 2727 Carp Road

Ottawa, Ontario

May 24, 2018
Project: 61318.15

experience • knowledge • integrity

RESPONSE TO COMMENTS

RVCA Comment	GEMTEC Response	Section / Page
Item 1 – Lot Layout		

A current lot layout and phasing plan with:
• Proposed well and septic locations / orientations;
• Terrain units;
• Constraints to septic system and well locations, as applicable; including:
  • water course setbacks
  • tree conservation areas;
  • bedrock outcrop location or thin soil areas etc.
	• Updated Lot Development Plan	Appendix A

Item 2 – Water Quantity		
• Professional confirmation, with reference to original analyses, that future wells will sustain repeat pumping at the test rate and duration of 24 hour intervals over the long-term; and that the test rates meet MOE Procedure D-5-5 and the demand for a specified number of occupants in a given house.	• Drilled three (3) new test wells to meet MOECC D-5-5; • Re-pump test wells from original study; and, • Model well interference. • See Section 6.7 Long Term Well Yields	Section 6.5, 6.6 and 6.7

Item 3 – Water Quality		
• Confirmation that water quality in the 'receiving groundwater' (usually the overburden) and in the water supply aquifer (including field parameters) is represented by the original study findings. More than one test-well and overburden piezometer may need to be re-tested if the original study found zones of differing groundwater quality or geology at the site.	• Additional water samples collected from overburden monitoring wells; • Bedrock water quality analyzed from three (3) new bedrock wells and re-sampling of two (2) bedrock wells from the original study.	Section 6.3
Item 4 – Land and Water Use Conflicts		
• Reassessment of Land and Water Use Conflicts within 500 m of the site; as per Section 4.6 of MOE Procedure D-5-5. This would include but not be limited to new local developments, certificate of approvals (now called Environmental Compliance Approvals), large water takings, buried fuel tanks, source protection policy area, etc.	• Section 2.2 speaks to the land use within 500 metres of the subject site.	Section 2.2
Item 5 – Hydrogeologically Sensitive Areas		
• Confirmation of the absence of hydrogeologically sensitive areas at the site, as per MOE D-5-4.	• See Section 5.2 Groundwater Impacts	Section 5.2

Item 6 – Revision to Three-Step Assessment		
• Revision to *Three-Step Assessment Process*, as applicable, such as when the number of proposed lots has changed etc. (see Section 5.2 in MOE Procedure D-5-4).	• See Section 5.2 Groundwater Impacts	Section 5.2
Item 7 – Revised Recommendations		
Revised final recommendations about the following: ○ Supplementary study requirements for phasing of the development. ○ *see attached requirements from MVCA* • Regulatory requirements for earth energy systems. • Provision of a final digital consolidated report.	• See Section 7.0 Conclusions	Section 7.0
Item 8 – Neighbouring Water Supply Wells		
Revised final conclusions and recommendations with detailed instructions to future home owners about the following: • Well location and construction recommendations with reference to maximum well and required casing depths and a constraints map. • Recommended maximum pumping rate.	• See Section 8.0 Recommendations	Section 8.0

• Any need for well drilling supervision or extraordinary measures to obtain drinking water that meets the ODWSOG etc. • Expected groundwater quality character and detailed recommendations for treatment and effluent disposal (as required). • Prescribed system type, locations and orientations with reference to a constraints map. • Others, as prescribed by attached MVCA review letter.		

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by 1384341 Ontario Ltd to conduct an updated hydrogeological investigation and terrain evaluation at the site of a proposed residential/commercial subdivision located at 2727 Carp Road, Ottawa, Ontario.

The proposed residential and commercial development (hereafter referred to as 'the subject site') will be comprised of a 69.76 hectare (172.4 acre) parcel of land located at 2727 Carp Road in Ottawa, Ontario (refer to Kay Plan, Figure 1). The proposed development will consist of 78 residential lot and 4 commercial lots along Carp Road.

The majority of the subject site is currently vacant and portions of it have been previously used for agricultural purposes. There is also one (1) commercial property located along Carp Road (northeastern portion of the subject site) which is used for trailer storage. Residential properties with private services along Sentinel Pine Way, William Mooney Drive and Huntley Manor are situated on the southeast, south and west borders of the site. The majority of the site consists of open fields with the exception of the southern portion where mature trees exist and in the northern portion where a stream bisects the northern portion of the site, flowing from northwest to southeast.

The proposed development at the subject site will consist of seventy eight (78) residential estate lots serviced with on-site septic disposal systems and water supply wells. The proposed lots will be accessed by an internal roadway system and will have an average lot size of 0.84 hectares, with a minimum lot size of 0.6 hectares. The proposed layout of the development is shown on the proposed Lot Development Plan, prepared by Novatech Engineering Consultants Ltd. located in Appendix A.

1.1 Other Background Information

It should be noted that this current report is a revision of our previous hydrogeological investigation entitled "Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, Part Lots 7 and 8, Concession 3, Huntley, City of Ottawa, Ontario" prepared by Morey Houle Chevrier Engineering Ltd. (MHC) and dated March 27, 2003.

This current revised hydrogeological report was completed to address comments prepared by the Rideau Valley Conservation Authority (RVCA) entitled "Hydrogeological Impact Assessment, Newill (Rump) residential sub-division, part of lots 7 & 8, con. III, City of Ottawa (Huntley)" dated August 30, 2005. The comments and our responses are attached at the beginning of the revised report to facilitate with the review process. It should be noted that the previous hydrogeological report prepared by MHC, dated March 27, 2003 was conditionally approved by the MVCA (refer to Appendix B).

1.2 Objectives of Investigation

The objectives of this investigation are as follows:

- To review available background information to assist in characterization of subsurface conditions in the vicinity of the subject site and develop a hydrogeological conceptual model;
- To identify and characterize the shallow subsurface conditions on the subject site as they relate to the design of septic sewage disposal systems under the Ontario Building Code (OBC);
- To assess the potential for impact on the receiving aquifer(s) and any nearby surface water features from on-site septic disposal systems;
- To investigate the potential quantity and quality of groundwater available from drilled test wells on the subject site for potential domestic supply; and,
- To assess the long term impacts on groundwater supply from existing developments on drilled water supply wells in the vicinity of the subject site.
- To address comments and specific questions raised by the RVCA from the previous Hydrogeological Investigation prepared by MHC.

Following a review of available background information and analysis of the results of the field investigation, conclusions and recommendations for the proposed residential development of the subject site are provided.

2.0 REVIEW OF BACKGROUND INFORMATION

2.1 Available Background Reports

A number of available background reports were reviewed as part of the revised investigation:

- "Carp Road Corridor, Community Design Plan" prepared by the City of Ottawa and dated June 2004 (Publication No. 3-08). This report is referred to herein as the "CDP Report".
- "Carp Road Corridor, Groundwater Study" prepared by Dillon Consulting Limited and dated November 30, 2004 (ref: 04-3219). This report will herein be referred to as the "Groundwater Study Report".
- "Mississippi-Rideau Source Protection Region, Assessment Report, Mississippi Valley Source Protection Area" prepared by Mississippi Valley Conservation and Rideau Valley Conservation Authority and dated August 4, 2011. This report will herein be referred to as the "MVSPR Report".

- "Aggregate Resources Inventory of the City of Ottawa, Southern Ontario" prepared by the Ontario Geological Survey Aggregate Resources Inventory (Paper 191) and dated 2013. This report will herein be referred to as the "ARIP 191 Report".

2.1.1 Community Design Plan Report (City of Ottawa, 2004)

The CDP report prepared by the City of Ottawa was reviewed for relevant information pertaining to the development of the subject site:

- Development of the site should preserve and add as many trees as possible and the use of landscaping, decorative fences, trees and/or shrubs in front of fencing to screen unsightly uses.

- The environmental features of the subject site (Schedule 2 CDP Report) shall be protected by implementing the policies in Section 4.7 of the Official Plan. In areas identified as groundwater recharge areas shown on Schedule 2, a groundwater impact assessment may be required to support development applications to determine the potential for impact on groundwater resources.

- A groundwater impact assessment may be required for development applications to support land uses that may pose a high risk to the groundwater resource, or uses that use large volumes of water or dispose of large volumes of liquid or solid waste, as per Section 4.7.5 of the Official Plan.

- Schedule 2 of the CDP Report indicates that the majority of the subject site is located in a high recharge area and a high quality fishery discharge area.

- When reviewing development applications in areas identified as groundwater recharge areas, the City will consider the potential for impact on groundwater resources. A groundwater impact assessment may be required where the City has identified that the lands play a role in the management of the groundwater resource or the need is indicated in other available information such as subwatershed plans or local knowledge as per Section 4.7.5 of the Official Plan.

2.1.2 Groundwater Study Report (Dillon, 2004)

The Groundwater Study Report prepared by the Dillon Consulting Ltd. was reviewed for relevant information pertaining to the development of the subject site. The following recommendations were presented:

- Applicants of future high risk commercial and industrial development should demonstrate that the proposed development will not impact groundwater prior to receiving approval. Elements of the proponent's proposal may include: assessment of the hydrogeological characteristics, the design of protection engineering systems to reduce risk of chemical discharges, identification and abandonment of unused wells, the design of a groundwater monitoring system, establishment of a spill response plan, plans to encourage natural infiltration and possible posting of bonds to cover future environmental clean-up efforts.

- For existing land uses, it is recommended that mitigation actions be enacted primarily through voluntary mechanisms including: promotion of best management practices, education of the public on the aquifer sensitivities, development of incentive programs to reduce contamination risk, and the review of road salting practices to reduce salt loading.

- For development of new subdivisions, a hydrogeological assessment following City of Ottawa protocols should be performed as a condition of approval. For development by consent, neighbouring wells should be sampled and favourable chemistry results obtained prior to approval being granted.

The following information from the report is considered relevant to this investigation:

- The Groundwater Study Report was completed using information from the following resources:
  - 1:50,000 scale overburden and bedrock geology maps by Geological Survey of Canada and 1:10,000 scale Ontario Base Maps from the Ministry of Natural Resources;
  - MOECC Water Well Records;
  - Other previous studies (please refer to the Groundwater Study Report for specific sources); and,
  - Geographic Information System (GIS) Database sources from: City of Ottawa, Renfrew County, Ministry of Northern Development. In addition, GIS data from a Regional Groundwater Study (Golder et al, 2003) was modified to a scale suitable for analysis (1:25,000).
- The Surficial Geology & Aquifer Location map of the Groundwater Study Report indicates that:
  - The subject site has predominantly offshore marine sediments of the Champlain Sea consisting of clay and silt as well as Paleozoic bedrock and organic deposits of peat and muck to the west and till to the east.
  - The lands immediately adjacent to the southeastern boundary of the subject site have nearshore sediments of the Champlain Sea consisting of gravel and sand.
  - The closest glaciofluvial deposits of sand and gravel to the subject site are mapped to the south of Richardson Side Road (which is greater than 1.0 kilometre from the closest boundary of the subject site).
  - The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.
- The Bedrock Geology & Aquifer Location map of the Groundwater Study Report indicates that:

- The subject site is mapped as Paleozoic bedrock consisting of limestone and shale of the Verulam Formation (northern portion of the site) and limestone of the Bobcaygeon Formation (southern portion of the site).

- The closest MOE Recorded Well Location and Aquifer Pumped symbols indicate an unconfined limestone aquifer.

- The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.

- The Groundwater Flow map of the Groundwater Study Report indicates that groundwater flow in the region of the site is expected to flow to the north (or to the northeast from the subject's site frame of reference). The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.

- The Groundwater Infiltration map of the Groundwater Study Report indicates that groundwater infiltration is low for clay, silt, and organic deposits, moderate for bedrock and till and high for the sand and gravel deposits of the subject site. The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.

- The Recharge/Discharge Areas map of the Groundwater Study Report indicates that the vertical groundwater gradient is subject site as being a recharge zone with the majority of the site identified as having a weak downward vertical groundwater gradient. A stream intersects the subject site and flows from west to east; the stream is identified as being a discharge area having a weak upward gradient. The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.

- The Aquifer Vulnerability map of the Groundwater Study Report indicates that the subject site (as is much of the Carp Road Development Corridor) is located in a high vulnerability aquifer area. The map notes indicate that the information conveyed by this map is regional in nature and is not suitable for use in site specific evaluations.

2.1.3 Mississippi Valley Source Protection Region Report (MVSPR, 2011)

The MVSPR Report prepared by Mississippi Valley Conservation and Rideau Valley Conservation Authority was reviewed for relevant information pertaining to the development of the subject site:

- The Mississippi-Rideau Source Protection Region - Highly Vulnerable Aquifers (HVA's) map indicates that the subject site is located in a highly vulnerable aquifer zone. However, it should be noted that much of the Carp Road Development Corridor, the Waste Management West Carleton Environmental Centre and the Karson Quarry are also all located in the highly vulnerable aquifer zone.

- The Carp Wellhead Protection Area Map indicates that the closest corner of the subject site is located about 3.0 kilometres to the south of the outermost boundary of the Carp Wellhead Protection Area (Zone D: 25 year travel time). In addition, the

closest corner of the subject site to the Carp Communal well is approximately 6 kilometres.

2.1.4 ARIP 191 Report

The ARIP 191 Report prepared by Ontario Geological Survey was reviewed for relevant information to the development of the subject site:

- The subject site is shown as being located in a sand and gravel deposit of tertiary significance;
- A sand and gravel quarry is located to the southeast of the subject site (greater than 1.0 kilometres).

In addition to the sand and gravel deposits noted in the ARIP 191 Report, a small sand pit (<1.0 hectares) is located on the subject site, adjacent to the stream that bisects the subject site. The sand pit has been depleted.

2.1.5 Carp Road Corridor Zoning Study

In 2013, the City of Ottawa initiated a study of the zoning along the Carp Road Corridor to support economic development opportunities and to resolve issues with the previous zoning that were triggering amendments to permit development proposals to proceed along the Corridor.

The changes to Zoning By-law 2008-250 were intended to stimulate the local economy, to allow for more employment opportunities and to recognize that the Carp Road Corridor Rural Employment Area, as the largest rural employment area in the City, which plays an important role in the local economy. The study was also meant to influence and ensure that future planning decisions/approvals within the Corridor better reflect the evolution of the Corridor as a more diverse economic hub for the Western Rural area of Ottawa. Rather than requiring a performance based zoning approach as recommended in past studies, the study of the zoning looked at each property along the Carp Road Corridor, which resulted in numerous changes including boundary changes, the addition of new uses and prohibition of other uses on some properties. Specific adjustments were also made to better separate the residential uses from the commercial and industrial uses given the conflicts with truck traffic and pollutants.

A report prepared by City staff (File Number: ACS2014-PAI-PGM-0071) was carried unanimously by City Council on May 14, 2014.

2.2 Land Use

The majority of the subject site is currently vacant undeveloped land and was previously used for agricultural purposes. Land use in the vicinity of the site consists of vacant undeveloped land and residential and commercial properties on private services. Residential properties, with private services, are located southeast and west of the subject site. Commercial properties are located to the north and northeast along Carp Road.

Specific land uses near the subject site boundaries are documented in Table 2.1.

Table 2.1 – Summary of Land Use in Study Area

Site Boundary	Existing Land Use
North / northeast (Carp Road)	• Commercial properties along Carp Road
East / southeast	• Combination of agricultural land, wooded areas, and residential properties
South / southwest (William Mooney Drive)	• Wooded areas and scattered residential properties
West / southwest	• Residential properties (subdivision) on Sentinal Pine Way

2.2.1 Technical Safety and Standards Authority (TSSA)

The Technical Standards and Safety Authority (TSSA) was contacted to conduct a search for the adjacent properties located at 2676, 2688, 2702, 2710, 2726, 2770, 2727, 2739, 2755, 2765, 2775, 2777, 2789, 2793, 2797, 2825, 2591 Carp Road, 80 Arbourbrook Boulevard, 120, 124, 128, 132, 136, 138, 140 Tansley Drive, 205, 215, 225 Maple Creek Crescent, 106, 122, 124, 128, 132, 136, 140, 144, 148, 152, 156, 160, 164, 168, 172 Reis Road and 158, 171, 189, 197, 217 Cardevco Road in Ottawa, Ontario. The TSSA indicated that they have no record of any fuel storage tanks at the above addresses.

It should be noted that the Fuels Safety Division of the TSSA did not register private fuel underground or aboveground storage tanks prior to January of 1990 or furnace oil tanks prior to May 1, 2002.

A copy of the search requests and the responses from the TSSA are provided in Appendix C.

2.2.2 Permit to Take Water and Environmental Compliance Approvals

No large scale water takings capable of causing adverse impacts to groundwater quantity were identified within 500 metres of the subject site boundary (PTTW search completed April 13, 2018; https://www.ontario.ca/environment-and-energy/map-permits-take-water).

Several commercial properties are located along Carp Road, directly north of the subject site. Environmental Compliance Approvals (ECA's) are present for fifteen (15) of the commercial properties. The ECA's include industrial sewage works, air, waste management systems, and

waste disposal sites. The waste disposal sites listed (ECA 2712-99VJ8R and 6469-ADXJVG) are for the processing and transfer of solid municipal and liquid waste as well as solid non-hazardous waste (limited to waste from the cleaning of water supply lines, storm sewers and sanitary sewers and all associated connections from municipal, industrial, commercial, institutional and domestic use). Potential impacts to groundwater quality from adjacent lands within 500 metres of the subject site boundary are not anticipated based on the present land uses identified in the ECA's.

2.2.3 Former Carp Road Landfill (WESA 2014a & WESA 2014b)

A former 35 hectare landfill is owned and operated by Waste Management and located at the West Carleton Environmental Centre (WCEC), approximately 1.8 kilometres from the southern edge of the subject site. The former landfill is closed and has been capped with vegetated layers. An expansion of the landfill is proposed to the west, which would be located approximately 1.3 kilometres from the subject site.

Groundwater impact and hydrogeological assessment reports have been prepared for the proposed expansion of the landfill, including:

- "Groundwater Impact Assessment Report, West Carleton Environmental Centre, Ottawa, Ontario" prepared by WESA, a division of BluMetric Environmental Inc. and dated January 2014.

- "Hydrogeological Assessment Report, West Carleton Environmental Centre Landfill, Ottawa, Ontario" prepared by WESA, a division of BluMetric Environmental Inc. and dated January 2014.

The overburden and shallow bedrock groundwater flow direction is to the north on the western half of the landfill study area and becomes north-easterly across the eastern portion of the landfill. The regional groundwater flow direction of the deep bedrock aquifer is to the northeast towards the Carp River.

The groundwater impact assessment report discusses the effects on the hydrogeology (groundwater flow and groundwater quality) of the proposed landfill expansion. Groundwater monitoring data shows that leachate-impacted groundwater is moving in the direction of groundwater flow, to the north away from the landfill. Future groundwater flow is predicted to be consistent with current observed conditions, with groundwater flow being in a northeastern direction.

The western two-thirds of the existing landfill is unlined and leachate can enter the underlying groundwater system. The leachate is expected to move following the groundwater flow direction, to the northeast, where it will intersect the existing purge well system installed along Carp Road. The purge wells control the off-site impacts within the Contamination Attenuation Zone (CAZ). Transport modelling indicates that leachate-impacted groundwater will continue to migrate off-site

in northeastern direction. Furthermore, groundwater impacts are expected from the proposed stormwater management ponds. The stormwater management ponds will have unlined portions to allow for groundwater infiltration. The maximum predicted extent of chloride concentrations from the stormwater management ponds is 130 mg/L, which could extend as far northwest as Richardson Side Road (located approximately 950 metres from the subject site).

Based on the hydrogeological and groundwater impact assessment reports, groundwater impacts at the subject site (located 1.3 kilometers northwest of the proposed landfill expansion) are not anticipated.

2.3 Topography

Topographic mapping data provided indicates that elevations range from about 112.5 to 120 metres above sea level. Overall, the property is relatively flat and slopes gently towards a stream that bisects the subject site.

2.4 Drainage

The drainage of the subject site is influenced by the natural topography and a stream which intersects the site. The stream flows from the west to east and controls the shallow groundwater flow from the northern and southern portion of the site.

2.5 Ontario Ministry of Environment and Climate Change Water Well Records

The Ministry of Environment and Climate Change (MOECC) Water Well Records for existing private wells in the surrounding development were obtained to determine the characteristics of existing private wells in the vicinity of the subject site (500 metre radius). A total of 146 well records were reviewed from the MOECC online water well record mapping resource. Of the 146 well records, 124 wells were identified as domestic, public, or commercial wells (remaining 22 wells are monitoring, test, or not used).

Table 2.2 provides a summary of the well characteristics for the 124 water well records (using available data) for depth to water found, static water levels, depth to bedrock, depth into bedrock and total well depth.

Table 2.2 – Summary of Water Well Records Search Results

Parameter	10th Percentile	90th Percentile	Average / Geometric Mean
Depth Water Found (m)	8.0	68.6	29.2 / 20.3
Static Water Level (m)	1.1	5.5	3.4 / 2.3

Parameter	10th Percentile	90th Percentile	Average / Geometric Mean
Depth to Bedrock (m)	2.7	11.9	7.5 / 6.0
Depth into Bedrock (m)	6.2	81.0	38.0 / 23.7
Total Well Depth (m)	11.4	84.8	42.3 / 31.2

The MOECC Water Well Records for drinking water wells surrounding the subject site (500 metre radius) indicate that water in existing private wells was encountered at shallower depths compared to that of the onsite test wells (i.e. geometric average of 20.9 metres below ground surface for the offsite private well records and geometric average of 27.9 metres below ground surface for the onsite test wells). The majority of wells are completed within the limestone bedrock, with the exception of thirteen (13) domestic overburden wells completed in sand and gravel at depths of 6.1 to 16.4 metres.

The MOECC Water Well Records indicate that the total well depth in existing private wells have shallower well completion depths to the onsite test wells (i.e. geometric average of 31.2 metres below ground surface for the offsite private well records and geometric average of 38.6 metres below ground surface for the onsite test wells).

The depth to bedrock in existing private wells is similar to the depth to bedrock of the onsite test wells (i.e. geometric average of 6.0 metres below ground surface for the offsite well records and geometric average of 5.2 metres below ground surface for the onsite test wells).

3.0 TERRAIN EVALUATION

3.1 Regional Geology

Surficial geology maps of the Carp area indicate that the site is underlain by organic deposits, offshore marine sediments (clay and silt), glacial till, nearshore marine sediments (sand, reworked glaciofluvial) and bedrock. Bedrock geology maps of the Carp area indicate that the site is underlain by interbedded limestone and shale of the Simcoe Group Formation (approximately 150 to 180 metres thick). Paleozoic bedrock geology mapping further indicates that the site is underlain by the Bobcaygeon and Verulam Formations, which are separated by a vertical fault that runs parallel to the stream that bisects the subject site. The bedrock geology consists of limestone and shale bedrock of the Verulam Formation to the north and limestone bedrock of the Bobcaygeon Formation to the south. Surficial and bedrock geology maps, Figure B1 and B2 respectively, are provided in Appendix C.

3.2 Field Procedure

The initial field work for the terrain analysis was carried out on March 25, 2003 at which time seventeen (17) test pits, numbered TP1 to TP17 inclusive, were advanced across the site. The test pits were advanced about 1.4 to 4.6 metres below the existing ground surface using a track mounted backhoe supplied and operated by the owner. The subsurface conditions in the test pits were identified by visual and tactile examination of the materials exposed on the sides and bottom of the test pits. The short-term groundwater condition within the open test pits was observed on completion of excavating.

A total of six (6) boreholes were advanced at the site on September 9-14, 2004 using a track-mounted, drill rig. Monitoring wells were installed in all boreholes, numbered MW1S, MW1D, MW2S, MW2D, MW3S, MW3D, MW4S, MW4D, MW5S, MW6S and MW6D. The monitoring wells were installed at depths of 1.5 to 3.0 metres (labelled “S”) and 4.5 to 6.0 metres (labelled “D”) below ground surface.

In addition, three (3) boreholes were advanced at the site on July 12-13, 2017 using a track mounted, drill rig supplied and operated by George Downing Estate Drilling Ltd. The boreholes were continuously sampled until inferred bedrock was encountered. The borehole locations were selected and positioned in the field by Houle Chevrier Engineering.

The locations of the boreholes and test pits are shown on the Detailed Site Plan, Figure 2. The ground surface elevations at the borehole locations were determined using our Trimble R10 GPS survey instrument. The elevations are referenced to geodetic datum. All field work was observed by a member of our engineering staff.

Following the completion of the borehole drilling work and test pit excavation, the soil samples were returned to our laboratory for examination by a geotechnical engineer and/or hydrogeologist. Descriptions of the subsurface conditions logged in the boreholes and test pits are provided on the Record of Borehole and Record of Test Pit sheets appended (Appendix D).

3.3 Soil Conditions

3.3.1 General

The soil descriptions in this report are based on commonly accepted methods of classification and identification employed in geotechnical practice. Classification and identification of soil involves judgment and GEMTEC does not guarantee descriptions as exact, but infers accuracy to the extent that is common in current geotechnical practice.

The subsurface conditions are variable throughout the site, with the greatest distinction north and south of the creek that flows west to east through the subject site. An overview of the subsurface conditions, interpreted from the test pits and boreholes advanced during the investigation, are

presented below, including geological cross sections. The results of grain size distribution analyses carried out on selected samples are shown in Appendix E.

3.3.2 Topsoil

A surficial layer of topsoil was encountered at all of the borehole and test pit locations. The topsoil is generally composed of brown silty sand and sand with varying amounts of organic material. The topsoil layer has a thickness ranging between about 0.1 to 0.4 metres.

3.3.3 Sand

A deposit of red brown to grey brown to grey, fine to medium sand to fine to coarse sand was encountered beneath the topsoil at all of the test pits, except borehole MW2 and test pits 11, 15, 16 and 17. The thickness of the sand deposit at the test pit and borehole locations is 0.2 to 4.4 metres. Test pits 1, 2, 3, and 9 were terminated in the sand material at depths of 4.2 to 4.3 metres below the existing ground surface.

3.3.4 Silty Sand

Beneath the topsoil at test pit 17, boreholes 17-1, 17-2, 17-3 and the fine to medium sand at test pit 6 and borehole MW4, a layer of yellow brown to grey brown to grey silty sand was encountered. The thickness of the silty sand layer at the test pit and borehole locations is 0.2 to 2.7 metres.

3.3.5 Silty Clay

Beneath the topsoil at test pits 11, 15, 16 and borehole 17-1, the sand deposit at test pits 6, 7, 8, 13, and 14 and beneath the silty sand layer at test pit 17, a deposit of grey brown to grey silty clay was encountered. Where penetrated at the test pit locations the silty clay layer is 1.0 to 2.0 metres in thickness. Test pits 6, 7, 8, 11 and 17 were terminated in the silty clay at depths of 4.2 to 4.6 metres below the existing ground surface.

3.3.6 Clayey Silt

Beneath the topsoil at borehole 17-1 and the upper and lower sand deposits at borehole 17-2 and 17-3 a deposit of grey brown to grey clayey silt was encountered. Where penetrated at the borehole locations, the clayey silt layer is 0.3 to 1.5 metres in thickness.

3.3.7 Clay

Beneath the topsoil at borehole MW2 and the sand deposit at borehole MW3 and MW6, a deposit of grey clay was encountered. Where penetrated at the borehole locations, the clay layer is 0.9 to 5.4 metres in thickness.

3.3.8 Sand and Gravel

Beneath the sand material at test pits 2 and 5, boreholes MW1, MW6, 17-1 and 17-2 a layer of grey brown sand and gravel was encountered. The thickness of the sand and gravel layer at the test pit and borehole locations is 1.8 to 3.5 metres. The test pits and boreholes MW1 and MW6

were terminated in the sand and gravel at depths of 3.5 to 6.0 metres below the existing ground surface. Boreholes 17-1 and 17-2 were terminated on inferred bedrock at depths of 12.2 to 12.9 metres below ground surface.

3.3.9 Glacial Till

Beneath the sand at test pit 12 and the silty clay at test pits 14, 15 and 16 a deposit of grey brown to grey clayey silt glacial till was encountered. Where fully penetrated at the test pit locations the glacial till is 0.3 to 0.9 metres in thickness. Test pits 12 and 14 were terminated in the glacial till at 1.4 to 3.3 metres below the existing ground surface.

3.3.10 Bedrock

Test pits 13, 15 and 16 were terminated on refusal to excavate on what is possibly the surface of the bedrock at depths of 2.3 to 3.3 metres below the existing ground surface.

Borehole MW2 encountered bedrock at 5.4 metres below ground surface and was cored to 6.0 metres below ground surface. Borehole MW5 was terminated on refusal at a depth of 3 metres below ground surface. Boreholes 17-1, 17-2, 17-3 were terminated on auger refusal at depths of 9.1 to 12.9 metres below ground surface.

The total overburden thickness at the site as indicated by the test well records provided by the well driller's ranges from 5 to 12 metres.

Water was encountered in test pits 1, 3, 5, 6, 7, 13, 14, 16 at depths of about 1.3 to 4.2 metres below the existing ground surface on March 25, 2003. All of the remaining test pits were dry for the short time the test pits remained open.

3.4 Groundwater Conditions

3.4.1 Groundwater Levels

Groundwater level elevations in the onsite monitoring wells (MW1 to MW6, inclusive) and groundwater level elevations in the onsite test wells (TW1 to TW8, inclusive) are summarized in Tables 3.1 and 3.2 respectively.

Table 3.1 – Overburden Groundwater Conditions in Boreholes

Monitoring Well	Depth (m B.G.S)			
	2004	June 7, 2016	June 9, 2017	June 14, 2017
MW1S	2.19	1.94	1.35	1.47
MW1D	2.19	2.03	1.38	1.49

Monitoring Well	Depth (m B.G.S) 2004	June 7, 2016	June 9, 2017	June 14, 2017
MW2S	0.78	1.11	0.43	0.89
MW2D	0.74	1.07	0.39	0.89
MW3S	0.84	1.17	-0.10	0.85
MW3D	0.81	1.33	0.46	0.97
MW4S	2.00	1.63	Abandoned	Abandoned
MW4D	2.11	1.69	Abandoned	Abandoned
MW5S	2.80	3.27	1.85	2.21
MW6S	2.68	2.53	1.66	1.75
MW6D	2.76	2.69	1.82	1.95

Notes: BGS – below ground surface

Table 3.2 – Bedrock Groundwater Conditions in Test Wells

Test Well	Depth (m B.G.S) 2004	Jun 7, 2016	Jun 9, 2017	Jun 14, 2017	Oct 16, 2017
TW1	2.16	1.80	1.22	1.37	-
TW2	0.52	0.57	-0.22	0.23	0.50
TW3	0.60	0.72	0.01	0.26	1.23
TW4	1.91	1.47	In Use	In Use	In Use
TW5	-	-	-	-	-
TW6	-	-	-	-	0.66
TW7	-	-	-	-	1.97
TW8	-	-	-	-	0.86

Notes: BGS – below ground surface

3.4.2 Groundwater Flow Directions

Water level measurements for both overburden monitoring wells (< 6 metres bgs) and test wells (35.6 to 62.5 metres b.g.s) were used to estimate groundwater flow. The water levels in the test wells ranged from -0.22 (artesian conditions) to 2.16 metres b.g.s, shallow monitoring wells ranged from -0.10 (artesian conditions) to 3.27 metres b.g.s, and deep monitoring wells ranged from 0.39 to 2.76 metres b.g.s.

A stream bisects the site and flows from the northwest to the southeast (Figure 2). The stream is approximately 1.5 metres below the water table at nearby monitoring wells MW 1, MW 6, MW 3, and MW 4 as measured on June 7, 2016.

There is minimal downward/upward vertical hydraulic gradients at the site. Shallow and deep overburden monitoring wells MW 1, MW 3, MW 4, and MW 6 have an average downward vertical gradient of approx. 0.04, whereas monitoring well MW 2 has a slight upward vertical gradient of 0.01. The test wells, screened in the bedrock, have a higher hydraulic head, indicating a slightly pressurized aquifer, which may indicate that it is at least partially confined.

Based on the test wells, the regional groundwater flow direction is to the northeast. The local groundwater flow direction in the overburden is heavily influenced by the stream that intersects the site and results in eastward and westward groundwater flows toward the stream (Figure 3).

3.4.3 Long Term Groundwater Levels

Electronic water level data loggers were installed in MW2S, MW2D and TW2 from June 6, 2017 to July 27, 2017 and in MW1S, MW1D and TW1 from July 27, 2017 to August 29, 2017 to monitor long term groundwater levels. The long term water levels, along with precipitation data are compiled in Appendix F and are summarized in Table 3.3 below:

Table 3.3 – Long Term Groundwater Level Measurements

Well ID	Geologic Material & Depth (m bgs)	Water Level (metres bgs)	Water Level (metres, elevation)
MW1S	Sand (1.5 – 3m)	2.00 - 2.31	114.55 – 114.86
MW1D	Sand / Gravel (4.5 – 6m)	1.95 - 2.25	114.53 – 114.83
TW1	Bedrock (14 – 62.5m)	2.05 - 2.36	114.57 – 114.87
MW2S	Clay (1.5 – 3m)	1.05 – 1.73	115.90 – 116.58

Well ID	Geologic Material & Depth (m bgs)	Water Level (metres bgs)	Water Level (metres, elevation)
MW2S	Gravel / Bedrock (4.5 – 6m)	1.04 – 1.77	115.88 – 116.61
TW2	Bedrock (6.1 – 36.6m)	-0.32 – 0.27	116.47 – 117.06

Notes: bgs = below ground surface

The bedrock test wells displayed minimal groundwater fluctuations of 0.31 and 0.59 metres for TW1 and TW2 respectively during the time they were installed. The maximum daily fluctuations were 0.08 to 0.35 metres for TW1 and TW2 respectively.

The overburden monitoring wells (MW1S, MW1D, MW2S and MW2D) and test well TW1 are directly influenced by precipitation events (Appendix F). The observed water levels in test well TW2 do not respond to precipitation events as quickly as the other wells. TW2 is influenced by periods of heavy rainfall (30+ mm) and displays artesian conditions (Appendix F).

The groundwater elevation at TW2 is approximately 0.4 to 0.8 metres higher than MW2S and MW2D, indicating that the limestone bedrock is slightly pressurized and the overburden and shallow bedrock are not directly hydraulically connected to the deeper bedrock aquifer. The groundwater elevation at TW1 is slightly higher (0.01 – 0.05 m) than MW1S and MW1D, indicating the bedrock aquifer is slightly pressurized.

3.5 Hydraulic Conductivity Testing

Hydraulic testing was carried out in the well screens installed as part of this investigation. The hydraulic testing was carried out in order to estimate the hydraulic conductivity of the overburden. The hydraulic testing included falling/rising head testing by introducing a slug. A summary of the hydraulic testing carried out in this investigation is provided in Table 3.4.

Table 3.4 – Summary of Hydraulic Testing

Borehole	Geological Material Monitored	Test Methodology	
		Falling Head Test by Introducing a Slug[1]	Rising Head Test by Removing a Slug[2]
MW1D	Gravel	✓	✓
MW2S	Clay	✓	✓
MW3D	Clay	✓	-

Borehole	Geological Material Monitored	Test Methodology	
		Falling Head Test by Introducing a Slug[1]	Rising Head Test by Removing a Slug[2]
MW6D	Sand/Gravel	✓	✓

Notes:

1. Falling head testing by introducing a slug involved introducing an instantaneous pressure increase to the water column within the well screen (equal to the volume of the slug) and monitoring the dissipation of the water level over time using a groundwater data logging pressure transducer together with an electric water level tape. Falling head testing was carried out on July 26, 2017.

2. Rising head testing by removing a slug involved introducing an instantaneous pressure decrease to the water column within the well screen (equal to the volume of the slug) and monitoring the recovery of the water level over time using a groundwater data logging pressure transducer together with an electric water level tape. Rising head testing was carried out on July 26, 2017.

The well screens were installed within a surround of filter sand. Above the surround of filter sand, bentonite pellets were used to seal the monitoring well from the soil above. Details of the well screens are provided on the Record of Borehole sheets in Appendix D.

3.5.1 Hydraulic Testing Results

The results of the hydraulic testing carried out in the well screens are provided in Appendix G. A summary of the recovery measurements made during slug testing in boreholes MW1D, MW2S, MW3D and MW6D are provided in Table 3.5.

Table 3.5 – Summary of Results for Falling Head (FH) and Rising Head (RH) Testing by Introducing/Removing a Slug

Borehole	Geological Material Tested	Static Groundwater Depth (metres bgs[1])	Initial Groundwater Level Displacement (metres)	Recovery Time (seconds)	Recovery (percent)
MW1D (FH)	Gravel	1.29	0.61	20	99
MW1D (RH)	Gravel	1.29	0.89	20	99
MW2S (FH)	Clay	0.53	0.45	30	95
MW2S (RH)	Clay	0.53	0.42	30	93
MW3D	Clay	0.19	0.55	1800	64

Borehole	Geological Material Tested	Static Groundwater Depth (metres bgs[1])	Initial Groundwater Level Displacement (metres)	Recovery Time (seconds)	Recovery (percent)
MW6D (FH)	Sand/Gravel	1.76	0.26	15	99
MW6D (RH)	Sand/Gravel	1.76	0.47	15	99

Notes: 1. Bgs = below ground surface
2. Water level within well screen (water losses to filter pack).

Hydraulic conductivities calculated from the hydraulic test results carried out at boreholes MW1D, MW2S, MW3D and MW6D are provided in Table 3.6.

Table 3.6 – Calculated Hydraulic Conductivities

Borehole	Geological Material Monitored	Calculated Hydraulic Conductivity, k (m/s)	
		Falling Head Test by Introducing a Slug	Rising Head Test by Removing a Slug
MW1D	Gravel	6×10^{-4}	3×10^{-4}
MW2S	Clay	8×10^{-5}	1×10^{-4}
MW3D	Clay	6×10^{-6}	-
MW6D	Sand/Gravel	2×10^{-4}	3×10^{-4}

Notes: 1. The hydraulic conductivities were calculated using the Hvorslev Analysis.

4.0 HYDROGEOLOGICAL CONCEPTUAL MODEL

4.1 Background Information

Based on the results of the review of MOECC water well records, land use observations and available geology maps, the local hydrogeology on the subject site and adjacent lands are characterized by offshore marine sediments (clay and silt), nearshore marine sediments (fine to medium sands and sand/gravel), organic deposits (peat and muck) and Paleozoic bedrock. The bedrock geology consists of limestone bedrock of the Bobcaygeon Formation and limestone and shale of the Verulam Formation. The bedrock formations are separated by an east-west oriented fault which intersects the site, located south of the stream (Appendix C).

4.2 Site Specific Geology

The subject site is primarily underlain by deposits of low permeability clay and silt and fine to medium sands south of the stream that bisects the site and fine to coarse sands and gravels north of the stream, with occasional layers of clayey-silt ranging from 0.3 to 1.5 metres in thickness.

The site specific geology findings are generally consistent with the findings of the available background information (surficial geology maps) with the exception of organic deposits and bedrock outcrops (refer to Figure C1 in Appendix C). No organic deposits (peat or muck) or exposed bedrock were identified in test pit, borehole, monitoring well, available water well records. Also, bedrock was not identified during the site walk over. The reclassified surficial geology is presented in Figure C3 in Appendix C.

4.3 Hydrogeological Conceptual Model

The framework for the hydrogeological conceptual model for the subject site is summarized in Table 4.1 below.

Hydrogeological cross-sections for a north-south (Figure 4) and west-east alignment (Figure 5) across the subject site were prepared based information from available on-site monitoring and test wells. Please note that the boundaries between zones indicated on the cross-sections have been interpreted based on available information and may differ somewhat from that indicated. Ground surface elevations for each of the monitoring and test wells were measured by Houle Chevrier Engineering Ltd. staff using a Trimble R10 global positioning system. The elevations are referenced to geodetic datum.

Table 4.1 – Framework of Hydrogeological Conceptual Model

	Stratigraphic Unit	Generalized Composition	Thickness (m)

North of stream / fault	Overburden	• Topsoil; and,
		• Coarse-grained glaciomarine;
		  ○ Relatively thick deposits of fine to medium sands;
		  ○ Sand and gravel (< 2 metres) overlying the limestone bedrock; and,
		  ○ Occasional, clayey-silt layers, increasing in thickness to the east (0.3 to 1.5 metres).
			7 to 13 metres

	Stratigraphic Unit	Generalized Composition	Thickness (m)
	Bedrock	• Limestone (Verulam Formation)	Unknown

South of stream / fault	Overburden	• Topsoil;
		• Fine grained glaciomarine;
		  ○ Clay, silty clay and silt.
		• Coarse grained glaciomarine;
		  ○ Fine to medium sands.
		• Till; and,
		  ○ Silty to sandy glacial till underlain by coarse sands and gravels;
		• Thin (1 metre) at the south-western portion of the site (forested area to be preserved).
			1 to 10 metres

	Bedrock	• Limestone and Shale (Bobcaygeon Formation)	Limestone - Unknown Shale - Approx. 40 metres (only identified in 1 well)

The bedrock surface elevation ranges from about 103.9 to 118.6 metres Above Mean Sea Level (AMSL) and the base of the well casings range from 101.4 to 112.9 metres AMSL. The elevation of the water bearing zones (depth water found) ranges from 63.4 to 108.5 metres AMSL and the elevation of the bottom of test wells ranged from 52.6 to 80.2 metres AMSL.

It is our assessment that the hydrogeological conceptual model is consistent with available background information and the results of the field investigation on the subject site. Hydrogeological cross sections (refer to Figures 4, 5A and 5B) were prepared based on our interpretation of the above noted hydrogeological conceptual model. The alignment of the cross section (Section A-A' and B-B') lines are provided on the Detailed Site Plan in Figure 2.

5.0 IMPACT ASSESSMENT

The impact on groundwater and surface water resources due to wastewater treatment and disposal by individual onsite sewage disposal systems on the subject site are assessed in the following sections.

5.1 Sewage Disposal Systems

This section discusses the results of the terrain evaluation as they relate to the feasibility of installing sewage disposal systems on the subject site for onsite wastewater treatment and disposal.

It should be noted that the following information is provided for general guidance purposes only and that all septic systems installed on the subject site should be designed on a lot by lot basis using a lot specific investigation involving test holes to determine the actual subsurface conditions at the location of the proposed septic system. In all cases, the septic system design must conform to the Ontario Building Code (OBC) requirements.

5.1.1 Class IV Septic Sewage Disposal Systems

This section discusses the results of the terrain evaluation as they relate to the feasibility of installing Class IV septic sewage disposal systems on the subject site.

The septic system envelope area (septic envelope) represents the area on a lot set aside for the construction of the leaching bed and is for the leaching bed only. It does not include that area required for the septic tank or the isolation/separation distances required by the Ontario Building Code (OBC). The size of the septic system envelope is a function of the percolation rate of the native soil in the vicinity of the septic envelope (or the fill used for the construction of a septic bed) and the daily effluent loading to the septic bed.

It is understood that the septic envelope sizes were estimated by Novatech for the purposes of preparing the Lot Development Plan in Appendix A. The conservative average septic system envelope required to service a single family dwelling at this site; which was calculated using a conservative design flow of 3,500 litres/day and a conservative loading rate of 6 to 8 L/m^2/day for the silty sand, is 440 to 580 m^2. For those lots which are underlain by silt and clay, a loading rate of 4 litres/m^2/day is considered to be appropriate. The septic envelope area required under this scenario is 875 m^2 (0.088 hectares). This septic system envelope should be readily accommodated on the lot sizes that are proposed (minimum 0.6 hectares), as demonstrated in the Lot Development Plan.

Prior to establishing the actual septic envelope (leaching bed) location on any particular lot, test holes should be excavated to determine the actual subsurface conditions in the area of the proposed leaching bed.

The septic leaching bed design must ensure that the bottom of the absorption trenches is at least 0.9 metres above low permeability soils (such as silty clay), bedrock, and the seasonally high groundwater table. Based on the soil conditions which were observed in the test pits and boreholes, it is expected that some or all of the septic leaching beds at this site will be partially or fully raised.

A site specific investigation should be carried out on each lot for septic system design purposes to determine the thickness and type of overburden present in any areas proposed for installation of leaching beds.

5.1.2 Tertiary Septic Systems

Approved septic disposal systems that meet the OBC requirements for tertiary treatment could also be considered for this development in place of conventional Class IV septic systems. The disposal beds for tertiary treatment systems require a smaller area than conventional Class IV septic systems. Furthermore, the required separation distance between the underside of the crushed stone layer in the disposal bed and low permeability soils, bedrock, or the seasonally high groundwater table is less than the required 0.9 metres for conventional septic systems. Some tertiary treatment systems are also effective in reducing contaminants, such as nitrate, prior to disposal to the leaching bed.

5.2 Groundwater Impacts

The potential risk to groundwater resources on and off the subject 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, the Three-Step Assessment Process outlining in MOECC D-5-4 was followed.

5.2.1 Three-Step Assessment: Step 1 - Lot Size Considerations

Lot sizes of 1.0 hectares or larger are assumed to be sufficient for attenuative processes to reduce nitrate-nitrogen to acceptable concentrations in groundwater below adjacent properties. The proposed lot sizes of 0.4 hectares (minimum) fails this consideration.

5.2.2 Three-Step Assessment: Step 2 – Isolation

Where proposed lot sizes are less than 1.0 hectares, the risk of sewage effluent contamination must be assessed for the proposed subdivision. As per Procedure D-5-4, it is required to:

- Evaluate the most probable groundwater receiver for sewage effluent; and,
- Define the most probable lower hydraulic or physical boundary of the groundwater receiving the sewage effluent.

Based on the hydrogeological conceptual model and as per the isolation requirements of MOECC Procedure D-5-4:

- The groundwater receiver for the septic effluent is the overburden groundwater within silty-clays, silty sands, fine to coarse grained sands and sands and gravels.

- The lower hydraulic boundary for the groundwater receiving the septic effluent is primarily low permeability soils (encountered south of the stream intersecting the subject site) and limestone bedrock north of the stream intersecting the subject site.

Further guidance for the determination of isolating conditions is provided in the MOECC document entitled "MOEE Hydrogeological Technical Information Requirements for Land Development Applications" dated April 1995. The guidance information is found within Section 3.2.1: Located on Protective Surficial Deposits of Appendix C8: Guideline for Applying 15-08 to Large Subsurface Disposal Systems. The guidance information indicates that:

- Protective surficial deposits are unconsolidated earth materials whose saturated hydraulic conductivities are 10^{-5} cm/sec (or lower) and comprise the top 10 metres of the surficial materials at the site;
- These deposits are likely to be laterally continuous for at least 100 metres;
- These deposits do not contain significant lenses or beds of higher conductivity materials that would:
    - Exceed one metre in cumulative or total thickness;
    - Serve as practical sources of groundwater flow to wells; or
    - Impair the function of the earth materials as a barrier to contaminant migration.

The result of the hydrogeological conceptual model indicates that the surficial overburden deposits across the site generally do not meet the above requirements for isolation.

5.2.3 Three-Step Assessment: Step 3 - Nitrate Dilution Calculations

Where it cannot be demonstrated that the effluent is hydrogeologically isolated from the water supply aquifer and the proposed lot sizes are less than 1.0 hectares, the risk of individual on-site septic systems will be assessed using nitrate-nitrogen contaminant loading. 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 and Climate Change's guideline D-5-4, dated August 1996.

The nitrate concentration at the site boundaries was calculated using the following information:

- Ministry of the Environment and Climate Change's guideline D-5-4, dated August 1996. In consideration of the proposal that the subject site will include both residential and commercial properties, information in both sections 5.6.2 and 5.6.3 of D-5-4 was implemented into our assessment;

- 78 residential lots are proposed;
- 4 commercial lots are proposed;
- An allowance for 40 percent hard surface area on the commercial lots;
- A varying allowance for hard surface area on the residential lots, roadways, and pathways (as provided by Novatech on April 13, 2017);
- A total available area for infiltration of 697,600 square metres, net of hard surfaces (600,915 sq.m. residential/roadways/pathways, 30,635 sq.m. commercial, and 66,040 sq.m. open space);
- An allowance of 1,000 litres per day of sewage flow per residential lot;
- An average allowance of 1,760 litres per day of sewage flow per commercial lot; (determined using information provided in Section 5.6.3 of D-5-4; see Table 1);
- An allowance of 40 mg/L of nitrate-nitrogen in the effluent discharging from the proposed Class 4 septic systems;
- An annual water surplus of 0.361 metres/year; and,
- A combined infiltration factor of 0.645 (a weighted average soil factor of 0.345 was used, based on test pit information gathered at the subject site.

The water surplus for the site was calculated using a monthly soil-moisture balance approach as described in Thornthwaite and Mather (1957). The weighted average soil moisture storage for glaciomarine silty sand (150 mm), silty sand glacial till (200 mm) and glaciomarine silty clay (250 mm) was used. The 1981-2010 Climate Normals from the McDonald Cartier Ottawa International Airport Meteorological Station were used and soil moisture values were selected based on the Ministry of Environment (MOE) Stormwater Management Planning and Design Manual Section 3.0 (MOE, 2003).

Based on information provided in Guideline D-5-4, Section 5.6.3, it was determined than an allowable, average daily design sanitary sewage flow for each of the four proposed commercial lots is 1,760 litres. The details of this are provided on the following table.

Table 5.1 - Allowable Sewage Flow per Commercial Lot (assuming 40% hard surfaced area)

Block	Area (m^2)	Infiltration Factor	Precipitation Surplus (m^3/year)	Available Infiltration (litres per day)	Maximum Septic Flow (litres per day)
79	11,300	0.70	4079	4694	1565
80	7,600	0.70	2744	3157	1052

Block	Area (m^2)	Infiltration Factor	Precipitation Surplus (m^3/year)	Available Infiltration (litres per day)	Maximum Septic Flow (litres per day)
81	20,100	0.70	7256	8349	2783
82	11,800	0.70	4260	4902	1634

Based on the above information, the estimated nitrate concentration in the groundwater at the property boundary following development of 4 commercial lots and 78 residential lots is 6.4 mg/L (refer to attached worksheet in Appendix H).

It has been determined that, through dilution of the nitrate stemming from the proposed septic systems, the proposed 4 commercial lots and 78 residential lots can be established while maintaining a nitrate concentration within the groundwater at the property boundary of less than 10 mg/L.

Background Nitrate Conditions

To further evaluate the potential risk of septic effluent on the water supply aquifer, the background water quality was assessed. Water samples were collected on June 9, 2016 and July 14, 2017 from all available overburden monitoring wells. Nitrate concentrations varied throughout the site, with concentrations of <0.05 mg/L for MW 5, MW 3, and MW 2 and ranging from <0.1 to 7.86 mg/L for MW 1, MW 4, and MW 6 (Table 5.1). Compared to historical data (October 23, 2004), nitrate levels are consistent spatially, with concentrations <0.05 mg/L on the south side of stream in 2016/2017 and 2004 and concentrations ranging from <0.1 to 7.86 mg/L and 4.12 to 12.5 mg/L to the north in 2016 and 2004 respectively (Figure 2). Nitrate levels measured in 2017 show a consistent decrease from the previous 2016 and 2004 sampling events, as seen in Table 5.2.

The test wells were sampled for nitrates during their respective pumping tests in 2003, 2016 and 2017. All bedrock test wells had nitrate concentrations at non-detectable levels <0.05 to <0.1 mg/L.

Two water samples were collected from the stream on June 30, 2016, one upstream entering the site and the other downstream, leaving the site (Figure 2). Nitrate concentrations in the stream were <0.05 mg/L upstream and 0.34 mg/L downstream (Table 5.3).

Table 5.2: Nitrate concentrations in shallow and deep monitoring wells (refer to Figure 2 for well locations)

Nitrate mg/L	MW 1		MW 2		MW 3		MW 4		MW 5	MW 6	
	S	D	S	D	S	D	S	D	S	S	D
Oct 23, 2004	4.12	9.47	<0.05	<0.05	<0.05	<0.05	12.5	5.76	<0.05	-	-
Jun 9, 2016	2.56	7.86	<0.05	<0.05	<0.05	<0.05	5.75	3.02	<0.05	2.17	1.32
Jul 14, 2017	2.1	7.3	<0.1	<0.1	<0.1	<0.1	-	-	<0.1	<0.1	0.5

Notes:

1. Nitrite levels for all monitoring wells are at non-detectable levels (<0.05 mg/L)
2. Monitoring wells MW4S and MW4D were decommissioned in late 2016 (current commercial property)
3. S = Shallow wells (screened 1.5 to 3 metres b.g.s)
4. D = Deep wells (screened 4.5 to 6 metres b.g.s)

Table 5.3: Nitrate concentrations in surface water (refer to Figure 2 for sample locations)

Location	Date	Nitrate Concentrations (mg/L)
SW-1 (Upstream)	June 30, 2016	<0.05
SW-2 (Downstream)	June 30, 2016	0.34

The southern portion of the site (south of the stream) had non-detectable nitrate concentrations in all overburden monitoring wells (MW2, MW3 and MW5). The northern portion of the site (north of the stream) has nitrate concentrations ranging from <0.1 to 7.3 mg/l in overburden monitoring wells MW1 and MW6 as measured on July 14, 2017. The arithmetic average and geometric mean of the nitrate concentrations in the northern portion of the site are 2.7 to 3.6 and 1.8 to 2.2 mg/l respectively (refer to Table 5.4). Based on the geometric average nitrate concentrations in the deep monitoring wells on the northern portion of the site (MW1, MW4 and MW6), the background nitrate concentration is 2.2 mg/l.

Table 5.4: Nitrate concentrations summary

Nitrate mg/L	MW 1		MW 4		MW 6		Arithmetic Average		Geometric Mean	
	S	D	S	D	S	D	S	D	S	D
Oct 23, 2004	4.12	9.47	12.5	5.76	-	-	8.3	7.6	7.2	7.4

Nitrate mg/L	MW 1		MW 4		MW 6		Arithmetic Average		Geometric Mean	
	S	D	S	D	S	D	S	D	S	D
Jun 9, 2016	2.56	7.86	5.75	3.02	2.17	1.32	3.5	4.1	3.2	3.2
Jul 14, 2017	2.1	7.3	-	-	<0.1	0.5	2.7[1]	3.6[1]	1.8[1]	2.2[1]

Notes:

1. Arithmetic average and geometric mean for July 14, 2014 calculated using MW 4 June 9, 2016 nitrate concentrations.
2. S = Shallow wells (screened 1.5 to 3 metres b.g.s)
3. D = Deep wells (screened 4.5 to 6 metres b.g.s)

In addition, the nitrate concentrations in all of the test wells completed in the proposed water supply aquifer (bedrock aquifer) for the subject site were negligible (at the laboratory method of detection limit of <0.10 mg/L).

Based on the results of the nitrate groundwater sampling and water level monitoring, the following conclusion are presented:

- Nitrate concentrations in the shallow and deep overburden monitoring wells have decreased at all well locations from previously reported levels in 2004. Residual nitrate concentrations are attributed to past agricultural practices and levels are expected to continue to decrease over time.
- Based on water level measurements across the subject site, groundwater flow in the overburden (shallow and deep overburden wells) is towards the stream that bisects the subject site; therefore, offsite impacts associated with nitrates are not anticipated. Nitrate concentrations over the eastern portion of the site decrease in a northerly (up gradient) direction, from well MW 1 to MW 6, further supporting the notion that offsite impacts will not likely occur.
- Based on surface water samples at the upstream and downstream property boundaries, nitrate impacts to the stream appear to be negligible.
- Water levels in the bedrock are higher than the shallow overburden water levels indicating upward flow in the bedrock or a semi-confined to confined bedrock aquifer system.

It has been determined that, through dilution of the nitrate stemming from the proposed septic systems, the proposed 4 commercial lots and 78 residential lots can be established while maintaining a nitrate concentration within the groundwater at the property boundary of less than 10 mg/L. Therefore, the proposed subdivision meets the requirements of the Three-Step Assessment Process as outlined in MOECC D-5-4.

5.2.4 Aquifer Vulnerability

The background documentation (see section 2.1) identifies the subject site to be located within a high recharge area (City of Ottawa, 2004) and highly vulnerable aquifer (MCSPR, 2011). The groundwater conditions have weak downward gradients (Dillon, 2004). The background reports indicate that the information conveyed by mapping is regional in nature and is not suitable for use in site specific evaluations. A review of the site uses in the vicinity of the subject site identified a landfill located 1.3 kilometres to the northwest. Based on the hydrogeological and groundwater impact assessment reports prepared for the landfill (see section 2.2.3), groundwater impacts at the subject site are not anticipated based on the groundwater flow directions, distance to the site and ongoing remediation of off-site water quality.

The on-site investigation identified the site to have a weak downward gradient at the majority of the site (MW 1, MW3, MW4 and MW 6) and a slightly upward gradient in the vicinity of MW2. The test wells, screened in the bedrock, have a higher hydraulic head, indicating a slightly pressurized aquifer, which may indicate that it is at least partially confined. The proposed low impact development (residential subdivision) does not pose a negative risk to groundwater quantity or quality based on the groundwater supply investigation (see section 6.0) and the three-step nitrate assessment (MOECC D-5-4).

6.0 GROUNDWATER SUPPLY

A groundwater supply investigation was carried out in accordance with the MOECC August 1996 document “Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment”, to determine the quantity and quality of groundwater available for domestic water supply. The results of the groundwater supply investigation are summarized in the following sections.

6.1 Test Well Construction

The MOECC Procedure D-5-5 document indicates that a minimum of seven (7) test wells are required for sites more than 60 hectares and up to 80 hectares, with the site under investigation being 70 hectares. Five (5) test wells (TW 1 to TW 5) were drilled by Air Rock Drilling Co. Ltd. under Well Contractor License No. 1119 and were completed on March 14 to 18, 2003. Three (3) additional wells (TW6 to TW8) were drilled by Air Rock Drilling Co. Ltd. and completed October 6-11, 2017; copies of the MOECC Water Well Records and the Certificates of Well Compliance (Well Grouting Inspections) are provided in Appendix I.

The locations of the new test wells were chosen to provide maximum coverage of the site and with the intent for future use as water supply wells on individual lots (Figure 2). The geographical references for the test wells are provided in the respective MOECC Water Well Records.

Well grouting inspections were carried out by GEMTEC staff during the sealing of the well casings in test wells TW 6, TW 7 and TW8. The test wells were constructed using a nominal 159 millimetre inside diameter steel casing. Based on the well records provided by the well driller, all of the test wells were completed with steel well casings installed a minimum of 6.1 metres (20 feet) below the ground surface. The construction details of the test wells are summarized in Table 6.1.

Table 6.1 – Summary of Test Well Construction Details

Test Well	Depth to Bedrock (m BGS)	Depth of Well Casing (m BGS)	Depth Water Found (m BGS)	Total Well Depth (m BGS)
TW 1	12.2	14.6	18.3 & 44.2	62.5
TW 2	4.6	6.7	15.2 & 34.4	36.6
TW 3	10.0	12.8	41.1 & 51.8	55.2
TW 4	7.6	10.0	45.1	61.0
TW 5	1.1	6.7	-	6.1
TW 6	6.4	8.2	9.1 & 32.3 & 41.7	43.6
TW 7	4.0	6.1	32.9	55.8
TW8	4.3	6.1	8.5 & 29.9 & 41.8	43.6

6.2 Pumping Tests Field Procedure

The pumping tests for the test wells used in this study were conducted March 17, 2003 to March 24, 2003 for TW 1 to TW 4. Due to initial low well yields, test wells TW 1 and TW4 were re-pumped on July 5, 2017 and May 16, 2016, respectively.

Six (6) to eight (8) hour duration constant discharge rate pumping tests were conducted in each test well. The pump discharge was directed to the ground surface at a distance ranging from 5 to

10 metres from the test wells and in a manner such that the flow of water on the ground surface was directed away from the test wells. Based on the overburden geology, thickness and the duration of pumping, this is considered to be sufficient to ensure that artificial recharge does not occur.

6.2.1 Water Level Measurements

During the pumping tests, water level measurements were taken at regular intervals in the well being pumped using an electric water level tape and on a continuous basis using electronic data loggers. After the pump was shut off, water level data was collected until a minimum of 95 percent of the drawdown in water level had recovered in the test wells or two hours had passed. The water level measurements for the drawdown and recovery data for the pumping tests are provided in Appendix J. The drawdown data was measured with reference to the top of the well casings.

Water level measurements were also taken from other onsite test wells (observation wells) during the pumping of select test wells to determine potential interference effects between the test wells during pumping. Water level measurements taken in the observation wells are provided in Appendix J.

6.2.2 Flow Rate Measurements

The flow rate of the pump discharge hose was maintained at a constant flow rate. The discharge nozzle of the pump hose was outfitted with a critical flow nozzle which ensures that the flow rate of the pump is restricted to the critical flow nozzle calibration rate. A summary of the flow rate and duration from the pumping tests of the test wells is provided in Table 6.2:

Table 6.2 – Pump Test Flow Rates

Test Well	Date	Flow Rate (litres per minute)	Duration (Hours)
TW 1	March 22, 2003	9	9
	July 5, 2017	18.9	6
TW 2	March 24, 2003	23	6
TW 3	March 17, 2003	32	6
TW 4	March 19, 2003	14	6
	May 16, 2016	26.5	8
TW 5	July 12, 2017	18.9	1

Test Well	Date	Flow Rate (litres per minute)	Duration (Hours)
TW 6	October 19, 2017	22	6
TW 7	October 18, 2017	38	6
TW8	October 17, 2017	57	6

6.2.3 Groundwater Sampling

Total chlorine tests were conducted in the field to ensure that chlorine levels were at 0.0 mg/L prior to sampling for bacteriological testing. The temperature, conductivity, total dissolved solids, pH, turbidity and total chlorine levels of the groundwater were measured at periodic intervals during the pumping tests and are summarized in Appendix K. The field equipment used during the pumping test is calibrated monthly by GEMTEC and the details of field equipment are provided in Table 6.3:

Table 6.3 – Field Equipment Overview

Field Parameters	Manufacturer	Model No.
Total Chlorine	Hach	CN-60
pH, temperature, TDS and Conductivity	Hanna	HI 98129
Turbidity	Hanna	HI 98703

Groundwater samples for laboratory analysis were collected from the test wells half way through pumping and within the last hour of pumping (i.e. 6 hour test = 3 hour / 6 hour sampling and 8 hour test = 4 hour / 8 hour sampling).

The groundwater samples were collected in laboratory supplied bottles and prepared/preserved in the field in accordance with the industry standard sampling, handling and preservation procedures required by the laboratory. All water samples, including samples for metal analysis, were unfiltered. The groundwater samples were subsequently submitted to accredited laboratories in Ottawa, Ontario for chemical, physical and bacteriological analyses as listed in the MOECC guideline titled “Technical Guideline for Private Wells: Water Supply Assessment”, dated August 1996.

6.3 Test Well Water Quality

The results of the chemical, physical and bacteriological analyses on the water samples from the test wells are summarized in Appendix K and the laboratory results are provided in Appendix L.

6.3.1 Maximum Acceptable Concentration Exceedances

The proposed water supply aquifer, based on water samples collected from the onsite test wells, does not contain any maximum acceptable concentration exceedances of the Ontario Drinking Water Standards (ODWS). Based on the absence of health related exceedances and the results of the bacteriological testing, the water from the proposed water supply aquifer is safe for consumption. It should be noted that total coliform exceedances were detected in multiple test wells, however following chlorination and re-sampling, all test wells reported non-detectable Total Coliform levels. A summary of the bacteriological exceedances is provided below.

- TW 1 (March 21, 2003) – Total Coliform reported as no data; overgrown with non-target;
    - Non-detectable Total Coliform following chlorination and re-sampling on August 21-22, 2003;
- TW 1 (July 5, 2017) – Total Coliform: 7 counts per 100 mL;
    - Non-detectable Total Coliform following chlorination and re-sampling on November 7-8, 2017;
- TW 2 (March 22, 2003) – Total Coliform reported as no data; overgrown with non-target;
    - Non-detectable Total Coliform following chlorination and re-sampling on August 20-21, 2003;
- TW 4 (May 10, 2016) – Total Coliform reported as no data; overgrown with non-target;
    - Non-detectable Total Coliform following chlorination and re-sampling on May 19-20, 2016.

6.3.1.1 Bacteriological Parameters

Total chlorine measurements made at regular intervals during the pumping test confirmed that total chlorine concentrations in the well water was non-detectable at the time of bacteriological sampling.

The results of the bacteriological analysis indicate that the water samples met all the standards of the ODWS for bacteriological parameters (following chlorination and re-pumping in test wells TW1, TW2 and TW4). Based on the bacteriological testing, the water is suitable for consumption.

6.3.1.2 Other Health Related Parameters

No maximum acceptable concentration limits of the ODWS were exceeded in the water samples collected from the onsite test wells. No maximum acceptable concentration limits of the ODWS were exceeded in the heavy metal samples from the onsite test wells (TW 4, TW 6, TW 7 or TW 8).

6.3.2 Operational Guideline Exceedances

Operational related exceedances of the Ontario Drinking Water Standards (ODWS) were detected for hardness (in all test wells sampled) and for organic nitrogen (TW 8). The operational guideline exceedances are discussed in the following section:

Hardness

The concentration of hardness in water samples obtained from all seven (7) test wells ranged from 201 to 395 mg/L as $CaCO_3$ and was higher than the operational guideline of 80 to 100 mg/L of $CaCO_3$ as specified in the ODWS.

Water having a hardness level above 80 to 100 mg/L as CaCO3 is often softened for domestic use. The MOECC Procedure D-5-5 document states that water having a hardness value more than 300 mg/L is considered "very hard". The Ontario Ministry of the Environment publication entitled "Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines", states that water with hardness in excess of 500 mg/L is considered to be unacceptable for most domestic purposes. There is no upper treatable limit for hardness specified in MOECC Procedure D-5-5.

The concentrations of hardness in all the test wells are below the reported threshold of 500 mg/L as CaCO3 as specified in the Technical Support Document for the ODWS. The concentration of hardness observed in the test wells is considered to be reasonably treatable using a conventional water softener. Most water supply wells within rural eastern Ontario are equipped with water softeners.

Water softening by conventional sodium ion exchange may introduce relatively high concentrations of sodium into the drinking water that 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 the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes (for example, a bypass of the softener to the cold water kitchen tap).

Organic Nitrogen

The organic nitrogen concentration (total kjeldahl nitrogen – ammonia) exceeded the operational guideline of 0.15 mg/L for Ontario Drinking Water Standards (ODWS) in samples from test well TW 8. Of the seven (7) test wells sampled, only TW 8 slightly exceeded the ODWS with a concentration of 0.2 mg/l.

The ODWS indicates that levels of organic nitrogen in excess of 0.15 mg/L may be caused by septic tank or sewage effluent contamination and is typically associated with Dissolved Organic Carbon (DOC) contribution of 0.6 mg/L. The DOC in TW 8 was reported to be 2.5 and 2.3 mg/L in the 3-hr and 6-hr sample respectively. Organic nitrogen can react with chlorine and severely reduce its disinfectant power; in addition, taste and odour problems may also occur.

The observed organic nitrogen concentration in TW 8 does not appear to be representative of the background groundwater quality at the subject site. In addition, it is not expected that chlorination will be utilized by homeowners in the residential subdivision and, as such, no concerns with the operational objective exceedance for organic nitrogen were identified.

6.3.3 Aesthetic Objective Exceedances

Aesthetic objective exceedances of the Ontario Drinking Water Standards (ODWS) were detected for manganese (TW1, TW6 and TW8), iron (all test wells except TW7), turbidity (TW1, TW4 and TW7 lab only), sulphide (TW2, TW3, TW6 and TW7) and total dissolved solids (TW1, TW4, TW6). These exceedances are discussed in the following sections:

Manganese

The manganese concentration in all test wells ranged from 0.006 to 0.191 mg/L. The manganese concentration in TW 1, TW6 and TW8 is above the aesthetic objective of 0.05 mg/L listed by the ODWS. Manganese can naturally occur in groundwater and elevated levels of manganese may cause staining to plumbing fixtures and laundry, and effect the taste of the water. However, the manganese level is well within the maximum reasonably treatable limits (1.0 mg/l) provided in Table 3 of the Appendix in the MOECC Guideline D-5-5.

Iron

The iron levels within the on-site test wells ranged from <0.1 to 1.0 milligrams per litre. With the exception of TW7, all remaining test wells exceeded the aesthetic objective of 0.3 milligrams per litre listed by the ODWS. Elevated levels of iron may cause staining to plumbing fixtures and laundry. However, the iron level is well within the maximum reasonably treatable limits (5.0 mg/l) provided in Table 3 of the Appendix in the MOECC Guideline D-5-5.

Turbidity

The laboratory Certificates of Analysis indicates that the level of turbidity in test wells TW 1 (2003 and 2017), TW3 (2003), TW4 (2003) and TW7 (2017) exceeded the ODWS aesthetic objective. However, it should be noted that turbidity may be affected by various factors to which the water sample would have been subjected from the time of sampling to the time of analysis. As such, field measurements of turbidity are considered to be more representative of the water being sampled. The turbidity levels during the pumping tests for all test wells, with the exception of TW3, indicated that the turbidity level continuously decreased throughout the pumping test and was less than 5 NTU at the time of sampling. Test well TW3 was further developed and pumped for a period of approximately seven (7) hours on August 25, 2003. Field measurements of turbidity following the additional pumping was measured to be <1.0 NTU.

Based on the field measurements the level of turbidity in all of the test wells meets the ODWS aesthetic objective.

Hydrogen Sulphide

Hydrogen sulphide levels of 0.16, 3.70, 0.39 and 0.30 were measured at TW2, TW3, TW6 and TW7 respectively. The hydrogen sulphide in the test wells is likely naturally occurring. The Ministry of Environment (MOE) indicates that hydrogen sulphide levels of up to 2.5 mg/l can be reasonably treatable using a manganese greensand filter. Based on past discussion with MOE personnel who set the MOE treatability limits, it is understood that the treatability limits are a conservative estimate of treatability. Valley Plumbing and Treatment of Perth, Ontario, water treatment specialists, were contacted to provide information on current capabilities of hydrogen sulphide treatment systems. Valley Plumbing indicated that hydrogen sulphide levels in drinking water of up to 20 mg/l can be treated using an air injection system such as Odour Oxidizer by Amitrol or equivalent. Accordingly, the hydrogen sulphide levels measured at the site are indicated to be readily treatable.

Total Dissolved Solids

The Total Dissolved Solids (TDS) levels in test wells TW1, TW4 and TW6 were reported to be 660, 512 and 502 mg/l respectively, which exceeds the ODWS aesthetic objective of 500 milligrams per litre. 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 test wells. These values are based on the TDS, temperature, pH, alkalinity, and calcium observed in the sample. A copy of the calculation to determine the LSI value is provided in Appendix M. The LSI was calculated to be 0.77, 0.94 and 0.76 for TW1, TW4 and TW6 respectively. This indicates that the water is scale forming but non

corrosive. In our experience, the palatability of water with a TDS concentration of that measured should not be an issue.

6.3.1 Testing for Pesticides

A sample of water was obtained from TW3 on October 23, 2004 and delivered to Accutest Laboratories Ltd. for pesticides testing. The results of the testing are provided in Appendix L and indicate no detectable levels of pesticides in the sample.

6.4 Off-site Water Quality

A survey of six (6) existing wells at the Arbourbrook Subdivision on the north side of the subject site and seven (7) existing wells in the Huntley Manor subdivision on the south side of the side were carried out in the fall of 2003. The seven (7) wells at the Huntley Manor subdivision are located immediately adjacent to the south boundary of the proposed subdivision. Both Arbourbrook and Huntley Manor subdivisions border the west portion of the subject site. As part of the well survey, well owners were questioned as to any problems experienced with the quantity of water obtained from their wells. The well owners interviewed indicated that the wells in question have been supplying water for domestic family dwelling for some 1 to 17 years. Only one (1) of the thirteen (13) well owners indicated any problem with water quantity. That well owner (on Huntley Manor Drive) indicated that about five years ago (1998) their well had to be deepened for quantity purposes to some 107 metres but since that time, with the use of a storage tank, no water quantity problems have been experienced. All of the well owners indicated that conventional water softeners are utilized for their well water to treat hardness, iron and/or manganese.

Water samples were collected from two (2) nearby private wells located on private lots to characterize groundwater quality at established wells in the vicinity of the subject site. The water samples were collected April 8, 2005. The locations of the private wells are not provided in this report to respect participant's privacy; however, all of the offsite private properties sampled in the study were located within 200 metres of the boundary of the subject site. The addresses of the private lots are maintained on file at GEMTEC's office. The results of the private well sampling were provided to each of the well owners separately by means of a letter.

The private well samples were collected in laboratory supplied bottles and prepared/preserved in the field in accordance with the industry standard sampling, handling and preservation procedures required by the laboratory. The private well samples were subsequently submitted to Accutest laboratories Ltd. in Ottawa, Ontario for analysis chemical, physical and bacteriological analyses as listed in the MOECC guideline titled "Technical Guideline for Private Wells: Water Supply Assessment", dated August 1996.

Water samples were collected directly from the pressure tank or an untreated sample point (as determined by the well owner) after purging the water system at full flow for a period of about 10

to 15 minutes. When contacting well owners for collection of a water sample, it was requested that we be provided access to an untreated sample point.

Based on the results of the water sampling for offsite private wells, the water quality in the vicinity of the subject site is considered to be good and no significant exceedances of the ODWS were identified. Furthermore, no health related parameters were exceeded.

6.4.1 Comparison between Onsite Test Wells and Offsite Private Wells

Table 6.4 provides a list of all aesthetic objective (AO) and operational guideline (OG) exceedances for both the onsite test wells and the offsite private wells sampled during the course of this investigation.

Table 6.4 - Comparison of Test Well and Private Well Exceedances

Onsite Test Wells (8)	Offsite Private Wells (2)
Hardness	Hardness
-	Turbidity
Hydrogen Sulphide	-
Iron	Iron
Manganese	Manganese
Organic Nitrogen	Organic Nitrogen
Total Dissolved Solids	Total Dissolved Solids
-	Colour

Both the onsite test wells and the offsite private wells had exceedances for hardness. The onsite test wells encountered exceedances for total dissolved solids (3 wells), hydrogen sulphide (4 wells), manganese (3 wells), iron (6 wells) and organic nitrogen (one test well only). The offsite private wells encountered exceedances of turbidity, colour, total dissolved solids, iron, manganese and organic nitrogen. Based on the laboratory results of the onsite test wells and offsite private wells, the onsite test wells are likely utilizing the same aquifer as the offsite private wells.

6.4.2 Comparison Between 2003 and 2016/2017 Water Quality

Tests wells TW1 and TW4 were originally pumped and sampled in 2003 and then re-pumped in July 2017 and May 2016 respectively. The ODWS exceedances are summarized in Table 6.5 below.

Table 6.5 –2003 and 2016/2017 ODWS Exceedances Test Wells TW 1 and TW 4

TW 1 March 21, 2003	TW 1 July 5, 2017	TW 4 March 19, 2003	TW 4 May 10, 2016
Hardness	Hardness	Hardness	Hardness
Turbidity	Turbidity	Turbidity	-
-	Iron	Iron	Iron
-	Total Dissolved Solids	-	-
-	Manganese	-	-

Generally, the water quality has not significantly changed from the 2003 sampling to the 2016 and 2017 sampling. Test well TW1 had ODWS exceedances of total dissolved solids, iron and manganese in 2017 that were not present in 2003 and TW4 had the same ODWS exceedances, with the exception of turbidity which is below the ODWS in the 2016 sample. All water quality parameters continue to meet the ODWS and/or aesthetic objective treatability limit; no health related parameters were exceeded. To note, TW1 had an initial total coliform exceedances (7 CFU/100mL) and TW4 had non-reportable values (overgrown) upon resampling. These exceedances can be attributed to the wells sitting idle for 10+ years; following chlorination and additional pumping, both TW1 and TW4 reported non-detectable total coliform.

Notable changes in water quality in TW1 include increases in chloride (66 to 86 mg/l) and decreases in sodium (47 to 38.8 mg/l) and fluoride (0.23 to <0.1 mg/l). Notable changes in water quality in TW4 include increases in chloride (49 to 133 mg/l) and sodium (32 to 56.7 mg/l) and decreases in fluoride (0.7 to 0.23 mg/l). The variability in water quality observed from 2003 to 2016 and 2017 may be attributed to the further development of the test wells, both of which had increased well yields (discussed in section 6.5 below).

6.5 Pumping Test Analysis

6.5.1 Pump Test Analysis Overview

The drawdown and recovery water level data from the eight (8) test wells are provided in Appendix J. Test wells TW1 and TW4 were re-pumped in order to confirm aquifer transmissivity and water quality parameters. The details of the pumping tests carried out on the test wells are provided in Table 6.6 and 6.7 below. All depths provided are in metres below ground surface (m BGS).

Table 6.6 – Pumping Tests Details (2003)

Parameter	TW 1 Mar 22/03	TW 2 Mar 24/03	TW 3 Mar 17/03	TW 4 Mar 19/03
Duration (minutes)	540	360	360	360
Flow Rate (litres per minute)	9	23	32	14
Static Water Level (m BGS)	3.43	0.93	1.19	3.45
Well Depth (m BGS)	62.5	36.6	55.2	61.0
Available Drawdown (m)	58	34	53	56
Water Level at End of Pumping (m BGS)	44.19	20.78	11.80	21.06
Observed Drawdown at End of Pumping (m)	40.76	19.85	10.61	17.61
Percent Drawdown Utilized (%)	70.3	58.4	20.0	31.4

Table 6.7 – Pumping Tests Details (2016-2017)

Parameter	TW 1 Jul 5/17	TW 4 May 16/16	TW 5 Jul 12/17	TW 6 Oct 19/17	TW 7 Oct 18/17	TW 8 Oct 17/17
Duration (minutes)	374	480	-	360	360	360
Flow Rate (litres per minute)	18.9	26.5	-	22	38	57
Static Water Level (m BGS)	1.89	1.75	-	0.27	1.42	0.49
Well Depth (m BGS)	62.5	61.0	-	43.6	55.8	43.6
Available Drawdown (m)	60.6	59.2	-	43.3	54.4	43.1

Parameter	TW 1 Jul 5/17	TW 4 May 16/16	TW 5 Jul 12/17	TW 6 Oct 19/17	TW 7 Oct 18/17	TW 8 Oct 17/17
Water Level at End of Pumping (m BGS)	2.29	18.4	-	1.82	3.1	0.78
Observed Drawdown at End of Pumping (m)	0.40	16.7	-	1.56	1.69	0.28
Percent Drawdown Utilized (%)	0.66	28.2	-	4.2	3.1	0.65

As per MOECC Procedure D-5-5, each of the test wells was pumped at a flow rate greater than 18.8 litres per minute for 6 hours. The largest percent drawdown utilized at the end of pumping was 70.3% in test well TW 1 (with the exception of TW5 which did not have sufficient water), which corresponds to a 40.76 metre drawdown. The drawdown utilized in the remaining test wells ranged from 0.65 to 70.3 percent. Test wells TW1 and TW4 were re-pumped on July 5, 2017 and May 16, 2016 respectively to confirm aquifer transmissivity. Both wells were capable of pumping at rates greater than 18.8 litres per minute for greater than six (6) hours. The increase in aquifer transmissivity may be attributed to further well development (additional pumping) or development in the vicinity of the subject site (drilling).

Based on these results, all of the onsite test wells are capable of supplying water at a rate greater than 18.8 litres per minute for a period greater than six (6) hours. This is considered more than sufficient for typical domestic use. The only exception was test well TW5 which is now situated in a tree conservation area outside of the proposed lot development plan (refer to Appendix A).

6.5.2 Transmissivity Analysis

The transmissivity of the water supply aquifer was estimated from the pump test drawdown and recovery data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. An analysis of the pump test and recovery data was carried out using the Cooper-Jacob method of analysis and Theis recovery method of analysis. The results of the Aqtesolv 4.5 analysis are provided in Appendix J.

6.5.2.1 Pumping Test TW 1

March 22, 2003

Test well TW 1 was pumped at a constant rate of 9 L/min for 540 minutes. The drawdown in the pumped well gradually increased to 40.76 metres throughout the 540 minutes of pumping. The water level in the test well recovered 95% in 120 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 0.2 L/min/m. An aquifer transmissivity of 1 x 10^{-6} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 7 x 10^{-7} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 8 x 10^{-7} m^2/sec.

July 5, 2017

Test well TW1 was re-pumped July 5, 2017 to confirm aquifer transmissivity and water quality. Test well TW 1 was pumped at a constant rate of 18.9 L/min for 374 minutes. The drawdown in the pumped well increased to 0.40 m after 30 minutes of pumping and remained at that level for the remaining 344 minutes of pumping. The water level in the test well recovered 100% in 60 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 47.25 L/min/m. An aquifer transmissivity of 2 x 10^{-4} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates.

6.5.2.2 Pumping Test TW 2

Test well TW 2 was pumped at a constant rate of 23 L/min for 360 minutes. The drawdown in the pumped well gradually increased to 14 metres throughout the first 200 minutes of pumping and then increased to approximately 20 metres in the following 160 minutes. The water level in the test well recovered 99% in 35 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 1.2 L/min/m. An aquifer transmissivity of 1 x 10^{-5} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 5 x 10^{-6} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 8 x 10^{-6} m^2/sec.

6.5.2.3 Pumping Test TW 3

Test well TW 3 was pumped at a constant rate of 32 L/min for 360 minutes. The drawdown in the pumped well gradually increased to 10.6 metres throughout the pumping test. The water level in the test well recovered 99% in 120 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 2.9 L/min/m. An aquifer transmissivity of 6 x 10^{-5} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 2 x 10^{-5} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 4 x 10^{-5} m^2/sec.

6.5.2.4 Pumping Test TW 4

March 19, 2003

Test well TW 4 was pumped at a constant rate of 14 L/min for 374 minutes. The drawdown in the pumped well gradually increased to approximately 21.5 metres throughout the first 220 minutes and then began to decrease during the remaining 154 minutes. The water level in the test well recovered 97% in 55 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 0.6 L/min/m. An aquifer transmissivity of 3 x 10^{-6} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 3 x 10^{-6} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 3 x 10^{-6} m^2/sec.

May 16, 2016

Test well TW4 was re-pumped May 16, 2016 to confirm aquifer transmissivity and water quality. Test well TW 4 was pumped at a constant rate of 26.5 L/min for 480 minutes. The drawdown in the pumped well gradually increased to 16.7 metres after 480 minutes of pumping. The water level in the test well recovered 97% in 45 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 1.6 L/min/m. An aquifer transmissivity of 1 x 10^{-5} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 7 x 10^{-6} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 8 x 10^{-6} m^2/sec.

6.5.2.5 Pumping Test TW 5

The water well record for test well TW5 reported no water found and no pump test was conducted following drilling on March 18, 2003. The test well was pumped on July 12, 2017 at a rate of 18.9 litres per minute and following one (1) hour of pumping was dry. No aquifer transmissivity analysis was conducted.

6.5.2.6 Pumping Test TW 6

Test well TW 6 was pumped at a constant rate of 22 L/min for 360 minutes. The drawdown in the pumped well increased to 1.56 metres after 30 minutes of pumping and remained at that level for the remaining 330 minutes of pumping. The water level in the test well recovered 95% in 15 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 14.1 L/min/m. An aquifer transmissivity of 7 x 10^{-5} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 8 x 10^{-5} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 7 x 10^{-5} m^2/sec.

6.5.2.7 Pumping Test TW 7

Test well TW 7 was pumped at a constant rate of 38 L/min for 360 minutes. The drawdown in the pumped well gradually increased to 1.69 metres throughout the 360 minutes of pumping. The water level in the test well recovered 95% in 85 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 22.5 L/min/m. An aquifer transmissivity of 4 x 10^{-4} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 3 x 10^{-4} m^2/sec was estimated using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 3 x 10^{-4} m^2/sec.

6.5.2.8 Pumping Test TW 8

Test well TW 8 was pumped at a constant rate of 57 L/min for 360 minutes. The drawdown in the pumped well increased to 0.28 m after 40 minutes of pumping and remained at that level for the remaining 320 minutes of pumping. The water level in the test well recovered 99% in 15 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown and recovery data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 203.6 L/min/m. An aquifer transmissivity of 2 x 10^{-3} m^2/sec was estimated using the Cooper-Jacob method for the water level drawdown data and pumping rates. An aquifer transmissivity of 2 x 10^{-3} m^2/sec was estimated

using the Theis Recovery method. The average transmissivity of the bedrock aquifer in the area of the test well is calculated to be 2 x 10^{-3} m^2/sec. Due to the minimal drawdown observed during pumping at a rate of 57 L/min, the average transmissivity of 2 x 10^{-3} m^2/s is a conservative estimate.

6.5.3 Unified Aquifer Parameters

The unified parameter values were calculated the geometric mean from the specific capacity and transmissivity values of the current investigation (Table 6.8).

Table 6.8 – Summary of Aquifer Parameters

Unified Aquifer Parameters	Minimum	Maximum	Arithmetic Average	Geometric Mean
Specific Capacity (Litres/min/m)	1.2	203.6	41.9	10.8
Transmissivity (m^2/sec)	8 x 10^{-6}	2 x 10^{-3}	4 x 10^{-4}	8 x 10^{-5}

Note: The specific capacity and transmissivity of TW 1 and TW4 from the most recent pumping test data was used in the calculations.

The geometric mean was computed in addition to the arithmetic average. The geometric average is a more representative “average” of a natural population (Gaussian distribution). Based on the unified parameter calculations, the specific yield of the bedrock water supply aquifer at the subject site is 3.4 litres per minute per metre and the transmissivity is about 4 x 10^{-5} m^2/sec.

6.6 Hydraulic Interference Effects

During the pumping of the onsite test wells TW 6, TW7 and TW 8 on October 17 to October 19, 2017, water level measurements were taken every 15 minutes at test wells TW2, TW3, TW6, TW7 and TW8 using Diver dataloggers. During the pumping of test well TW1 on July 5, 2017, water level measurements were taken every 15 minutes at test wells TW2 and monitoring wells MW1D. The water level measurements in the observation wells are reported in Appendix J and discussed below.

6.6.1 Bedrock Observation Wells

The change in water level measurements in bedrock monitoring wells (test wells not being pumped) during the pumping tests for test wells TW 1, TW 6, TW 7 and TW 8 ranged from 0.03 to 0.20 metres (decrease in water level). The measured drawdown in each of the observation wells is provided in Appendix J. Based on the observed water levels during pumping, hydraulic interference between wells is expected to be minimal. The well interference effects are further discussed in section 6.6.3 below.

6.6.2 Overburden Observation Wells

The change in water level measurements overburden monitoring well MW1D (screened 4.5 to 6.0 metres below ground surface in sand and gravel) during the pumping tests for test well TW 1 decreased approximately 0.03 metres. The 0.03 metre decrease in water level is within the daily water level fluctuations for MW1D and does not appear to be the result of pumping from test well TW1. Based on the water level measurements in the overburden monitoring well (MW1D), the overburden does not appear to be hydraulically connected to the bedrock aquifer in the vicinity of the test well.

6.6.3 Computer Model Simulations

A well interference simulation was developed using Aqtesolv version 4.5. A scenario was developed and the well simulation output is provided on Figure O1 in Appendix O for discussion purposes. A discussion of the simulation and the parameters used in its development are provided in the following sections.

No estimates of the storativity are available, however typical values for confined aquifers range from 5×10^{-5} to 5×10^{-3} (Todd, 1980).

6.6.3.1 Scenario 1 (Figure O1 - Appendix O)

Scenario 1 is provided to illustrate the maximum drawdown using the unified aquifer parameters identified in Table 6.7. The average storativity for a confined aquifers was used (Todd, 1980). Furthermore, the individual pumping rate of 18.9 litres per minute is used for both residential and commercial properties. The peak demand for commercial properties is expected to occur over a larger time period (i.e. 8 hour day) and therefore a peak demand of 18.9 litres per minute should be sufficient to represent commercial well usage.

The following parameter values were utilized in the model:

- Number of pumping wells = 82 wells (78 residential and 4 commercial);
- Individual well pumping rate = 18.9 litres per minute;
- Duration of pumping = 120 minutes;
- Analysis model = Theis
- Aquifer thickness = 60 metres;
- Aquifer transmissivity = 6.9 m^2/day (current investigation); and,
- Storativity coefficient = 5×10^{-4}.

The results of Scenario 1 simulation indicate that the maximum drawdown within the site is about 4.0 to 4.5 metres and the maximum interference between wells is approximately 0.5 to 1.0 metres. The drawdown decreases to less than 0.1 metres a distance of approximately 100 metres from the pumping wells and is a maximum of approximately 0.5 metres at the property boundary. Based

on the results of the well interference simulation, the interference between drinking water wells is deemed acceptable.

6.7 Long Term Well Yields

The British Columbia Ministry of the Environment (2012) estimates the long-term well yield by first determining the well's specific capacity after 100 days of pumping (theoretical drawdown without recharge). The assessment was carried out using the following data:

- Time (t) - 100 days;
- Pumping Rate (Q) – 27.2 m^3/day (based on peak flow of 18.9 litres per minute);
- Transmissivity (T) – 6.9 m^2/day (based on Table 6.7 Unified Parameter);
- Distance (r) - 0.078 metres (based on radius of open hole test well);
- Storativity (S) – 5 x 10^{-4} (based on an estimate of storativity from Todd, 1980); and,
- Maximum Available Drawdown (D) – 34 metres (based on TW 2 current investigation).

First, the drawdown in the aquifer after 100 days of pumping is calculated using the Modified Nonequilibrium Equation (Groundwater and Wells 2nd Ed., Driscoll, 1986):

$$s = \frac{0.183 \cdot Q}{T} \cdot Log \frac{2.25 \cdot T \cdot t}{r^2 \cdot S}$$

The specific capacity after 100 days (SC) is calculated using the pumping flow rate (Q) and estimated drawdown after 100 days (S):

$$SC = \frac{Q}{s}$$

The safe well yield (Q_{safe}) can then be estimated by multiplying the specific capacity after 100 days of pumping (SC) by the maximum available drawdown (D) by a safety factor of 0.7:

$$Q_{safe} = 0.7 \times SC_{100} \times D_{available}$$

Using this approach, the safe well yield was calculated for the average scenario based on unified transmissivity values. The safe well yield was calculated to be approximately 103 litres per minute of continuous pumping for 100 days. This is significantly more than the peak pumping rates of MOECC Procedure D-5-5 of 18.9 litres per minute for a period of 2 hours.

In addition, the onsite test well with the lowest aquifer transmissivity, TW 4, was assessed using this method. The assessment was carried out using the following data:

- Time (t) - 100 days;

- Pumping Rate (Q) – 6.8 m^3/day (based on peak flow of 18.9 litres per minute for 6 hours);
- Transmissivity (T) – 0.69 m^2/day (based on TW 4 average transmissivity from current investigation);
- Distance (r) - 0.078 metres (based on radius of open hole test well);
- Storativity (S) – 5 x 10^{-4} (based on an estimate of storativity from Todd, 1980); and,
- Maximum Available Drawdown (D) – 59 metres (based on TW 4 current investigation).

Using this approach, the safe well yield for TW 4 was calculated. The safe well yield was calculated to be approximately 20.3 litres per minute for six (6) hours per day over a 100 day pumping period (or 8.1 litres per minute of continuous pumping for 100 days). This conservative estimate remains greater than the peak pumping rates of MOECC Procedure D-5-5 of 18.8 litres per minute for a period of 2 hours.

Based on these results, it is our opinion that the long term safe well yield of the onsite test wells and future wells constructed in accordance with the well construction recommendations is greater than the demand of the proposed development. That is, no concerns with long term sustainability of the proposed water supply aquifer were identified.

7.0 CONCLUSIONS

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

- The site geology consists of glaciomarine deposits (clayey silts to fine to medium sands), glacial till, and sand and gravel overlying the proposed bedrock water supply aquifer.
- The overburden of the subject site is characterized by shallow bedrock conditions on the southwestern portion of the subject site (1.0 to 2.2 metres) with the overburden depth increasing in a northeasterly direction. The surficial soils are characterized by silty clay, silty sand, fine to coarse sands and sand and gravel at depths.
- Water levels measured in on-site overburden and bedrock wells indicate an average downward vertical gradient of 0.04 (based on MW 1, MW3, MW4 and MW6) and a slightly upward gradient of 0.01 at MW2. The test wells, screened in the bedrock, have a higher hydraulic head, indicating a slightly pressurized aquifer, which may indicate that it is at least partially confined.
- The test well construction is typical of wells which will be used in the development in the future.

- Interference between drinking water wells is expected to be negligible under typical usage for residential developments. This is based on observations made during groundwater pumping tests, long-term groundwater level monitoring and groundwater model simulations.

- The water quality determined in the course of this investigation is representative of the long term water quality which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.

- The water quality available from drilled wells on the subject site is safe for consumption based on the absence of health related exceedances of the ODWS.

- The quality of the groundwater meets the Ministry of the Environment and Climate Change Regulations, Standards, Guidelines and Objectives with the exception of hardness (all wells), organic nitrogen (1 of 7 wells), iron (6 of 7 wells) and hydrogen sulphide (4 of 7 wells). Following well chlorination, no health related parameters have been exceeded.

    - The levels of hardness and iron are considered to be reasonably treatable using a conventional water softener (Table 3 of the Appendix of MOE Guideline D-5-5).

    - The level of organic nitrogen is an operational parameter intended for use in waters requiring chlorination for disinfection purposes. As there are no disinfection requirements for the subject site, this operational exceedance is not of concern.

    - An unofficial addendum to Procedure D-5-5 (July 6, 1995) indicates that sulphide concentrations of up to 2.5 mg/L can be reasonably treated with manganese greensand filters. Based on past discussions with the MOE personnel who set the MOE treatability limits, it is understood that the treatability limits are a conservative estimate. Valley Plumbing and Treatment of Perth, Ontario, water treatment specialists, indicated that hydrogen sulphide levels in drinking water of up to 20 mg/L can be treated using air injection systems such as Odour Oxidizer or equivalent.

- The quantity of groundwater available from the proposed water supply aquifer is more than sufficient for the proposed development and will sustain repeated pumping at the test rate and duration at 24-hour intervals over the long term. The well yields determined in the course of this investigation are representative of the long-term yields which future lot owners are likely to obtain from their wells constructed in accordance with the well construction recommendations.

- The proposed subdivision (low impact development) meets the MOECC D-5-4 Groundwater Impact Assessment (Three-Step Process).

    - Individual on-site septic systems will not cause concentrations of nitrate-nitrogen in groundwater to exceed 10 mg/L at the downgradient property boundary based on contaminant attenuation concentrations.

8.0 RECOMMENDATIONS

The following provides recommendations regarding well construction specifications, water quality and septic system design:

8.1 Well Construction Recommendations

- Any original test wells which are not located in suitable locations for future development use and any other existing wells located on the property should be abandoned by a licensed well driller in accordance with MOECC regulations following draft plan approval of the subdivision;

- All wells that are drilled in the subdivision should be constructed in accordance with local and MOECC regulations, including but not limited to Ontario Reg. 903. In addition, it is recommended that all new wells be installed in the bedrock aquifer;

- Drinking water wells should be located so that they meet and preferably exceed the minimum setback distances from septic systems, property lines and any other sources of contamination, as required in the Ontario Building Code and/or Ontario Reg. 903;

- Well casings should be extended at least 6.0 metres below ground surface. The entire annular space between the steel casing and the overburden/bedrock should be filled with a suitable cement or bentonite grout;

    - In addition to the minimum recommended well casing lengths specified in the preceding recommendation, all well casings should be completed a minimum of 1.5 metres into sound, competent bedrock;

- A well grouting certification inspection should be conducted during the installation and grouting of the well casing for future wells installed on the subject site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist;

- It is recommended that newly drilled water wells be developed by the well driller for a minimum of one (1) hour of pumping following completion of the well drilling. This well development can be carried out in conjunction with the one (1) hour pumping test that is required for the MOECC Water Well Record;

    - It is recommended that newly drilled water wells be chlorinated by the well driller following completion of the well drilling and pumping; and,

- The test wells completed for this study were completed at depths ranging from 36.6 to 67.0 metres below ground surface. Future drinking water wells completed on the subject

site at depths outside of this range may encounter different hydrogeological conditions and the quality and quantity of water available from drilled wells may differ than that presented in this study.

8.2 Well Ownership Recommendations

- 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".

- The use of earth energy systems shall not be permitted within the subdivision.

- For all newly drilled wells, it is recommended that a raw water sample be collected and analyzed for potability requirements (E. Coli. and total coliform bacteria).

    - If any bacteriological exceedances of the Ontario Drinking Water Standards (ODWS) are noted in the sampling, then it is recommended that the homeowner take remedial actions (such as chlorination of the well to eliminate bacteria) and retest a raw water sample to confirm that the remedial actions were effective.

- It is recommended that homeowners be informed that hardness levels may exceed the ODWS operational guidelines. Conventional water softeners may be desired by homeowners to treat minor aesthetic objective and operational guideline exceedances of the ODWS such as hardness. On heating, hard water has a tendency to form scale deposits and can form excessive scum with regular soaps. Conversely, soft water may result in accelerated corrosion of water pipes.

- Aeration of well water (or other treatment such as activated charcoal filters, chlorination, manganese greensand filters and other forms of oxidizing treatment) may be desired by homeowners to treat aesthetic objective exceedances of the ODWS for hydrogen sulphide;

- It is recommended that homeowners be informed that water softening by conventional sodium ion exchange 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 the water at background levels. Consideration could also be given to providing a bypass of the water softener for drinking water purposes.

- Potential residents should be informed of the following information:

    - Background sodium levels in the drinking water wells at the site may exceed the warning level for persons on sodium restricted diets;

    - The following water quality parameters may not meet the ODWS operational guidelines in drinking water wells completed at the subject site:

        - Hardness – Hardness levels in the onsite test wells were greater than the operational guideline for hardness and can be expected in future wells drilled at the property.

        - Organic nitrogen – Organic nitrogen levels in onsite test wells encountered a single exceedance of the operational guideline for organic nitrogen; this result may occur in future wells drilled at the property. Taste and odour problems are common with organic nitrogen levels greater than the operational guideline. In addition, organic nitrogen levels in exceedance of the operational guideline can react with chlorine disinfection systems and severely reduce its disinfection power.

    - The following water quality parameters may not meet the ODWS aesthetic objectives in drinking water wells completed at the subject site:

        - Iron – Iron concentrations in some of the water samples from onsite test wells exceeded the ODWS aesthetic objective for iron and a similar condition may be encountered in future wells drilled at the property. Excessive levels of iron may impart a brownish colour to laundered goods, plumbing fixtures and the water itself; it may also produce a bitter, astringent taste in water and beverages; and the precipitation of iron can promote the growth of iron bacteria in water distribution systems. Any iron exceedances can be effectively treated with the use of conventional water softener (up to 5 mg/L), oxidation with filtration through proprietary media (up to 10 mg/L) or chlorination followed by sand or multimedia filtration (up to 10 mg/L).

        - Sulphide – Sulphide levels in four (4) of the onsite test wells exceeded the ODWS aesthetic objective for sulphide and a similar condition may be encountered in future wells drilled on the subject site. Although ingestion of large quantities of sulphide can produce toxic effects on humans, it is unlikely that an individual would consume a harmful dose in drinking water because of the associated unpleasant taste and odour. Sulfide, in association with iron, produces black stains on laundered items and black deposits on pipes and fixtures. Hydrogen sulphide can be effectively treated through the use of activated charcoal filters, chlorination, manganese greensand filters and other forms of oxidizing treatment.

8.3 Septic System Construction Recommendations

- Septic systems should be located in general accordance with the Lot Development Plan prepared by Novatech.

- The proposed lots will be serviced by conventional septic sewage disposal systems designed according to the Ontario Building Code. A site specific investigation should be conducted on each lot for the design of the septic system;

- Tertiary septic systems could be considered for the proposed development and/or individual property owners. Any tertiary systems should be designed according to the Ontario Building Code. A site specific investigation should be conducted on each lot for the design of the septic system;

- It is recommended that if property owners choose to install tertiary treatment septic systems, then it will be required to enter a maintenance agreement with authorized agents of the system manufacturer for the service life of the system;

- In view of the percolation time of the native silty clay of this site, a sand mantle should be allowed for on some or all of the proposed lots; and,

- The proposed commercial lots (lots 79-82) shall have sewage flows limited to those outlined in Table 5.1 – Allowable Sewage Flow Per Commercial Lot.

8.4 Septic Ownership Recommendations

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

8.5 Site Phasing and Performance Reviews

- The proposed 78 residential lots should be completed in two (2) phases, with no more than 40 lots in any phase (refer to the Lot Development Plan in Appendix A for lot and phasing locations).

- Performance reviews will be conducted in accordance with MOECC Procedure D-5-5 Private Wells: Water Supply Assessment, section 4.7 Phased Developments.

    - To provide information on the groundwater quality and septic system performance for each phase of the development, groundwater samples will be obtained from a representative number of wells on nearby lots within the previous phases. The wells will be sampled prior to the registration of the next phase for chemical, physical and bacteriological analyses listed in the Ontario Ministry of the Environment (MOE) guideline titled “Technical Guideline for Private Wells: Water Supply Assessment”, dated August 1996. The wells would be chosen based on groundwater flow directions and the locations of septic systems, such that the

results are representative of the groundwater available from drilled wells in the subsequent phases.

- Carry out interviews with the homeowners at the sampling locations to identify any problems with the existing septic system or the water quality and quantity.

- Maintain the results of all sampling/testing and resident interviews in a spreadsheet to easily track any potential groundwater quality or quantity issues. The spreadsheet would also include Global Positioning Systems (GPS) data for each well used in the study.

- The results of the proposed performance evaluation would be reported prior to the registration of the subsequent phases. The report would include the MOECC Water Well Records for the private wells sampled and a site plan showing the sampled well locations as well as any other wells drilled in the subdivision.

- In accordance with the MOE guideline D-5-5, the recommendations and requirements provided in the hydrogeological report and terrain evaluation will be assessed and updated, if required, based on the findings of the investigations for the performance reports and/or a change in the surrounding land use.

9.0 LIMITATIONS OF REPORT

This report was prepared for 1384341 Ontario Ltd and is intended for the exclusive use of 1384341 Ontario Ltd. This report may not be relied upon by any other person or entity without the express written consent of GEMTEC and 1384341 Ontario Ltd. Nothing in this report is intended to provide a legal opinion.

The investigation undertaken by GEMTEC with respect to this report and any conclusions or recommendations made in this report reflect the best judgments of GEMTEC based on the site conditions observed during the investigations undertaken at the date(s) identified in the report and on the information available at the time the report was prepared. This report has been prepared for the application noted and it is based, in part, on visual observations made at the site, subsurface investigations at discrete locations and depths and laboratory analyses of specific chemical parameters and material during a specific time interval, all as described in the report. Unless otherwise stated, the findings contained in this report cannot be extrapolated or extended to previous or future site conditions, portions of the site that were unavailable for direct investigation, subsurface locations on the site that were not investigated directly, or chemical parameters, materials or analysis which were not addressed.

Should new information become available during future work, including excavations, borings or other studies, GEMTEC should be requested to review the information and, if necessary, re-assess the conclusions presented herein.

We trust that this report is sufficient for your requirements. If you have any questions concerning this information or if we can be of further assistance to you on this project, please call.

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- Dillon Consulting Limited. 2004. Carp Road Corridor, Groundwater Study. November 30, 2004.
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- WESA. 2014. Groundwater Impact Assessment Report, West Carleton Environmental Centre, Ottawa, Ontario. January 2014.
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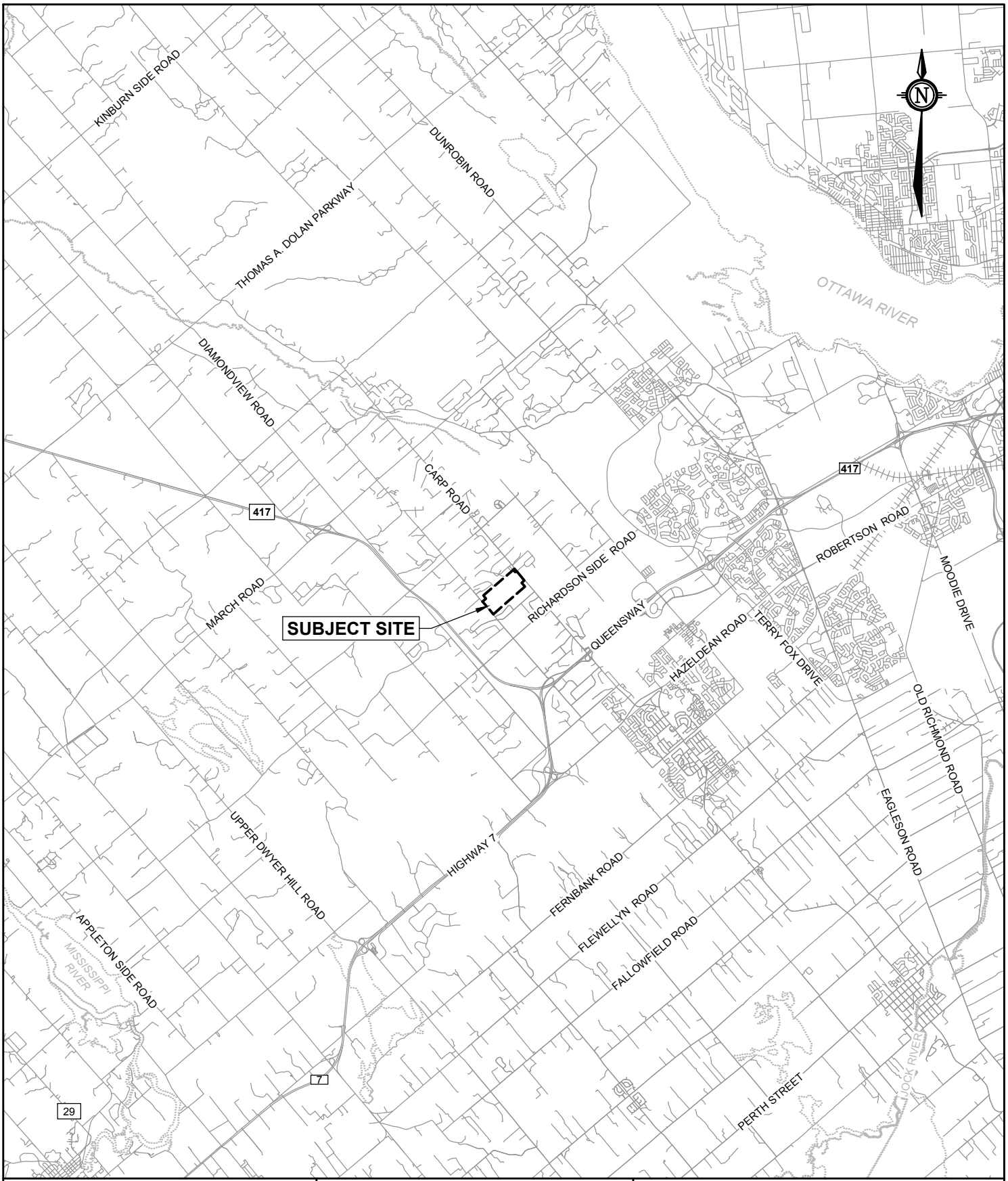

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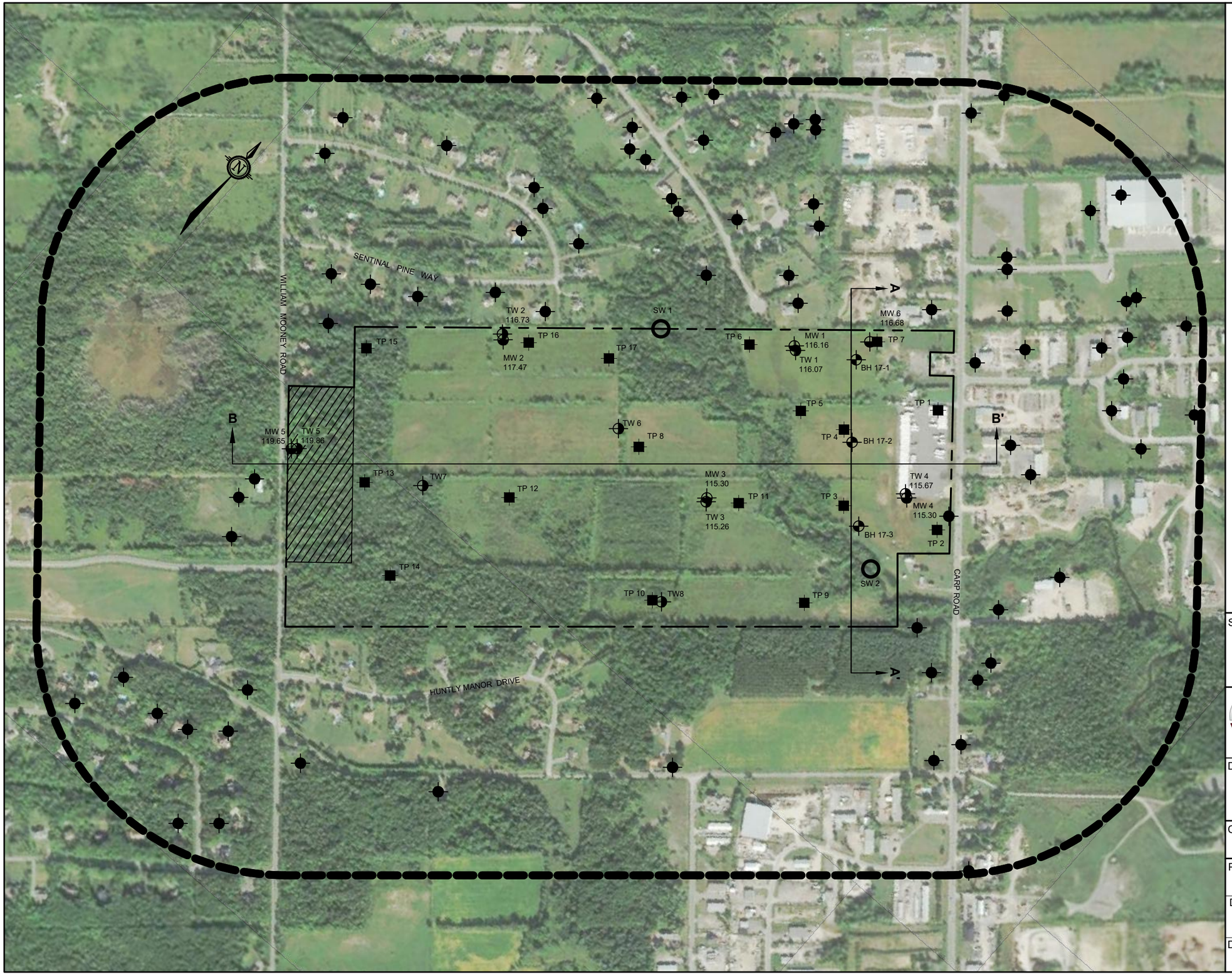
Project
HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

Drawing
KEY PLAN

Drwn By	Chkd By	Date	Project No.	Revision No.	
S.L.	A.P.	NOVEMBER 2017	61813.15	0	**FIGURE 1**

P:\0. Files\61300\61318.15\Drafting\1. Drawings\61318.15_(04)_FG1_V01_2017-11-16.dwg



LEGEND

- BH 17-1 / 115.97 — BOREHOLE (current investigation by GEMTEC)
  - GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM
- TW 1 / 116.16 — TEST WELL (current investigation by GEMTEC)
- MW 1 / 116.16 — MONITORING WELL LOCATION (current investigation by GEMTEC)
- TP 1 — TEST PIT - APPROXIMATE LOCATION (current investigation by GEMTEC)
- AVAILABLE MOECC WATER WELL RECORDS
- SW 1 — SURFACE WATER SAMPLING (approximate location)
- SUBJECT SITE
- 500 METRE BUFFER SHOWING EXTENT OF STUDY AREA
- A — A' — CROSS SECTION (current investigation by GEMTEC)
- FORESTED AREA TO BE PRESERVED (Refer to lot development plan by Novatech)

Scale 1:7500

0 150 300 450m

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Drawing: DETAILED SITE PLAN

Client: 1384341 ONTARIO LTD.

Project: 61318.15

HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

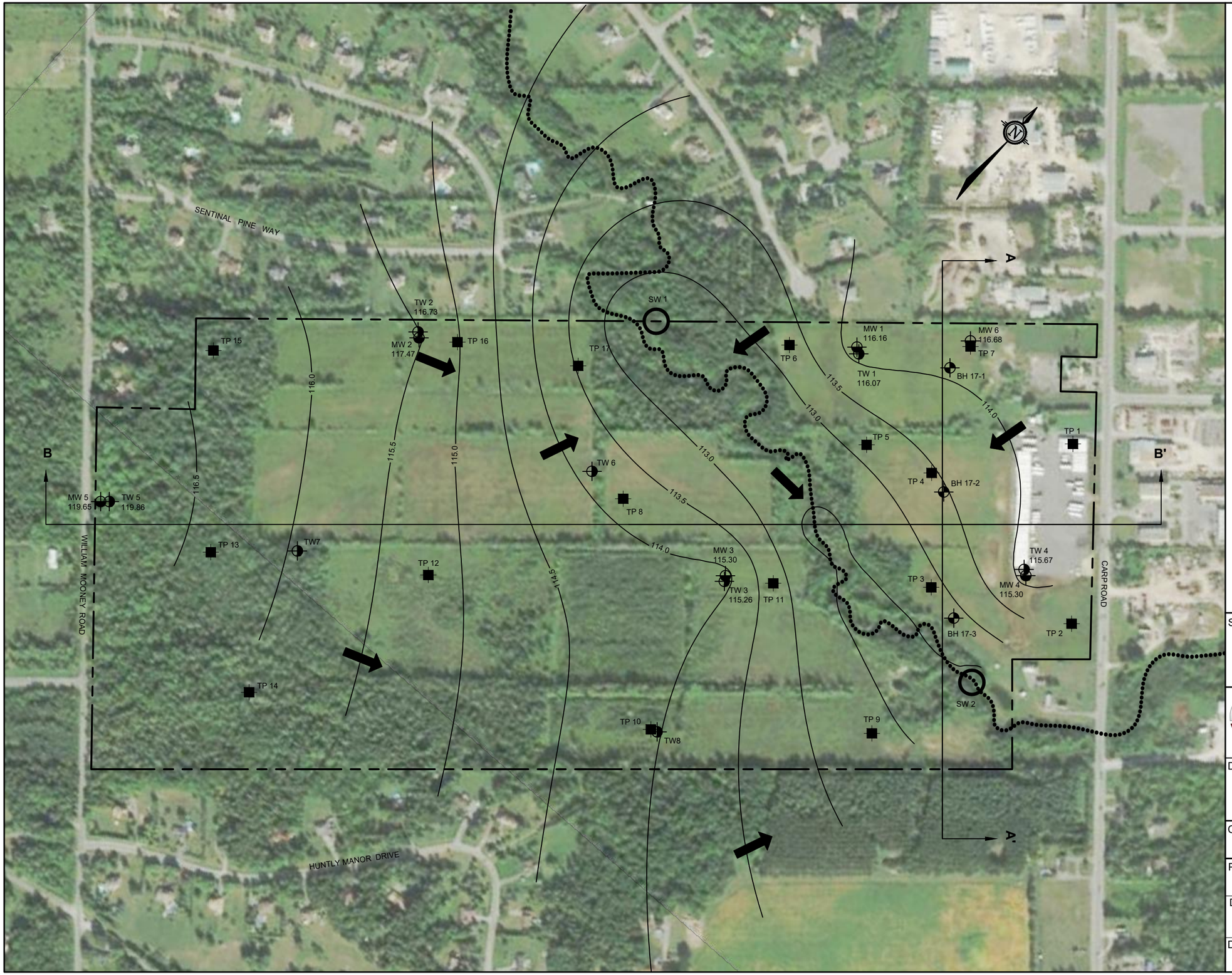
Drwn by: S.L.

Chkd by: A.P.

Date: JANUARY 2018

Rev.: 0

FIGURE 2



LEGEND

- BH 17-1 / 115.97 — BOREHOLE (current investigation by GEMTEC); GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM
- TW 1 / 116.16 — TEST WELL (current investigation by GEMTEC)
- MW 1 / 116.16 — MONITORING WELL LOCATION (current investigation by GEMTEC)
- TP 1 — TEST PIT (approximate location)
- SW 1 — SURFACE WATER SAMPLING (approximate location)
- SUBJECT SITE
- A A' — CROSS SECTION (current investigation by GEMTEC)
- 116 — GROUNDWATER ELEVATION CONTOURS, SHALLOW OVERBURDEN (June 9, 2016)
- STREAM
- DIRECTION OF SHALLOW GROUNDWATER FLOW (June 9, 2016)

Scale 1:5000

0 100 200 300m

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Drawing: OVERBURDEN GROUNDWATER FLOW DIRECTION

Client: 1384341 ONTARIO LTD.

Project: 61318.15

HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

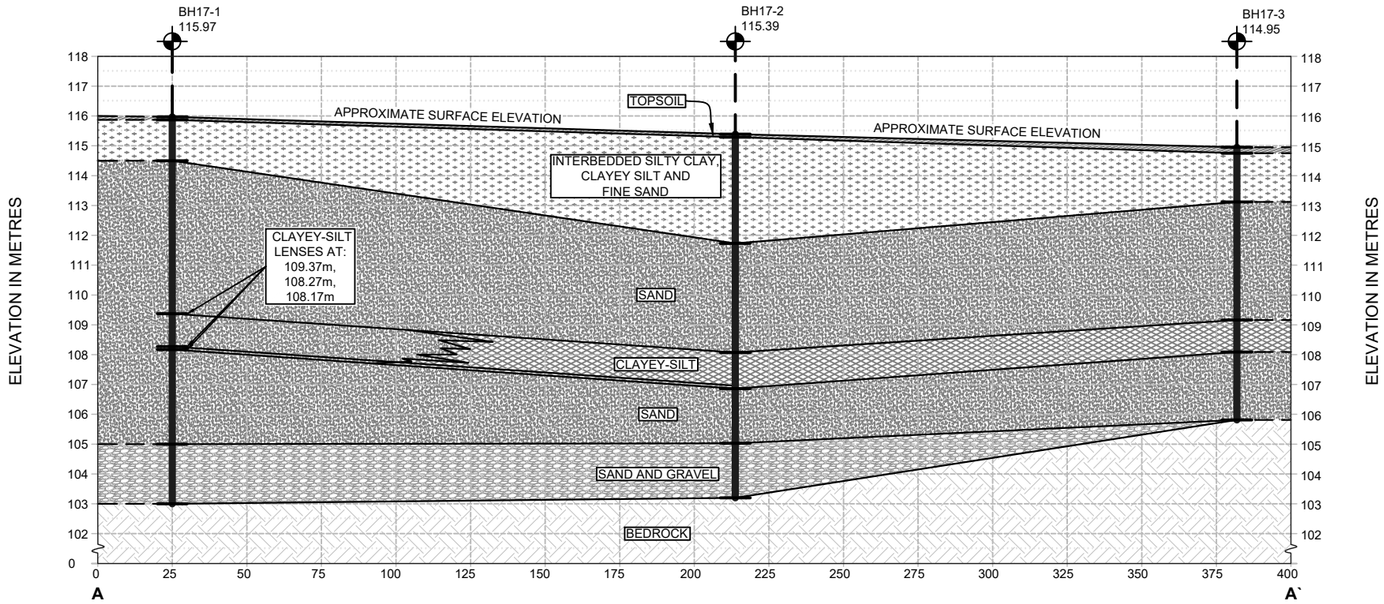
Date: JANUARY 2018

Rev.: 0

FIGURE 3

PROFILE A - A`

2727 CARP ROAD



LEGEND

- BH 17-1 115.97 — BOREHOLE (current investigation by GEMTEC); GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM
- INTERPRETTED
- TOPSOIL
- INTERBEDDED SILTY CLAY, CLAYEY-SILT, AND FINE SAND
- CLAYEY-SILT
- SAND
- SAND AND GRAVEL
- BEDROCK

Vertical Scale

1:200

0 4 8 12m

Horizontal Scale

1:2000

0 40 80 120

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Drawing: HYDROGEOLOGICAL CROSS SECTION A-A` (OVERBURDEN/ BEDROCK)

Client: 1384341ONTARIO LTD.

Project: 61318.15

HYDOGEOLOGICAL INVESTIGATIC
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

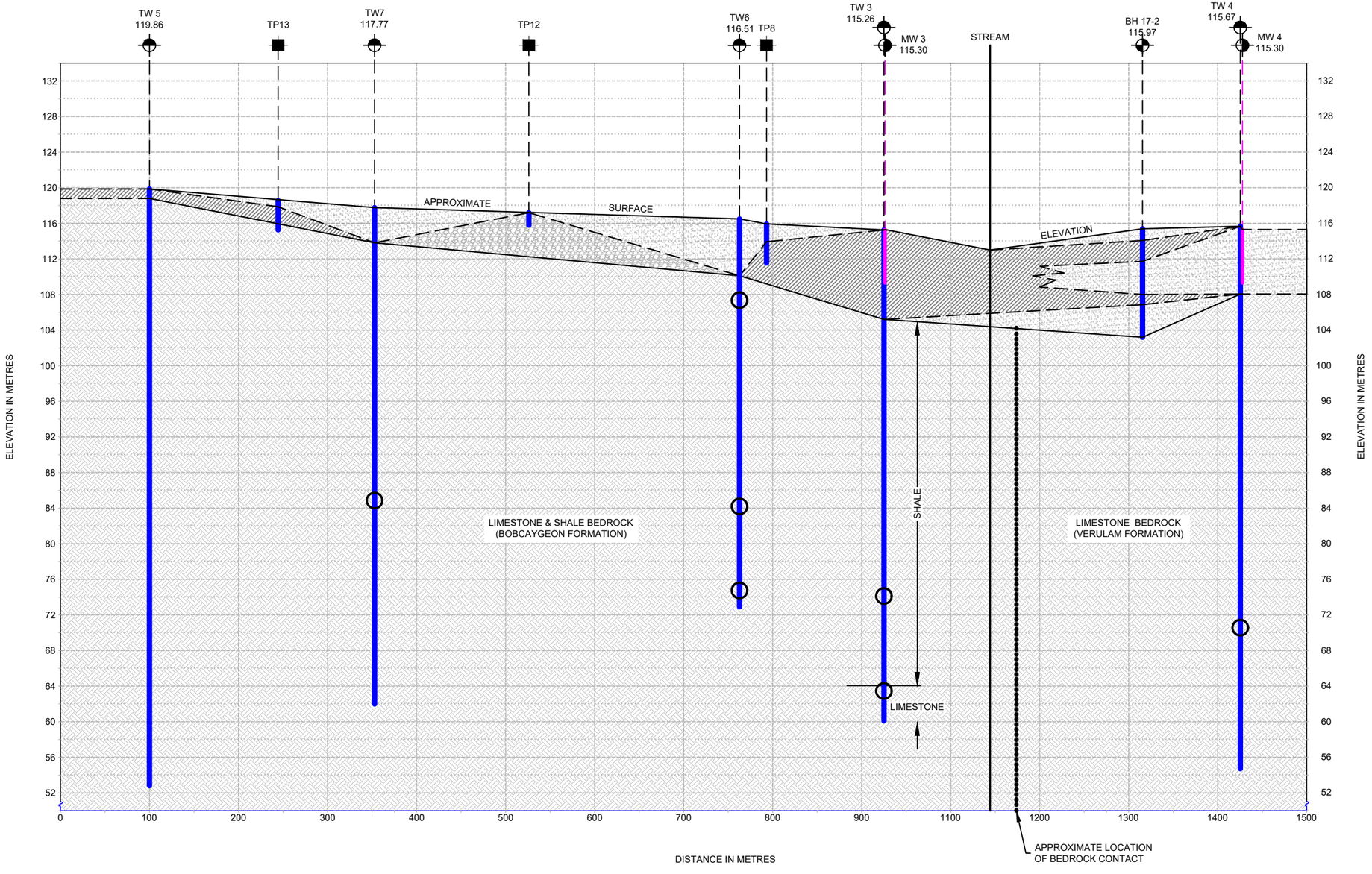
Date: JANUARY 2018

Rev.: 0

FIGURE 4

PROFILE B - B` (BEDROCK)

2727 CARP ROAD



LEGEND

- TW 3 115.26 — TEST WELL (current investigation by GEMTEC); GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM
- MW 3 115.30 — MONITOR WELL (current investigation by GEMTEC)
- BH 17-2 115.39 — BOREHOLE (current investigation by GEMTEC)
- TP1 — TEST PIT - APPROXIMATE LOCATION AND INFERRED GROUND SURFACE ELEVATION (current investigation by GEMTEC)
- WATER FOUND (current investigation by GEMTEC)
- INTERPRETTED
- CLAY, SILTY CLAY AND SILT (FINE GRAINED GLACIOMARINE)
- LIMESTONE & SHALE BEDROCK
- SILTY TO SANDY CLAY, WITH GRAVELS/ COBBLES (GLACIAL TILL)
- SAND/ SAND AND GRAVEL (COURSE GRAINED GLACIOMARINE)

Vertical Scale

1:500

0 10 20 30m

Horizontal Scale

1:5000

0 100 200 300

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Drawing: HYDROGEOLOGICAL CROSS SECTION B-B` (BEDROCK)

Client: 1384341 ONTARIO LTD.

Project: 61318.15

HYDOGEOLOGICAL INVESTIGATIC
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

Date: JANUARY 2018

Rev.: 0

FIGURE 5

APPENDIX A

Lot Development Plan
Prepared by Novatech Engineering Consultants Ltd.

(Rev 5 Lot Development and Constraints Plan appended July 13, 2018 no other changes to report or appendices)

LEGEND

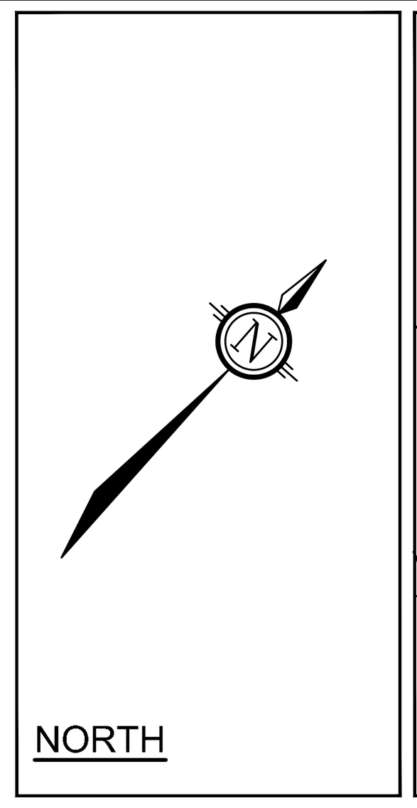
- 30m SETBACK LINE (FROM NHWM)
- MEANDER BELT (PROVIDED BY MVCA)
- 1:100 YR FLOODPLAIN (PROVIDED BY MVCA)
- REGULATORY LIMIT (PROVIDED BY MVCA)
- PROPOSED PHASE LIMITS
- PROPOSED REALIGNED HEADWATER FEATURE
- PROPOSED 30m CORRIDOR WIDTH
- PROPOSED RAISED SEPTIC SYSTEM
- PROPOSED BUILDING ENEVELOPE (2500ft²)
- PROPOSED WELL LOCATION
- EXISTING TEST WELL LOCATION
- EXISTING MONITORING WELL LOCATION
- EXISTING BUTTERNUT TREE LOCATION WITH 25m SETBACK

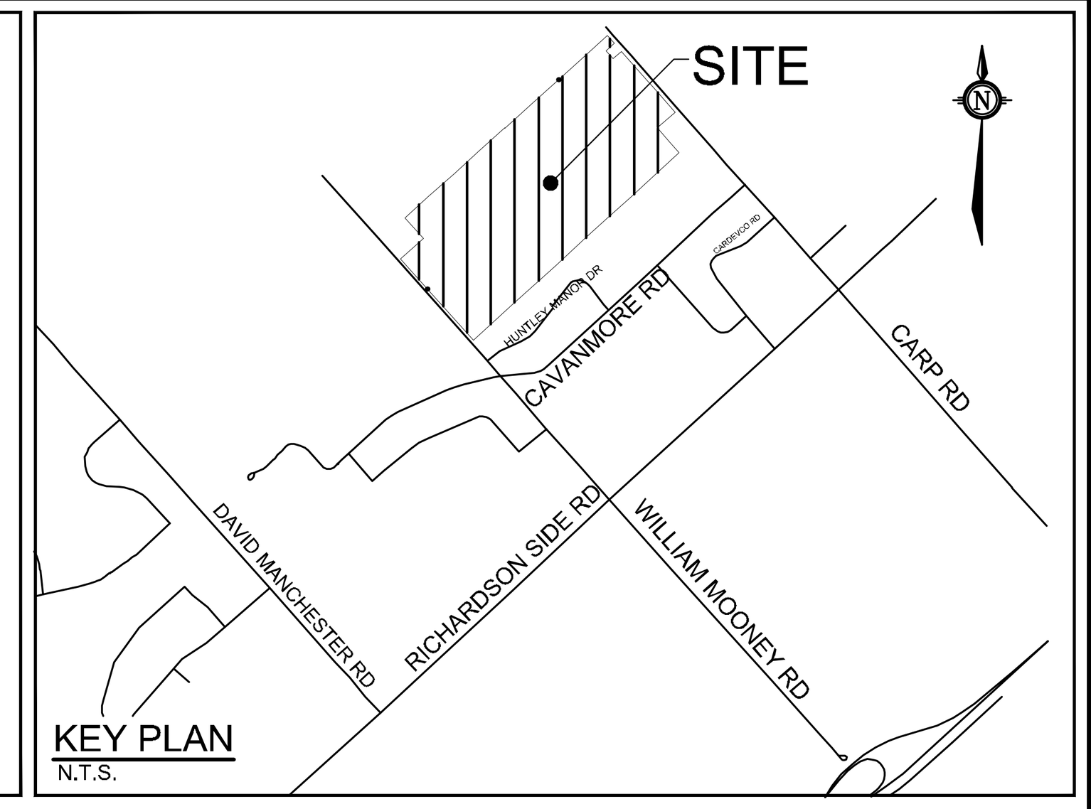
PROPOSED SEPTIC SYSTEM DETAILS:

LOCATION	DESIGN FLOW (L/day)	# OF RUNS	LENGTH OF RUNS	IMPORTED SAND (min/cm)	SIDE SLOPES	LOADING RATE (L/m2/day)	LOADING AREA REQUIRED (m2)	LOADING AREA PROVIDED (m2)
LOTS 1-78	3500	8	17.5	8	3:1	4	875	877
BLOCK 79 AND 82	1635	6	12	8	3:1	4	408	618
BLOCK 80	1050	6	8	8	3:1	4	262	542
BLOCK 81	2785	8	15	8	3:1	4	696	877

RR4 and RC9 Zoning Provisions

I	II	III	IV	V	VI		VII	VIII	IX	X	XI
ZONING MECHANISMS	Minimum Lot Area (m2)	Minimum Lot Width (m)	Minimum Front Yard Setback (m)	Minimum Rear Yard Setback (m)	Minimum Interior Side Yard Setback (m)		Minimum Corner Side Yard Setback (m)	Maximum Height (m) -Principal Building	Maximum Lot Coverage (%)	Landscaping of Yards	Outdoor Storage
					Abutting a residential zone	All other zones					
RC9	4000	30	10	10	4.5	3	6	11	25	required front and corner side yards to be landscaped, except for driveways crossing the front or corner side yard leading to a parking area	outdoor storage permitted in interior side and rear yard only; must be screened and concealed from view from abutting streets and from abutting non-commercial or non-industrial zones
RR4	4000	30	7.5	15	4.5		3	4.5	11	N/A	N/A





NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
5	REVISED FOR COORDINATION	JUL 11/18	LAB
4	REVISED FOR COORDINATION	APR 06/18	LSC
3	ISSUED FOR COORDINATION - REVISED NTW LOCATIONS	JUL 21/17	SM
2	ISSUED FOR COORDINATION	MAY 12/17	DJC
1	ISSUED FOR COORDINATION	MAY 10/17	DJC

SCALE 1:1500

1:1500 0 15 30 45 60

DESIGN DJC
CHECKED SMG
DRAWN DJC
CHECKED SMG
APPROVED SMG

FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

CITY OF OTTAWA
2727 CARP ROAD

LOT DEVELOPMENT AND CONSTRAINTS PLAN

PROJECT No. 100149-00
REV REV # 5
DRAWING No. 100149-LDC

PLANB1.DWG - 1000mmx707mm

APPENDIX B

Mississippi Valley Conservation Authority (MVCA) Comments

100149

RECEIVED OCT - 7 2005

Mississippi Valley Conservation

File: P08-T15-OLV2002-0025

October 4, 2005

Mr. Greg Winters
Novatech Engineering Consultants Ltd.
Suite 200
240 Michael Cowpland Drive
Ottawa, ON K2M 1P6

Dear Mr. Winters:

Re: Plan of Subdivision and Zoning By-law Amendment Proposal
Newill Corporation
Part of Lots 7 and 8, Concession 3
2727 Carp Road
City of Ottawa (Huntley)
City File Nos. OLV2002-0025 and OZP2002-0132

Please find enclosed our letter dated September 28, 2005 containing our recommended draft plan conditions for the above noted subdivision application. As detailed in the letter, one of the key aspects of the recommendations is the performance report to be completed between phases of the subdivision. The following are to expand on the items listed in our letter of September 28, 2005 that will be addressed in the performance report:

- An update on the neighboring land use with an assessment of any new threats to the water supply aquifer.
- Water quality analysis including volatile organic carbons of untreated water supply from wells identified in the original hydrogeological report in the phase already developed and the representative samples from the newer wells.
- A study addressing the interference and drawdown impacts for existing wells. The study will be conducted on selected wells. The wells must be located in similar hydrogeology and down gradient of the groundwater and septic flow direction. Water levels in the new wells will be monitored for a sufficiently long period of time accounting for water levels during peak hours of use and to account for slow response of the aquifer. More than one set of observations must be obtained over a sufficiently long time to account for seasonal changes.

Member of
Conservation ONTARIO
Natural Champions

4175 Hwy. 511, RR#2
Lanark, ON K0G 1K0 ▪ Tel. (613) 259-2421 ▪ Fax (613) 259-3468 ▪ info@mvc.on.ca

- Water quality analysis from east side (between Carp Road and Huntley Creek) from monitors installed in the aquifer receiving the septic effluent and in the test wells to demonstrate that nitrates, due to agricultural sources, are dissipating as implied by the original report. Placement of monitors should account for groundwater and nitrate plume flow directions.
- Interviews with the property owners to determine if there have been any occurrences of well water quality or quantity problems or malfunctioning septic systems.
- A visual inspection of septic systems, together with information from the property owners on septic tank pump out intervals and any other required maintenance.
- Re-evaluation of well construction and other recommendations contained in the original hydrogeological report within the context of the updated information.
- Re-assessment of the original recommendations and conclusions within the context of any new criteria or guidelines.
- Well records, GPS coordinates and a map showing well sampling locations and water level elevations must be provided. Original lab analysis reports must also be made available. The wells must be located in similar hydrogeology. Borehole logs and site cross-sections are useful tools to clarify site conceptual hydrogeology. The rationale for determining the size of the representative sample must be provided. The placement and number of monitors must be sufficient to provide confidence in the conclusions and recommendations. Methodologies, investigations and analysis, including assumptions, must be documented in detail.

If you have any questions please contact the undersigned.

Yours truly,

John Price

John Price, P. Eng.
Watershed Management Coordinator

cc Asher Rizvi, Conservation Partners Site

OLV2002-0025a.wpd

Mississippi Valley Conservation

File: P08-T15-OLV2002-0025

September 28, 2005

Mr. Kathy Rygus
City of Ottawa
Planning and Growth Management
110 Laurier Avenue West
Ottawa, ON K1P 1J1

Dear Ms. Rygus:

Re: Plan of Subdivision and Zoning By-law Amendment Proposal
Newill Corporation
Part of Lots 7 and 8, Concession 3
2727 Carp Road
City of Ottawa (Huntley)
City File Nos. OLV2002-0025 and OZP2002-0132

Staff of Mississippi Valley Conservation (MVC) have reviewed the above noted plan of subdivision and zoning by-law proposal with respect to the potential impact on natural hazards, natural heritage features and private servicing. As indicated in the proposal summary, a tributary of the Carp River (Huntley Creek) conveys flow through the proposed subdivision. The number and layout of the lots have changed since the original application. There are now proposed to be 80 residential lots and 3 commercial blocks along Carp Road. Considering the total gross area of the property, the average lot size is of 0.8 hectares. Also the originally proposed crossing of the tributary has been eliminated.

The supporting documentation that was part of our review included:

- "Newill Corporation Subdivision - Conceptual Stormwater Management Report" (March 2003) prepared by Novatech Engineering Consultants Ltd.
- "Preliminary Tree Study and Conservation Plan" (April 2003) prepared by Muncaster Environmental Planning.
- "Hydrogeological Investigation and Terrain Evaluation" (March 2003) prepared by Morey Houle Chevrier Engineering Ltd. and subsequent submissions dated October 2003, December 2004, January 2005, February 2005, May 2005 and June 2005.

Member of
Conservation ONTARIO
Natural Champions
[redacted], 4175 Hwy. 511, RR#2, Lanark, ON K0G 1K0 • Tel. (613) 259-2421 • Fax (613) 259-3468 • info@mvc.on.ca

Stormwater Management

Due to the low increase in imperviousness with estate residential subdivisions, it is proposed to address change in runoff with development by implementing Best Management Practices (BMPs) such as minimum grade ditches, vegetated swales, vegetative buffers around watercourses and promoting infiltration and filtering of runoff through sheet drainage.

Tree Conservation Plan

The key features have been highlighted and flagged for retention. Best Management Practices will be help retain trees on the lots that have significant woody vegetation. Key general recommendations from the plan are:

- Protect breeding birds by not removing trees between May 15th and July 10th.
- Grubbing and grading should be kept to a minimum and the limits of vegetation removal should be clearly marked and maintained with flagging tape and/or fencing for the duration of construction.
- A minimum setback of the drip line around tree trunks should be marked with fencing or flagging tape before the start of construction and maintained to protect the root system. No grading or heavy machine traffic should be permitted in the setback area due to possible soil compaction.
- Close cutting of vegetation will reduce the need for grubbing where vegetation removal is normally required for access or in work areas where re-grading is not necessary.
- To reduce major changes to micro-habitats, gradual removal or thinning is recommended.
- Transplanting of regenerating stems is recommended for the agricultural fields and open areas in the riparian zone along the watercourse.

Hydrogeological Investigation and Terrain Evaluation

The hydrogeological and terrain assessment report and the subsequent submissions for the proposed subdivision were reviewed to evaluate availability of water for 80 lots, suitability of septic systems and risk to water quality from proposed and existing land uses as considering the Official Plan policy of the City of Ottawa, the Ministry of the Environment Hydrological Technical Information Requirements for Land Development Applications (April, 1995) and Provincial Policy Statement (2005). Reports have concluded that:

.../3

- Sufficient water quantity is available on-site based on the 4 test wells. The report has concluded that it may be necessary to drill to depths greater than 61m on some lots to produce a sufficient water supply. Site water storage may also be required to meet peak daily domestic demands. Mutual well interference is calculated to range from 3.7 to 68 metres depending on the assumptions made during calculations (see Kollaard Associates June 15, 2005 response).
- On-site water quality from test wells was found to be acceptable as per the Safe Drinking water guidelines (with the exception of background Nitrate levels on the east side of the property as described below) with elevated parameters of Phenols, Hydrogen Sulphide, organic Nitrogen, Iron, Sodium, Manganese, TDS and turbidity. Pesticide analysis was conducted on well water to further assess the potential health risk. No pesticide presence was found. For Hydrogen Sulphide, the report has concluded that it is treatable with commercially available treatment systems. The reports have indicated that all the neighboring well owners surveyed are using treatment systems.
- Background Nitrate levels ranging from 4.1 to 12.5 mg/l were found east of Huntley Creek and less than 0.1 mg/l on west side of the creek. The report indicates the source of the Nitrate on the east side to be agricultural. Subsequent analysis (Kollaard Associates June 15, 2005) showed that nitrates are decreasing with current levels at 2.54-7.98 mg/l on the east side at the same locations sampled previously.
- A solid waste disposal site, located about 2km south east of the property, is not seen as posing any danger. The plume from the waste site is migrating to the east and the waste site is fitted with an intercept system. Accordingly , it is considered that the private wells at the subject site should not be impacted by the presence of the waste disposal site.
- The report has concluded that no impacts from neighboring developments are expected.

Based on the information contained in the reports, it can be confirmed that the bedrock aquifer could supply groundwater of reasonable quality for the proposed subdivision. Considering the proposed lot density, however, there could be some issues regarding well drawdown and interference effects. The existing nitrate contamination on the east side of Huntley Creek will have to be addressed before development can proceed in that area.

Therefore, MVC recommends draft plan approval of this proposed plan of subdivision application subject to the following conditions:

1) Prior to registration, or prior to an application for a Certificate of Approval for any stormwater works (whichever comes first), the owner shall prepare a Stormwater Site

Management Plan in accordance with the approved "Newill Corporation Subdivision - Conceptual Stormwater Site Management Plan" (March 2003) prepared by Novatech Engineering Consultants Inc. and "Preliminary Tree Study and Conservation Plan" (April 2003) prepared by Muncaster Environmental Planning. The Stormwater Site Management Plan shall identify the sequence of its implementation in relation to the construction of the subdivision and shall be to the satisfaction of the City of Ottawa and Mississippi Valley Conservation.

2) The design of the subdivision and development on individual lots will implement the conclusions and recommendations of the Site Stormwater Management Plan, Tree Study and Conservation Plan and Hydrogeological and Terrain Assessment and any subsequent addendums.

3) A consolidated report will be prepared incorporating and appending all the hydrogeological and terrain analysis information submitted to date.

4) The development of the subdivision shall proceed starting with the lots between William Mooney Road and Huntley Creek. Prior to any development occurring on lots between Huntley Creek and Carp Road, it shall be demonstrated that the Nitrate levels in the near surface and deep aquifers in this area are substantially reduced from current levels and it can be demonstrated that reasonable use criteria can be met.

5) The development of this subdivision will be phased. Each phase is to contain not more than 35 lots. Prior to the registration of each phase, subsequent to the first phase, the owner shall prepare a performance report demonstrating the operation of wells and private sewage disposal systems in the previous phases of the development to be satisfactory.

   A report prepared by a qualified professional shall be submitted to the City of Ottawa and Mississippi Valley Conservation to demonstrate that the existing wells and private sewage disposal systems in previous phases are functioning in a satisfactory manner. The assessment shall be based on a representative sample of sewage disposal systems and wells from the previous phases and shall include:

   - interviews with the property owners to determine any occurrences of well water quality or quantity issues or malfunctioning sewage disposal systems
   - a general chemistry analysis (including volatile organic carbons) of the water supply (untreated)
   - a visual investigation of sewage disposal systems together with records from property owners on septic tank pump out intervals and any other required maintenance

.../5

- Re-evaluation of conclusions and recommendations contained in the original hydrogeological analysis with respect to well construction, interference and draw down impacts, Nitrate plume levels and within the context of new criteria or guidelines.

The performance report will not be completed for any phase until 80% of the lots for that phase have been built upon and occupied.

6) Any operation involving groundwater extraction (e.g. groundwater source open loop heat pumps) within the development should not be permitted unless a detailed assessment of the water demand on the overall aquifer is completed.

7) The subdivision agreement and the agreements of purchase and sale will contain a clause whereby the purchaser is advised and acknowledges that, to prevent mutual interference of future wells on site, all wells must be drilled to a minimum depth of 35 metres. Additionally, any well with a yield of less than 13.7 L/min must be drilled to at least 70 metres below the existing ground surface.

8) All water wells will be constructed in compliance with amended Regulation 903 and the recommendations contained in the hydrogeological report. Wells should be drilled with casings set well into bedrock, with the entire annular space filled with a suitable grout and supervised by a certified professional

9) Wells that will not be utilized for potable water or future monitoring and/or not meeting minimum specifications shall be abandoned in accordance with *Ontario Water Resources Act, R.R.O. Regulation 903.*

10) The agreements of purchase and sale will also contain the following causes:
- Homeowners should regularly inspect their sewage disposal systems and follow a sewage management program to minimize the impact to the groundwater aquifer and the risk of system failure
- Prior to connection to the plumbing system, each well should be properly developed and re-tested to verify that bacteria Nitrates, Fluoride and other health related parameters are within the Ontario Safe Drinking Water Standards.
- Homeowners are advised to complete regular water quality analysis for bacteria and other health related parameters. In case of any exceedances of health related parameter criteria contained in the Ontario Safe Drinking Water Standards, the Medical Officer of Health should be consulted for further evaluation and measures.
- Homeowners are advised that water quality is not guaranteed over time and treatment/filtration may become necessary.

.../6

- Depending on the individual wells, the water may be subject to elevated aesthetic parameters (Hydrogen, Sulphide, hardness, Iron, Manganese, total dissolved solids, Sodium, Organic Nitrogen, etc.). Incrustation, taste, odor and colour problems may occur and treatment units may be required to improve water quality.
- Treating water using softeners may further increase the sodium content. People on sodium restricted diets should use a separate water supply and should consult their physician for advice on the use of well water.
- Low yield wells may be encountered on individual lots and supplemental storage may also be required to meet peak daily domestic demands.

If you have any questions please contact the undersigned.

Yours truly,

John Price

John Price, P. Eng.
Watershed Management Coordinator

cc Asher Rizvi, Conservation Partners Site

OLV2002-0025.wpd

Internal Memo
Date: Aug. 30, 2005
File No:OLV2002-0020 &
OZP2002-0132

L'OFFICE DE PROTECTION DE LA NATURE DE LA VALLÉE RIDEAU
RIDEAU VALLEY CONSERVATION AUTHORITY

To: John Price, Water Resources Coordinator, MVC
From: Asher Rizvi, Hydrogeologist, Conservation Partners

Subject: **Hydrogeological Impact Assessment, Newill (Rump) residential sub-division, part of lots 7 & 8, con. III, City of Ottawa (Huntley)**

Hydrogeological Assessment (MHC March 2003) and subsequent submissions (Oct. 2003, Dec. 2004, Jan. 2005, Feb. 2005, May. 2005, Jun. 2005) for the Newill sub-division were reviewed to evaluate availability of water for 80 lots, suitability of septic systems and risk to water quality from proposed and existing landuses as per official plan policy of the City of Ottawa, document MOEE Hydrological Technical Information Requirements for Land Development Applications (April, 1995) and Provincial Policy Statement (2005). Reports have concluded that:

1 Sufficient water quantity is available on-site based on 4 test wells. Report has concluded that it may be necessary to drill to depths greater then 61m on some lots to produce a sufficient water supply. Site water storage may be required to meet peak daily domestic demands. Mutual well interference is calculated to be ranging from 3.68-68m depending on the assumptions made during calculations as per Kollaard Associates June 15, 2005 response.

2 On-site water quality from test wells was found to be acceptable as per Safe Drinking water guidelines with elevated parameters of Phenols, hydrogen sulphide, organic nitrogen, Iron, sodium, Manganese, TDS and turbidity. Pesticide analysis was conducted on well water to further confirm the health risk. No pesticide presence was found. For hydrogen sulphide report has concluded that it is treatable with commercially available treatment systems. MHC reports have indicated that all the neighboring well owners surveyed are using treatment systems.

3 Background Nitrate levels ranging from 4.1 to 12.5 mg/l were found east of the Huntley Creek and 1.56 to 3.75 mg/l on west side of the Creek . Report indicates the source to be agricultural. Subsequent analysis (Kollaard Associates June 15, 2005) showed that nitrates are decreasing with current levels at 2.54-7.98 mg/l on the east side at the same locations sampled previously.

4 A solid waste disposal site, located about 2km south east , is not seen as posing any danger as the plume for the waste site is directed to the east and waste site is fitted with an intercept system. Accordingly , it is considered that the private wells at the subject site should not be impacted by presence of the waste disposal site. (MHC Oct.10, 2003).

5 Report has concluded that no impacts from neighboring developments are expected.

Based on the information contained in MHC and Kollard reports, it can be confirmed that the bedrock aquifer could supply groundwater of reasonable quality for the Proposed Subdivision. Considering the proposed lot density, however, there is some concern about drawdown, interference effects and existing nitrate contamination. In order to overcome these problems, alternative solutions are considered. These are:

a) decreasing the lot density to optimum interference and to optimum nitrate levels
b) using groundwater from communal wells located in well head protected areas.
c) A study addressing the interference and drawdown impacts including all the wells using the aquifer and suggesting optimum number of wells and septic systems
d) a draft approval can be granted for the development of a limited number of lots, subject to the following conditions:
    i) A limited number (about 40 lots accounting for background nitrate levels) be allowed to develop. After the total completion of the development of the 40 lots, a study shall be undertaken of sufficient detail to review the operation of existing wells, including quantity/ quality, more specifically, drawdown and interference effects of wells. The study will also evaluate the nitrate plume.
    ii) If the above mentioned study concludes that nitrate levels, drawdown and interference of wells are not being affected by the proposed lot sizes, then the registration of the second phase shall resume, without further study.
    iii) If on the contrary, the study indicates the possibility that drawdown and interference of wells are being affected by lot density, then the whole proposed subdivision should be serviced by an alternative communal well water supply or not allowed to proceed at all.

Based on the above and hydrogeological assessment reports , MVC recommends allowing the subdivision application to proceed for limited number of lots only, provided that following conditions are applied/considered to require that:

General

1 A consolidated report must be provided appending all the information submitted to date in the relevant sections.
2 Recommendations of the Hydrogeological Assessment must be implemented to ensure safe drinking water and minimize the impacts to environment.
3 Development should proceed in phases. Minimum lot size in each phase will be 0.8 ha. First phase should not contain more than 40 lots.
4 Development is only to proceed in up-gradient side (west side of the creek) as determined through site investigations.
5 Recommendation of the subsequent phases and development in east side of the Huntley Creek will be based on the satisfactory performance of water quality, wells and septic system in earlier phase. Report will also evaluate the nitrate plume levels. Atleast 100% of the lots must have been built and occupied in the earlier phase before the performance evaluation. The performance report must include:
    e) An up-date on the neighboring landuse with an assessment of any new threats to water supply aquifer.
    b) Water quality analysis including volatile organic carbons of untreated water supply from wells identified in the original hydro-g report in the phase already developed, original wells in the subsequent phase and the representative sample from the newer wells.
    c) A study addressing the interference and drawdown impacts for existing wells. Study will be conducted on selected wells. The wells must be located in similar

hydrogeology and down gradient of the groundwater and septic flow direction. Water levels in the new well will be monitored for sufficiently long period of time accounting for water levels during peak hours of use and to account for slow response of the aquifer. More then one set of observations must be obtained over sufficient long time to account for seasonal changes.

d) Water quality analysis from east side (between carp road and huntley creek) from monitors installed in the aquifer receiving the septic effluent and in the test wells to demonstrate that nitrates due to agricultural source are dissipating as implied by the report. Placement of monitors should account for groundwater and nitrate plume flow directions.

e) Interviews with the property owners to determine if there have been any occurrences of well water quality or quantity problems or malfunctioning septic systems.

f) A visual inspection of septic systems, together with information from the property owners on septic tank pump out intervals and any other required maintenance.

g) Re-evaluation of well construction and other recommendations contained in the original hydrogeological report within the context of the updated information,

h) Re-assessment of original hydro-G within the context of any new criteria or guidelines.

i) Well records, GPS coordinates and a map showing well and sampling locations. Waterlevel elevations must be provided. Original lab analysis reports must also be made available. The wells must be located in similar hydrogeology. Borehole logs and site cross-sections are useful tools to clarify site conceptual hydrogeology. The rationale for determining the size of the representative sample must be provided. The placement and number of monitors must be sufficient to provide confidence in the conclusions and recommendations. Methodologies, investigations and analysis including assumptions must be documented in detail.

4 Any operation involving groundwater extraction (groundwater source open loop heat pumps etc.) within the development should not be permitted unless a detailed assessment of the water demand on the overall aquifer is completed.

5 Nitrate dilution calculations based on MOE 1995 methodology (exclusion of impervious areas, no storm water management contribution towards dilution etc.) are being accepted as basis for recommending the development. If in the future, the total lot coverage area in the development used in the nitrate dilution calculations changes due to some reasons, then applicant shall demonstrate by providing updated calculations as per MOE methodology that the nitrate impacts still meet the provincial criteria of 10 mg/l.

Septic system

1 Sewage system designs shall be based on specific investigations to evaluate the suitability of local conditions on each lot. All sewage systems shall be constructed according to the Ontario Building Code and in accordance with the recommendations of the hydrogeological report.

2 Where applicable, the sewage systems along the surface water features have to be examined individually to assess their impact on the feature. Proper separation between sewage source and sensitive features should be maintained. This may be problem for lands with boundaries extending all the way to surface water features. In this case,

additional buffers should be included for protection as agreed. Sensitive features are not to be utilized for nitrate reductions for the sewage effluent being generated within the site boundaries.

3 Homeowners are advised that the Ontario Building Code allows the installation of selected Treatment Units capable of producing secondary and tertiary effluent quality. Treatment Units may benefit the homeowner, depending on site-specific conditions, as the associated leaching bed area will be smaller. As an added benefit, Treatment Units will reduce the nutrient and contaminant impact on the groundwater.

4 A clause shall be registered on title stating that the homeowners shall regularly inspect their sewage systems and follow a sewage system management program to minimize the impact to the groundwater and the risk of system failure. Septic Systems Do's and Don'ts Guides and Septic Smart Guides should be consulted in this regard and are available from regulatory agencies.

Water Quantity

1 Wells should be drilled with casing set well into the bedrock and entire annular space filled with a suitable grout.

2 Low yielding wells are a possibility. Well driller or hydrogeological professional must ensure that wells have a min. of 13.7 l/min well yield sustainable for 6 hours as per MOE requirements. If this requirement is not met then supplementary storage must be installed to prevent extreme well interference problems during peak hours of well use. Repots has indicated that it may be necessary to drill deeper then 61 on some lots to produce sufficient water supply.

3 All water wells should be constructed in compliance with the MOE amended Well Regulations 903 and in accordance with the recommendations contained in the hydrogeological report for ensuring well and water quality safety. The construction and grouting of the wells should be supervised by a certified professional and a well compliance certificate provided to the satisfaction of the City of Ottawa.

4 The subdivision agreement contain a clause whereby the owner agrees that any existing wells or other monitors on the site including test wells which do not meet minimum specifications (13.7 l/min yield etc.) of the MOE requirements and hydrogeological assessment (minimum well casing etc.) will be abandoned. Wells that will not be utilized for potable water supply or future monitoring or are at risk due to improper well construction and under surficial or septic impacts, shall also be abandoned in accordance with well regulations (Ontario Water Resources Act, R.R.O. 1990, Regulation 903, and any subsequent amendments). A certificate of compliance shall be provided in this regard.

Water Quality

1 Prior to connection to the plumbing system each well shall be retested to verify that bacteria, nitrates, flouride and other health related parameters are within the Ontario Safe Drinking Water Standards. Newly developed wells may encounter turbidity, which can interfere with the effectiveness of some treatment systems. Therefore, wells must be properly developed before connection to the house plumbing system.

2 The well owner is advised to do a regular water quality analysis for bacteria, septic indicators and other health related parameters in accordance with the Ontario Safe Drinking Water Act (2003). In case of any exceedances, medical officer of health should

be consulted for further evaluation and necessary measures. Safe Drinking water Act criteria must be followed to avoid any future serious health issues.

3 The homeowner is advised that water quality is not guaranteed over time and treatment/filtration may become necessary. Depending on the well, the water may be subject to elevated aesthetic parameters (hydrogen sulphide, hardness, iron, manganese, TDS, sodium, Organic Nitrogen etc.). Incrustation, taste, odor and color problems are expected. Therefore, well owners should be aware that treatment systems may be required to improve the water quality. Treating the water by softeners may further increase the sodium content. People on sodium restricted diets should use a separate water supply and should consult their physician for advice on the use of the well water.

4 Homeowners shall follow a well management program to minimize the potential for contamination of the groundwater from various pollutants. The guides "How Well is Your Well" and "Water Well Best Management Practices" should be consulted in this regard. These guides are available from regulatory agencies.

We would like to take this opportunity to point out that a comprehensive hydrogeological review is conducted based on the MOEE Hydrological Technical Information Requirements for Land Development Applications (April, 1995) including appendices D-5-4/D-5-5 last revised in 1996. The procedures documented in the guidelines are a minimum requirement for risk assessment and must be followed for evaluating the drinking water supplies. The hydrogeological assessments submitted in support of this development lack the reporting and investigative protocols as specified in these guidelines. Such deviations from the guidelines without any rationalization or substantiation and the absence of complete information in one comprehensive report delays the review process.

APPENDIX C

Land Use Maps and Documents

RE: 61318.15 - Storage tank / incident report

Public Information Services <publicinformationservices@tssa.org>

Wed 7/26/2017 10:15 AM

To: Andrius Paznekas <apaznekas@hceng.ca>;

Hello Andrius,

Thank you for your inquiry.

We have no record in our database of any fuel storage tanks at the subject address (addresses).

For a further search in our archives please submit your request in writing to Public Information Services via e-mail (publicinformationservices@tssa.org) or through mail along with a fee of $56.50 (including HST) per location. The fee is payable with credit card (Visa or MasterCard) or with a Cheque made payable to TSSA.

Although TSSA believes the information provided pursuant to your request is accurate, please note that TSSA does not warrant this information in any way whatsoever.

Thank you and have a great day,
Sherees

Sherees Thompson | Public Information Agent
Facilities
345 Carlingview Drive
Toronto, Ontario M9W 6N9
Tel: +1-416-734-3363 | Fax: +1-416-231-6183 | E-Mail: sthompson@tssa.org
www.tssa.org

From: Andrius Paznekas
[mailto:apaznekas@hceng.ca]
Sent: Thursday, July 20, 2017 1:37 PM
To: Public Information Services
Subject: 61318.15 - Storage tank / incident report

Good afternoon,

Please conduct a search for storage tanks and/or incidents at the following addresses located in Ottawa (Carp), Ontario.

I'm interested in commercial/industrial properties within 500 metres of 2727 Carp Road. I'm not sure if there's a better way to request the information (e.g. if you're able to search a radius or have to enter addresses manually), but I've compiled the addresses below. Let me know if I'm able to provide any other information that may aid in your search.

2676, 2688, 2702, 2710, 2726, 2770, 2727, 2739, 2755, 2765, 2775, 2777, 2789, 2793, 2797, 2825, 2591 Carp Road

80 Arbourbrook Boulevard

120, 124, 128, 132, 136, 138, 140 Tansley Drive

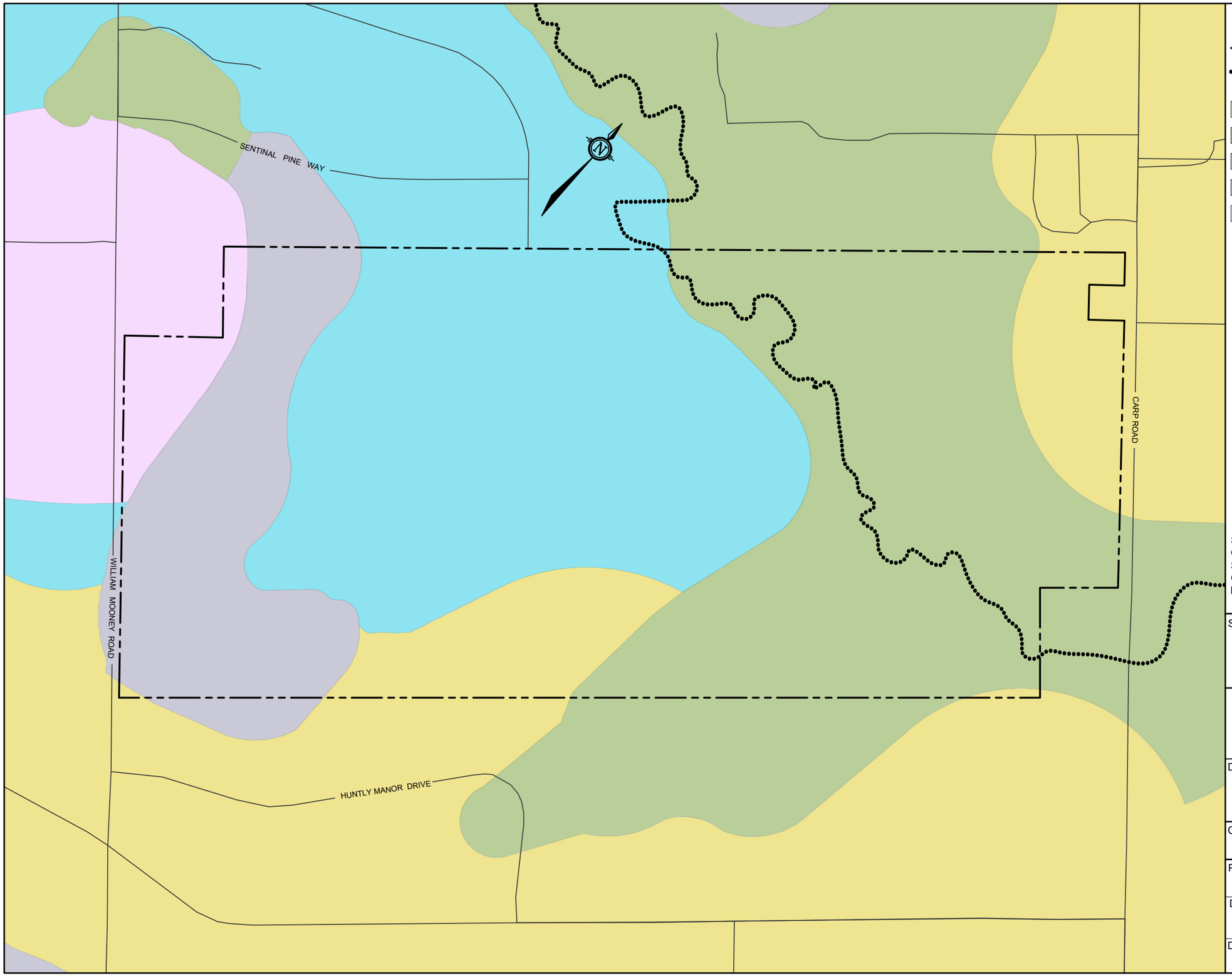
205, 215, 225 Maple Creek Crescent

106, 122, 124, 128, 132, 136, 140, 144, 148, 152, 156, 160, 164, 168, 172 Reis Road

158, 171, 189, 197, 217 Cardevco Road

Thank you!

Andrius Paznekas, B.Sc., M.Sc.
tel: 613.836.1422
cell: 613.295.8425
fax: 613.836.9731
Houle Chevrier Engineering Ltd.
32 Steacie Drive • Ottawa, Ontario • K2K 2A9
www.hceng.ca



LEGEND

- SUBJECT SITE
- STREAM
- COURSE-TEXTURED GLACIOMARINE DEPOSITS
- TILL
- FINE-TEXTURED GLACIOMARINE DEPOSITS
- ORGANIC DEPOSITS
- PALEOZOIC BEDROCKS

SOURCE:
ONTARIO GEOLOGICAL SURVEY 2010.
SURFICIAL GEOLOGY OF SOUTHERN ONTARIO;
ONTARIO GEOLOGICAL SURVEY, MISCELLANEOUS
RELEASE - DATA 128 - REVISED

Scale 1:5000

0 100 200 300m

GEMTEC
Consulting Engineers and Scientists
32 Steacie Drive
Ottawa, ON
Tel: (613) 836-142
www.gemtec.ca
ottawa@gemtec.c

Drawing: OGS SURFICIAL GEOLOGY

Client: CAVANAGH CONSTRUCTION LTD.

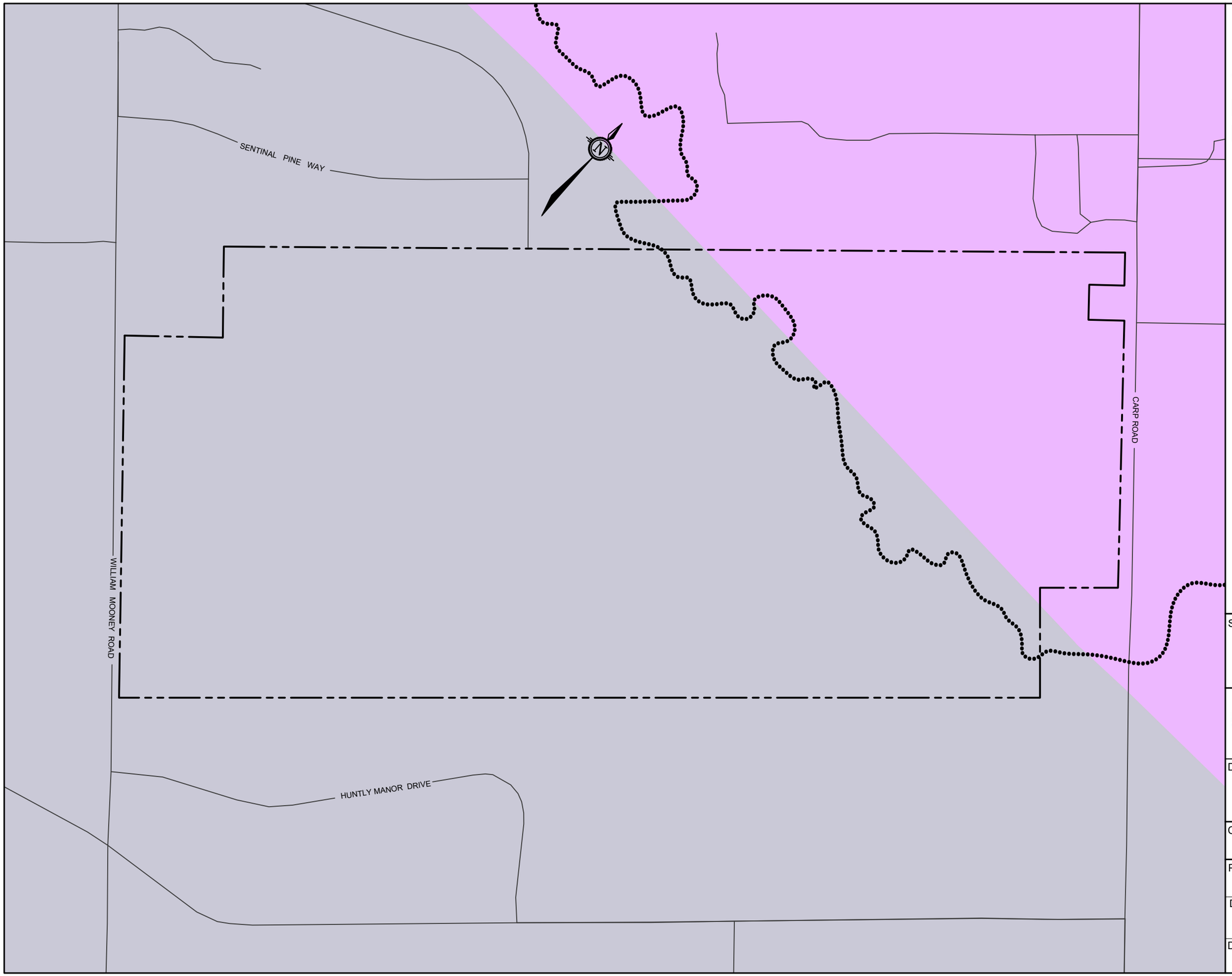
Project: 61318.15

HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by: S.L.
Chkd by: A.P.

Date: JANUARY 2018
Rev.: 0

FIGURE C



LEGEND

- SUBJECT SITE
- STREAM
- VERULAM FORMATION: LIMESTONE AND SHALE
- BOBCAYGEON FORMATION: LIMESTONE

SOURCE:
ARMSTRONG, D.K. AND DODGE, J.E.P. 2007. PALEOZOIC GEOLOGY OF SOUTHERN ONTARIO; ONATRIO GEOLOGICAL SURVYE, MISCELLANEOUS RELEASE - DATA 219.

Scale 1:7500

0 150 300 450m

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ottawa@gemtec.c

Drawing
OGS BEDROCK GEOLOGY

Client
CAVANAGH CONSTRUCTION LTD.

Project		HYDROGEOLOGICAL INVESTIGATION 2727 CARP ROAD OTTAWA, ONTARIO
61318.15		
Drwn by: S.L.	Chkd by: A.P.	
Date: JANUARY 2018	Rev.: 0	**FIGURE**

SENTINAL PINE WAY

WILLIAM MOONEY ROAD

CARP ROAD

HUNTLY MANOR DRIVE

TW 2
116.73
MW 2
117.47
TP 15
TP 16
TP 17
TP 6
MW 1
116.16
TW 1
116.07
MW 6
116.68
TP 7
TP 5
TP 1
TP 4
TW 6
TP 8
MW 5
119.65
TW 5
119.86
TP 13
TW7
TP 12
MW 3
115.30
TW 3
115.26
TP 11
TP 3
TW 4
115.67
MW 4
115.30
TP 2
TP 14
TP 10
TW8
TP 9

LEGEND

- BH 17-1 / 115.97 — BOREHOLE (current investigation by GEMTEC)
  - GROUND SURFACE ELEVATION IN METRES GEODETIC DATUM
- TW 1 / 116.16 — TEST WELL (current investigation by GEMTEC)
- MW 1 / 116.16 — MONITORING WELL LOCATION (current investigation by GEMTEC)
- TP 1 — TEST PIT (approximate location)
- SW 1 — SURFACE WATER SAMPLING (approximate location)
- SUBJECT SITE
- STREAM
- COURSE-TEXTURED GLACIOMARINE DEPOSITS
- FINE-TEXTURED GLACIOMARINE DEPOSITS
- TILL

Scale
1:5000
0 100 200 300m

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

Drawing
RECLASSIFIED SURFICIAL GEOLOGY

Client
CAVANAGH CONSTRUCTION LTD.

Project
61318.15

HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by
S.L.

Chkd by
A.P.

Date
JANUARY 2018

Rev.
0

FIGURE C

APPENDIX D

Borehole and Test Pit Logs

RECORD OF BOREHOLE 17-1

CLIENT: 1384341 Ontario Ltd.
PROJECT: Hydrogeological Investigation
JOB#: 61318.15
LOCATION: See Detailed Site Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: 12/07/2017

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m; DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m; SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED); WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		115.97							
		Brown sandy-silt, roots (TOPSOIL)		115.87 0.10	1	50 D.O.		4			
		Brown CLAYEY-SILT, some sand, roots			2	SS 50 D.O.		5			
1		Brown/grey SILTY-CLAY, some sand, stiff		114.97 1.00	3	SS 50 D.O.		14			
		Brown fine to medium SAND		114.50 1.47	4	SS 50 D.O.		22			
2					5	SS 50 D.O.		12			
					6	SS 50 D.O.		14			
3					7	SS 75 D.O.		27			
				111.70 4.27	8	SS 75 D.O.		6			
4		Brown/grey fine SAND, some silt and clay			9	SS 75 D.O.		4			
					10	SS 75 D.O.		4			
5					11	SS 75 D.O.		4			
				109.26 6.71	12	SS 75 D.O.		9			
6		Brown/grey fine SAND with occasional stiff to very stiff grey clayey-silt lenses (6.6m, 7.7m and 7.8m)			13	SS 75 D.O.		7			
						SS					
7				107.44 8.53							
		Brown/grey fine to coarse SAND			14	62.5 D.O.		10			
8					15	SS 62.5 D.O.		24			
				105.92 10.05	16	SS 62.5 D.O.		95			
9		Brown medium-coarse SAND with gravels		105.61 10.36	17	SS 62.5 D.O.		67			
	N Diamond Bit	Grey/black layered fine to medium SAND		105.00 10.97	18	SS 62.5 D.O.		122	>>		
10		Brown/grey coarse SAND and GRAVEL			19	SS 62.5 D.O.		35			
					20	SS 62.5 D.O.		35			
11				103.02 12.95		SS		>99 for 50mm			
		Inferred BEDROCK (spoon refusal)									
12											
13											
14											
15											

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.P.
CHECKED: K.H.

GEO - BOREHOLE LOG 61318.15_GNT_2018-05-24 GEMTEC.GPJ GEMTEC 2018.GDT 24/5/18

RECORD OF BOREHOLE 17-2

CLIENT: 1384341 Ontario Ltd.
PROJECT: Hydrogeological Investigation
JOB#: 61318.15
LOCATION: See Detailed Site Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: 12/07/2017

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m	PENETRATION RESISTANCE (N), BLOWS/0.3m / DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m / SHEAR STRENGTH (Cu), kPA (NATURAL, REMOULDED) / WATER CONTENT, % (W_P, W, W_L)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		115.39							
		Brown TOPSOIL		115.29 / 0.10							
		Brown/grey SILTY-SAND		114.78 / 0.61	1	50 D.O.		2			
1		Brown fine SAND			2	50 D.O.		8			
		Brown/grey CLAYEY-SILT, trace sand, stiff		114.07 / 1.32	3	50 D.O.		6			
		Brown/grey fine to medium SAND		113.56 / 1.83							
2		Brown/grey CLAYEY, SANDY-SILT, stiff		113.26 / 2.13	4	50 D.O.		9			
					5	50 D.O.		4			
3		Brown/grey CLAYEY-SILT, some sand, loose		112.34 / 3.05	6	50 D.O.		2			
		Brown/grey fine SAND		111.73 / 3.66	7	50 D.O.		8			
4					8	50 D.O.		9			
		Brown/grey fine to medium SAND, trace gravel		110.51 / 4.88	9	75 D.O.		33			
5					10	75 D.O.		29			
					11	75 D.O.		43			
6					12	62.5 D.O.		32			
		Grey CLAYEY-SILT some sand		108.07 / 7.32	13	62.5 D.O.		7			
7					14	62.5 D.O.		28			
	N Diamond Bit	Brown/grey fine-coarse SAND, some gravel		106.86 / 8.53	15	62.5 D.O.		19			
8					16	62.5 D.O.		42			
					17	62.5 D.O.		29			
9		Coarse SANDS and GRAVELS		105.03 / 10.36	18	62.5 D.O.		34			
					19	62.5 D.O.		30			
10					20	62.5 D.O.		35			
				103.20 / 12.19				>99 for 50mm			
11		Inferred BEDROCK (spoon and auger refusal)									
12											
13											
14											
15											

GEO - BOREHOLE LOG 61318.15_GNT_2018-05-24 GEMTEC.GPJ GEMTEC 2018.GDT 24/5/18

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.P.
CHECKED: K.H.

RECORD OF BOREHOLE 17-3

CLIENT: 1384341 Ontario Ltd.
PROJECT: Hydrogeological Investigation
JOB#: 61318.15
LOCATION: See Detailed Site Plan, Figure 2

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: 13/07/2017

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		114.95				
		Brown TOPSOIL		114.75				
		Brown SILTY-SAND, roots		0.20	1	75 D.O.		3
				114.34				
		Brown fine SAND		0.61	2	75 D.O.		7
1								
				113.43	3	75 D.O.		7
		Brown/grey CLAYEY-SILT, trace sand, stiff to very stiff		1.52				
				113.12				
2		Brown/grey silty fine SAND Occasional layers of stiff CLAYEY-SILT, some sand (2.7m and 4.8m)		1.83	4	75 D.O.		17
					5	75 D.O.		8
3					6	75 D.O.		9
					7	75 D.O.		8
4					8	75 D.O.		4
					9	75 D.O.		4
5					10	75 D.O.		2
				109.16				
		Brown/grey CLAYEY-SILT, some sand, stiff		5.79	11	75 D.O.		1
6								
				108.09				
		Brown/grey fine SAND		6.86	12	75 D.O.		5
7					13	75 D.O.		16
				106.73	14	75 D.O.		42
		Brown/greymedium to coarse SAND, trace gravel		8.22				
8					15	75 D.O.		82
				105.81				>99 for 50mm
9		Inferred BEDROCK (spoon and auger refusal)		9.14				
10								
11								
12								
13								
14								
15								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE (N), BLOWS/0.3m
SHEAR STRENGTH (Cu), kPA: + NATURAL ⊕ REMOULDED
WATER CONTENT, %: W_P — W — W_L
10 20 30 40 50 60 70 80 90

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GEMTEC
Consulting Engineers and Scientists

LOGGED: A.P.
CHECKED: K.H.

Ontario Ministry of the Environment

Well Tag No. (if below) A 000478

MW1

Well Record

Regulation 903 Ontario Water Resources Act

page __ of __

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at: 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: LEWIL | Last Name: CORPORATION | Mailing Address (Street Number/Name, RR,Lot,Concession): 2591 CARP ROAD

County/District/Municipality: WEST CARLETON | Township/City/Town/Village: OTTAWA | Province: Ontario | Postal Code: K0A 1L0 | Telephone Number (include area code): 831 8968

Address of Well Location (County/District/Municipality): WEST CARLETON | Township: HUNTLEY | Lot: 3 | Concession: 3

RR#/Street Number/Name: 2727 CARP ROAD | City/Town/Village: OTTAWA | Site/Compartment/Block/Tract etc.: 4R 8028

GPS Reading | NAD: 83 | Zone: 18 | Easting: E 422533 | Northing: N 5016669 | Unit Make/Model: MADELLINI | Mode of Operation: USM | Differentiated / 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)
BROWN	TOP SOIL		FINE	0	1.5
GREY	SAND		MED	1.5	3.6
GREY	GRAVEL	BOULDERS	COARSE	3.6	6

WELL #3

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6	25

Water Record

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

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

Chlorinated ☐ Yes ☒ No

Construction Record

Casing

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
25	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4mm	0	3
25	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4mm	0	6
15	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	+.9	.9

Screen

Outside diam	Material	Slot No.	Depth From	Depth To (Metres)
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4	4.5	6

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method

	Draw Down Time (min)	Draw Down Water Level Metres	Recovery Time (min)	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type ☐ Shallow ☐ Deep	4		4	
Recommended pump depth, ___ metres	5		5	
Recommended pump rate, (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	1 bag
1.5	3	#80 SAND	5 bag
3	4.5	BENTONITE	6 bag
4.5	6	#8 SAND	5 bag

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: PLUMBING VILLAGE | Well Contractor's Licence No.: 6574

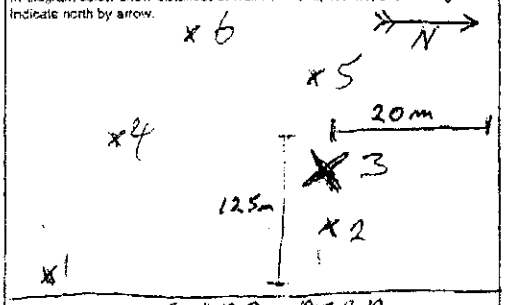
Business Address (street name, number, city etc.): BOX 429 CARP ONT K0A 1L0

Name of Well Technician (last name, first name): S. SIRUSE | Well Technician's Licence No.: 310

Signature of Technician/Contractor: X | Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 03582 | Date Well Completed YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

0506E (06/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

Ontario Ministry of the Environment

Well Tag No.: A 033480

MW2

Well Record

Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: NEWILL | Last Name: CORPORATION | Mailing Address (Street Number/Name, RR, Lot, Concession): 2591 CARP ROAD

County/District/Municipality: WEST CARLETON, OTTAWA | Township/City/Town/Village | Province: Ontario | Postal Code: K0A 1L0 | Telephone Number (include area code): 831 8768

Address of Well Location (County/District/Municipality): 2727 CARP ROAD

RR#/Street Number/Name: ~~OTTAWA~~ WEST CARLETON | Township: WEST CARLETON | Lot: 8 | Concession: 3

City/Town/Village: OTTAWA | Site/Compartment/Block/Tract etc.: 4R 8028

GPS Reading | NAD 8:3 | Zone: 18 | Easting: E 422093 | Northing: N 5016301 | Unit Make/Model: MAGELLAN | Mode of Operation: USM | ☐ 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)
BROWN	TOPSOIL		PACKED	0	.9
GREY	CLAY		HARD	.9	4.8
GREY	GRAVEL	STONES	LOOSE	4.8	5.4
GREY	LIMESTONE		MED	5.4	6.0

WELL #5

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6	25

Water Record

Water found at ___ Metres | Kind of Water

- ___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other
- ___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other
- ___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other

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

Chlorinated ☐ Yes ☒ No

Construction Record

Inside diam. (centimetres)	Material	Wall thickness (centimetres)	Depth From	Depth To (Metres)
Casing				
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4 m	0	3
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4 m	0	6
15	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	+.9	.9
Screen				
Outside diam. 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No. #15 #45	3	6

No Casing or Screen: ☐ Open hole

Test of Well Yield

Pumping test method	Draw Down: Time (min)	Draw Down: Water Level (Metres)	Recovery: Time (min)	Recovery: Water Level (Metres)
Pump intake set at - (metres)	Static level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type: ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record

☒ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	4 bags
1.5	3	#80 SAND	5 bags
3	4.5	BENTONITE	4 bags
4.5	6	#80 SAND	5 bags

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: PLUMBING VILLAGE | Well Contractor's Licence No.: 6574

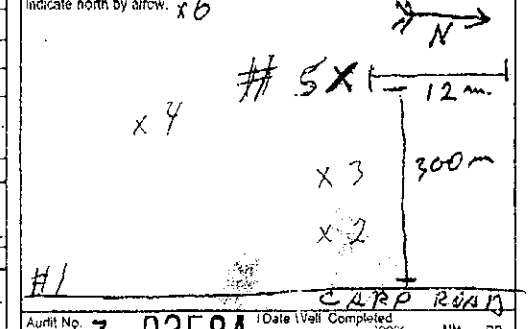
Business Address (street name, number, city etc.): BOX 429 CARP ONT. K0A-1L0

Name of Well Technician (last name, first name): S. SLUSE | Well Technician's Licence No.: 510

Signature of Technician/Contractor: [signature] | Date Submitted: YYYY MM DD

Location of Well

In diagram below show distances of well from road, lot line, and building. Indicate north by arrow. x6



Audit No.: Z 03584 | Date Well Completed: YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered: YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received: YYYY MM DD | Date of Inspection: YYYY MM DD

Remarks | Well Record Number

(506E (99/03)) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

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Ontario — Ministry of the Environment

Well Tag No. A 003479

MW3

Well Record

Regulation 903 Ontario Water Resources Act

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only

Well Owner's Information and Location of Well Information

Ministry Use Only — MUN | CON | LOT

First Name: NIEWILL — Last Name: CORPORATION — Mailing Address (Street Number/Name, RR, Lot, Concession): 2391 CARP ROAD

County/District/Municipality: WEST CARLETON — Township/City/Town/Village: OTTAWA — Province: Ontario — Postal Code: K2A 1L0 — Telephone Number (include area code): 831 8968

Address of Well Location (County/District/Municipality): WEST CARLETON — Township: HUNTLEY — Lot: 7 — Concession: E 3

RR#/Street Number/Name: 2727 CARP ROAD — City/Town/Village: OTTAWA — Site/Compartment/Block/Tract etc.: 4 R 8028

GPS Reading — NAD: 83 — Zone: 18 — Easting: 422610 — Northing: 5016328 — Unit Make/Model: MAGELLAN — Mode of Operation: UTM — ☐ 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)
BROWN	SAND		FINE	0	6
GREY	CLAY		HARD	6	3.9
BLUE	CLAY		WET	3.9	6

WELL #4

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	6	25

Water Record

Water found at (Metres)	Kind of Water	
m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals
m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals
m	☐ Fresh ☐ Salty ☐ Gas ☐ Other:	☐ Sulphur ☐ Minerals

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

Chlorinated ☐ Yes ☒ No

Construction Record

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Metres)	Depth To (Metres)
Casing				
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4m	0	3
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4m	0	6
15	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188	+.9	.9
Screen				
Outside diam 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No 4	4.5	6
No Casing or Screen	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time (min)	Draw Down Water Level (Metres)	Recovery Time (min)	Recovery Water Level (Metres)
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ____hrs + ____ min	2		2	
Final water level end of pumping ____metres	3		3	
Recommended pump type ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ____metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record — ☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	4 cu m
1.5	3	#80 SAND	5 cu m
3	4.5	BENTONITE	4 cu m
4.5	6	#80 SAND	5 cu m

Method of Construction

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

Water Use

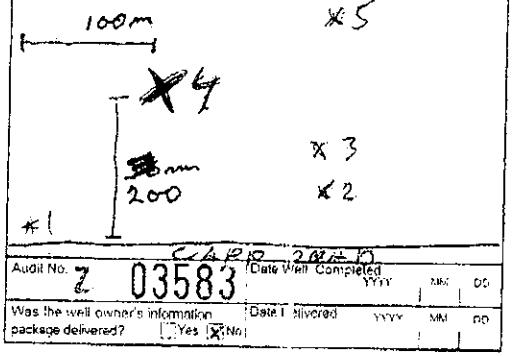
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☒ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 03583 — Date Well Completed YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No — Date Delivered YYYY MM DD

Well Contractor/Technician Information

Name of Well Contractor: PLUMBING VILLAGE — Well Contractor's Licence No.: 6574

Business Address (street name, number, city etc.): BOX 419 CARP ONT K0A 1L0

Name of Well Technician (last name, first name): S. SIRUSE — Well Technician's Licence No.: 310

Signature of Technician/Contractor: x — Date Submitted YYYY MM DD

Ministry Use Only

Data Source — Contractor

Date Received YYYY MM DD — Date of Inspection YYYY MM DD

Remarks — Well Record Number

05068 (09/03) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ontario Ministry of the Environment

Well Tag No. A 003475 00 3476

MW4

Well Record

Regulation 903 - Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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- **All metre measurements shall be reported to 1/10th of a metre.**
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: NEWILL | Last Name: CORPORATION

Mailing Address (Street Number/Name, RR, Lot, Concession): 2591 CARP ROAD

County/District/Municipality: WEST CARLETON | Township/City/Town/Village: OTTAWA | Province: Ontario | Postal Code: K0A 1L0 | Telephone Number (include area code): 831 8968

Address of Well Location (County/District/Municipality): WEST CARLETON | Township: HUNTLEY | Lot: 7 | Concession: 3

RR#/Street Number/Name: 2727 CARP ROAD | City/Town/Village: OTTAWA | Site/Compartment/Block/Tract etc: 4R 8028

GPS Reading: NAD 83 | Zone: 18 | Easting: 422914E | Northing: 5016591N | Unit Make/Model: MAGELLAN 410M | Mode of Operation: ☐ Undifferentiated ☒ Averaged ☐ Differentiated, specify ___

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
BROWN	SAND		FINE	0	.9
GREY	SAND	SILT	MEDIUM	.9	4.5
GREY	SAND		FINE	4.5	6

WELL #1

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	6	25

Water Record

Water found at ___ Metres | Kind of Water

- ___ m: ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other
- ___ m: ☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other
- ___ m: ☒ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other

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

Chlorinated: ☐ Yes ☒ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4	0	3
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4	0	6
15	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188 +.9	.9	
Screen				
Outside diam 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No. 4	1.5 4.5	3 6
No Casing or Screen	☐ Open hole			

Test of Well Yield

Pumping test method	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static Level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type ☐ Shallow ☐ Deep	4		4	
Recommended pump depth ___ metres	5		5	
Recommended pump rate (litres/min)	10		10	
If flowing give rate - (litres/min)	15		15	
If pumping discontinued, give reason	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	4 bag
1.5	3	#80 SAND	5 bag
3	4.5	BENTONITE	4 bag
4.5	6	#80 SAND	5 bag

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: PLUMBING VILLAGE | Well Contractor's Licence No.: 6574

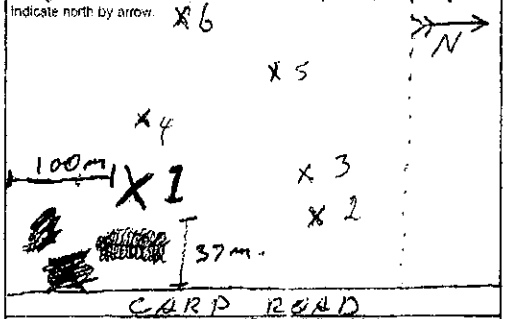
Business Address (street name, number, city etc.): BOX 429 CARP ONT K0A 1L0

Name of Well Technician (last name, first name): S. LOUISE | Well Technician's Licence No.: 310

Signature of Technician/Contractor: ___ | Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 03580 | Date Well Completed YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

MW5

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag Numb: A062684

page ___ of ___

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- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: | Last Name: NEWILL CORPORATION | Mailing Address (Street Number/Name, RR, Lot, Concession): 2591 CARP ROAD

County/District/Municipality: WEST CARLETON | Township/City/Town/Village: OTTAWA | Province: Ontario | Postal Code: K2H 1C0 | Telephone Number (include area code): 613 831 8168

Address of Well Location (County/District/Municipality): WEST CARLETON | Township: HUNTLEY | Lot: 7 | Concession: 3

RR#/Street Number/Name: 2227 CARP ROAD | City/Town/Village: OTTAWA | Site/Compartment/Block/Tract etc.: 4R 8028

GPS Reading: NAD 83 | Zone | Easting | Northing | Unit Make/Model | Mode of Operation | Uncorrected | Averaged | Differentiated, specify

Log of Overburden and Bedrock Materials (see instructions)

General Colour	Most common material	Other Materials	General Description	Depth From	Depth To
GREY	HARDPAN	STONES	PACKED	0	3

WELL #6

Hole Diameter

Depth From	Depth To	Diameter Centimetres
0	3	25

Water Record

Water found at ___ Metres / Kind of Water

___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other

___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other

___ m: ☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas ☐ Other

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

Chlorinated: ☐ Yes ☒ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4	0	3
15	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	188 +.9		.9
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam 5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	Slot No. 4	1.5	3

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method:

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Pump intake set at - (metres)	Static level			
Pumping rate - (litres/min)	1		1	
Duration of pumping ___ hrs + ___ min	2		2	
Final water level end of pumping ___ metres	3		3	
Recommended pump type ☐ Shallow ☐ Deep	4		4	
Recommended pump depth. ___ metres	5		5	
Recommended pump rate. (litres/min)	10		10	
If flowing give rate (litres/min)	15		15	
If pumping discontinued, give reason.	20		20	
	25		25	
	30		30	
	40		40	
	50		50	
	60		60	

Plugging and Sealing Record ☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	4
1.5	3	#80 SAND	5

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: FLEMING VILLAGE | Well Contractor's Licence No.: 6574

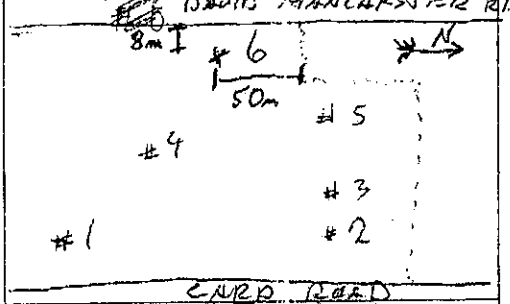
Business Address (street name, number, city etc.): BOX 429 CARP ONT K0A 1L0

Name of Well Technician (last name, first name): S. SZUCS | Well Technician's Licence No.: 310

Signature of Technician/Contractor | Date Submitted YYYY MM DD

Location of Well

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



Audit No. Z 03585 | Date Well Completed YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered YYYY MM DD

Ministry Use Only

Data Source | Contractor

Date Received YYYY MM DD | Date of Inspection YYYY MM DD

Remarks | Well Record Number

Ontario Ministry of the Environment

Well Tag No. A003477 003477

MW 6

Well Record

Regulation 903, Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

- For use in the Province of Ontario only. This document is a permanent legal document. Please retain for future reference.
- All Sections must be completed in full to avoid delays in processing. Further instructions and explanations are available on the back of this form.
- Questions regarding completing this application can be directed to the Water Well Management Coordinator at 416-235-6203.
- All metre measurements shall be reported to 1/10th of a metre.
- Please print clearly in blue or black ink only.

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

First Name: JEWILL | Last Name: CORPORATION

Mailing Address (Street Number/Name, RR, Lot, Concession): 2591 CARP ROAD

County/District/Municipality: WEST CARLETON | Township/City/Town/Village: OTTAWA | Province: Ontario | Postal Code: K2H 1C0 | Telephone Number (include area code): 613 831 8968

Address of Well Location (County/District/Municipality): WEST CARLETON | Township: HUNTLEY | Lot: 3 | Concession: 3

RR#/Street Number/Name: 2227 CARP ROAD | City/Town/Village: OTTAWA | Site/Compartment/Block/Tract etc.: 4R 8028

GPS Reading: NAD 83: Zone 18 E 422653 N 5016778 | 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)
BROWN	SAND		FINE	0	1.2
GREY	CLAY		HARD	1.2	2.1
BROWN	SAND		FINE	2.1	4.2
GREY	SAND	GRAVEL	COARSE	4.2	6
			WELL #2		

Hole Diameter

Depth From (Metres)	Depth To (Metres)	Diameter (Centimetres)
0	6	25

Water Record

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

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

Chlorinated: ☐ Yes ☒ No

Construction Record

Casing

Inside diam (centimetres)	Material	Wall thickness (centimetres)	Depth From (Metres)	Depth To (Metres)
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4	0	3
5	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	.4	0	6
15	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.188	+9	9

Screen

Outside diam	Material	Slot No	Depth From (Metres)	Depth To (Metres)
5.7	☐ Steel ☐ Fibreglass ☒ Plastic ☐ Concrete ☐ Galvanized	4	4.5	6

No Casing or Screen

☐ Open hole

Test of Well Yield

Pumping test method: ___

Draw Down: Time (min)	Draw Down: Water Level (Metres)	Recovery: Time (min)	Recovery: Water Level (Metres)
Static level			
1		1	
2		2	
3		3	
4		4	
5		5	
10		10	
15		15	
20		20	
25		25	
30		30	
40		40	
50		50	
60		60	

Pump intake set at - (metres): ___

Pumping rate - (litres/min): ___

Duration of pumping: ___ hrs + ___ min

Final water level end of pumping: ___ metres

Recommended pump type: ☐ Shallow ☐ Deep

Recommended pump depth: ___ metres

Recommended pump rate: ___ (litres/min)

If flowing give rate - (litres/min): ___

If pumping discontinued, give reason: ___

Plugging and Sealing Record

☐ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
0	1.5	BENTONITE	4
1.5	3	#80 SAND	5
3	4.5	BENTONITE	6
4.5	6	#8 SAND	5 kg

Method of Construction

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

Water Use

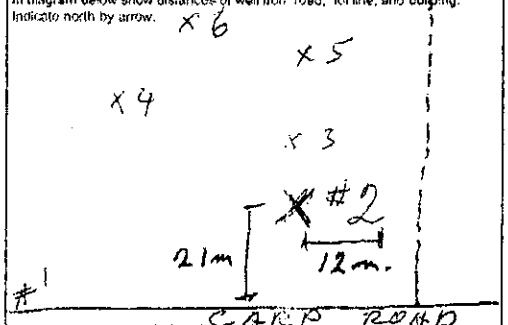
☐ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☒ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

Final Status of Well

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

Location of Well

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



Audit No. Z 03581 | Date Well Completed: YYYY MM DD

Was the well owner's information package delivered? ☐ Yes ☒ No | Date Delivered: YYYY MM DD

Well Contractor/Technician Information

Name of Well Contractor: PLUMBING VILLAGE | Well Contractor's Licence No.: 6574

Business Address (street name, number, city etc.): BOX 429 CARP ONT | 1208 120

Name of Well Technician (last, name, first name): S. GILLISE | Well Technician's Licence No.: 310

Signature of Technician/Contractor: X | Date Submitted: YYYY MM DD

Ministry Use Only

Data Source: ___ | Contractor: ___

Date Received: YYYY MM DD | Date of Inspection: YYYY MM DD

Remarks: ___ | Well Record Number: ___

05083E(09/02) Contractor's Copy ☐ Ministry's Copy ☐ Well Owner's Copy ☐

Cette formule est disponible en français

TABLE I

RECORD OF TEST PITS
PROPOSED RESIDENTIAL SUBDIVISION
PART LOTS 7 AND 8, CONCESSION 3
HUNTLEY WARD, CITY OF OTTAWA, ONTARIO

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP1	0.00 – 0.30	TOPSOIL
	0.30 – 1.00	Red brown fine to medium SAND
	1.00 – 4.20	Grey brown fine to coarse SAND
	4.20	End of test pit
Water observed in test pit at about 2.0 metres below existing ground surface, March 25, 2003.		
TP2	0.00 – 0.30	TOPSOIL
	0.30 – 0.75	Red brown fine to medium SAND, trace to some coarse sand, gravel and cobbles
	0.75 – 4.20	Grey brown SAND and GRAVEL, some cobbles, trace silt and clay
	4.20	End of test pit
Test pit dry, March 25, 2003.		
TP3	0.00 – 0.30	TOPSOIL
	0.30 – 3.76	Yellow brown to grey brown fine to medium SAND, trace silt
	3.76 – 4.30	Grey fine to medium SAND, some silt, trace clay
	4.30	End of test pit
Water observed in test pit at about 3.8 metres below existing ground surface, March 25, 2003.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP4	0.00 – 0.20	TOPSOIL
	0.20 – 1.27	Red brown fine to medium SAND
	1.27 – 3.75	Grey brown fine to medium SAND
	3.75 – 4.60	Grey fine to medium SAND, some boulders
	4.60	End of test pit
Test pit dry, March 25, 2003.		
TP5	0.00 – 0.25	TOPSOIL
	0.25 – 0.80	Red brown to grey brown fine to coarse SAND, some gravel and cobbles
	0.80 – 3.50	Grey brown SAND and GRAVEL
	3.50	End of test pit
Water observed in test pit at about 3.1 metres below existing ground surface, March 25, 2003.		
TP6	0.00 – 0.22	TOPSOIL
	0.22 – 1.34	Red brown fine to medium SAND
	1.34 – 3.20	Grey brown fine to medium SAND
	3.20 – 3.36	Grey SILTY SAND, trace to some clay
	3.36 – 4.20	Grey SILTY CLAY
	4.20	End of test pit
Water observed in test pit at about 1.3 metres below existing ground surface, March 25, 2003.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP7	0.00 – 0.28	TOPSOIL
	0.28 – 0.58	Red brown fine to medium SAND
	0.58 – 4.20	Grey brown fine to coarse SAND
	4.20 – 4.30	Grey brown SILTY CLAY, some silt
	4.30	End of test pit
Water observed in test pit at about 4.2 metres below existing ground surface, March 25, 2003.		
TP8	0.00 – 0.30	TOPSOIL
	0.30 – 1.57	Yellow brown fine to medium SAND
	1.57 – 2.00	Grey brown fine to medium SAND
	2.00 – 4.40	Grey SILTY CLAY
	4.40	End of test pit
Test pit dry, March 25, 2003.		
TP9	0.00 – 0.28	TOPSOIL
	0.28 – 4.20	Grey brown fine to medium SAND
	4.20	End of test pit
Test pit dry, March 25, 2003.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP10	0.00 – 0.30	TOPSOIL
	0.30 – 1.50	Yellow brown to grey brown fine to medium SAND, trace silt
	1.50 – 2.45	Grey fine to medium SAND
	2.45	End of test pit in grey SILTY CLAY
Test pit dry, March 25, 2003.		
TP11	0.00 – 0.25	TOPSOIL
	0.25 – 2.30	Grey brown SILTY CLAY
	2.30 – 4.26	Grey SILTY CLAY
	4.26	End of test pit
Test pit dry, March 25, 2003.		
TP12	0.00 – 0.25	TOPSOIL
	0.25 – 0.56	Yellow brown fine to medium SAND
	0.56 – 1.40	Grey brown silty clay, some gravel, cobbles and boulders (GLACIAL TILL)
	1.40	End of test pit
Test pit dry, March 25, 2003.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP13	0.00 – 0.35	TOPSOIL
	0.35 – 0.70	Red brown fine to medium SAND
	0.70 – 3.30	Grey brown to grey SILTY CLAY, some cobbles
	3.30	End of test pit, refusal BEDROCK
Water observed in test pit at about 1.8 metres below existing ground surface, March 25, 2003.		
TP14	0.00 – 0.23	TOPSOIL
	0.23 – 0.43	Red brown fine to medium SAND
	0.43 – 1.42	Grey brown SILTY CLAY, some cobbles
	1.42 – 3.30	Grey clayey silt, some sand gravel and cobbles (GLACIAL TILL)
	3.30	End of test pit, refusal
Water observed in test pit at about 3.2 metres below existing ground surface, March 25, 2003.		
TP15	0.00 – 0.17	TOPSOIL
	0.17 – 2.00	Grey brown SILTY CLAY
	2.00 – 2.25	Grey brown clayey silt clay, some sand gravel and cobbles (GLACIAL TILL)
	2.25	End of test pit, refusal BEDROCK
Test pit dry, March 25, 2003.		

TABLE I (CONTINUED)

TEST PIT NUMBER	DEPTH (METRES)	DESCRIPTION
TP16	0.00 – 0.25	TOPSOIL
	0.25 – 2.20	Grey brown SILTY CLAY
	2.20 – 3.10	Grey clayey silt, some sand gravel and cobbles (GLACIAL TILL)
	3.10	End of test pit, refusal BEDROCK

Water observed in test pit at about 3.0 metres below existing ground surface, March 25, 2003.

TP17	0.00 – 0.30	TOPSOIL
	0.30 – 2.00	Yellow brown SILTY SAND
	2.00 – 3.00	Grey brown SILTY SAND, trace clay
	3.00 – 4.60	Grey SILTY CLAY
	4.60	End of test pit

Test pit dry, March 25, 2003.

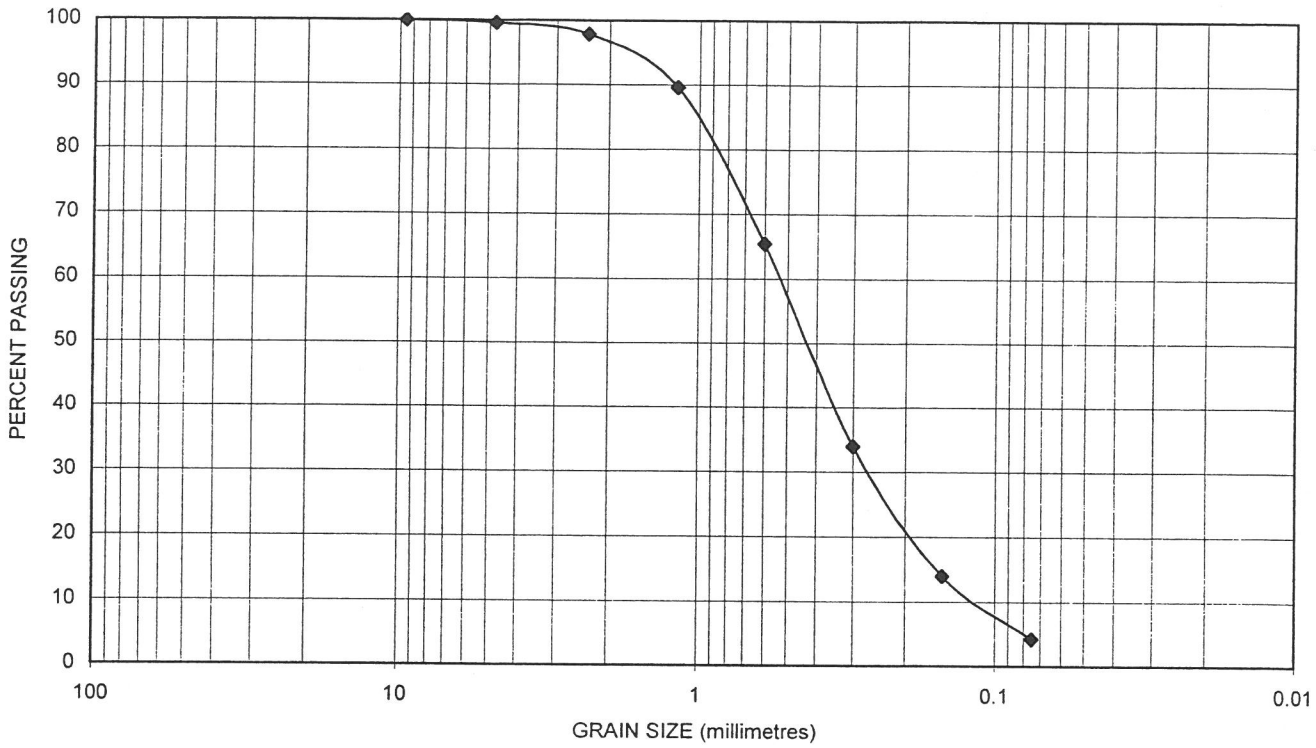
APPENDIX E

Grain Size Analyses

GRAIN SIZE DISTRIBUTION ANALYSIS

FIGURE 3

NATIVE SAND



SIEVE SIZE (mm)	150	75	37.5	26.5	19.0	13.2	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
SAMPLE							100.0	99.6	97.9	89.6	65.4	34.0	14.0	4.3

CLIENT: Novatech Engineering Consultants Ltd.

PROJECT: Newill Subdivision OUR REF.: 031-040

TYPE OF MATERIAL: Sand INTENDED USE: unknown

DATE SAMPLED: March 25, 2003 DATE TESTED: March 28, 2003

SOURCE: TP1 SAMPLE NO: 1

REMARKS:

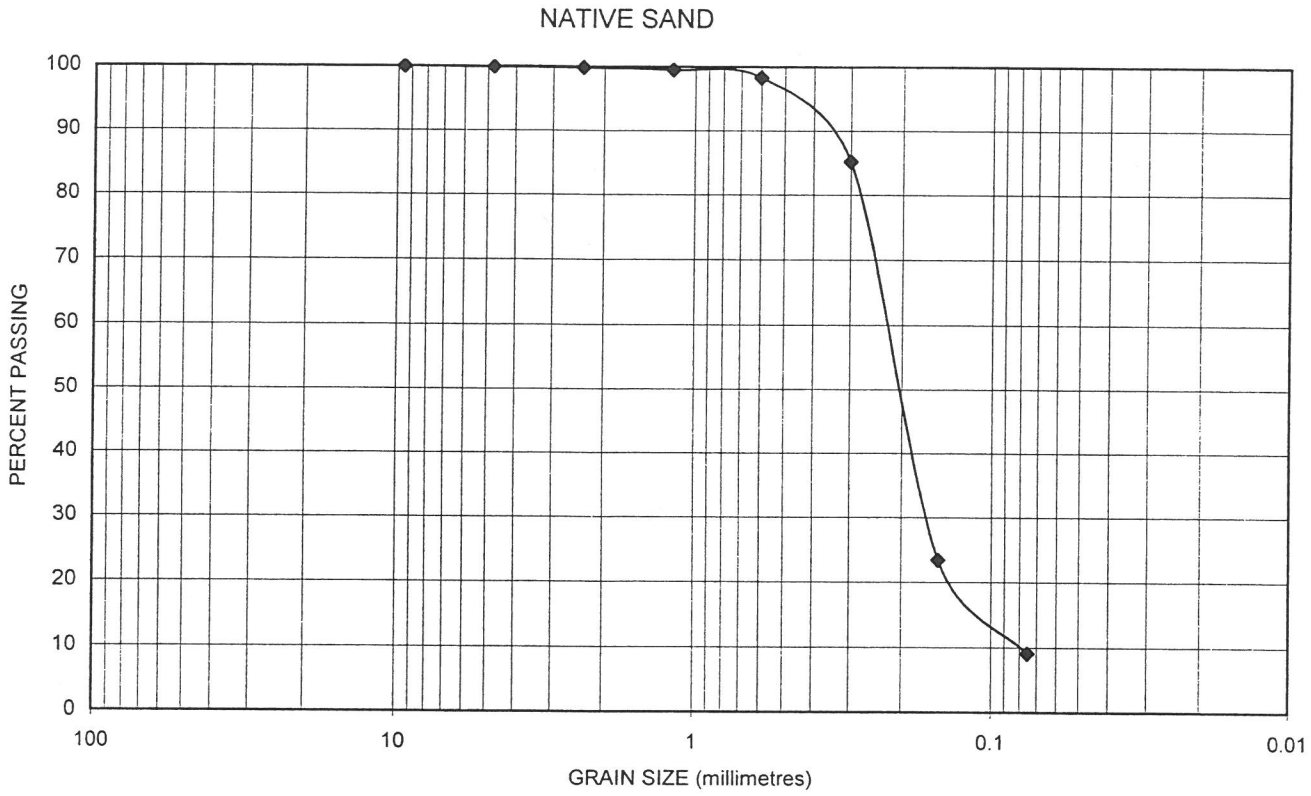
MOREY HOULE CHEVRIER
ENGINEERING LTD
2204 Abbott Road, RR 5, Kemptville, Ontario, K0G 1J0
ph: 258-3742 fax: 258-4541

Issued by: C.R. Morey, P.Eng.

Date:

GRAIN SIZE DISTRIBUTION ANALYSIS

FIGURE 4



SIEVE SIZE (mm)	150	75	37.5	26.5	19.0	13.2	9.5	4.75	2.36	1.18	0.600	0.300	0.150	0.075
SAMPLE							100.0	99.9	99.8	99.5	98.3	85.2	23.4	9.1

CLIENT: Novatech Enginerring Consultants Ltd.

PROJECT: Newill Subdivision OUR REF.: 031-040

TYPE OF MATERIAL: Sand INTENDED USE: unknown

DATE SAMPLED: March 25, 2003 DATE TESTED: March 28, 2003

SOURCE: TP13 SAMPLE NO: 1

REMARKS:

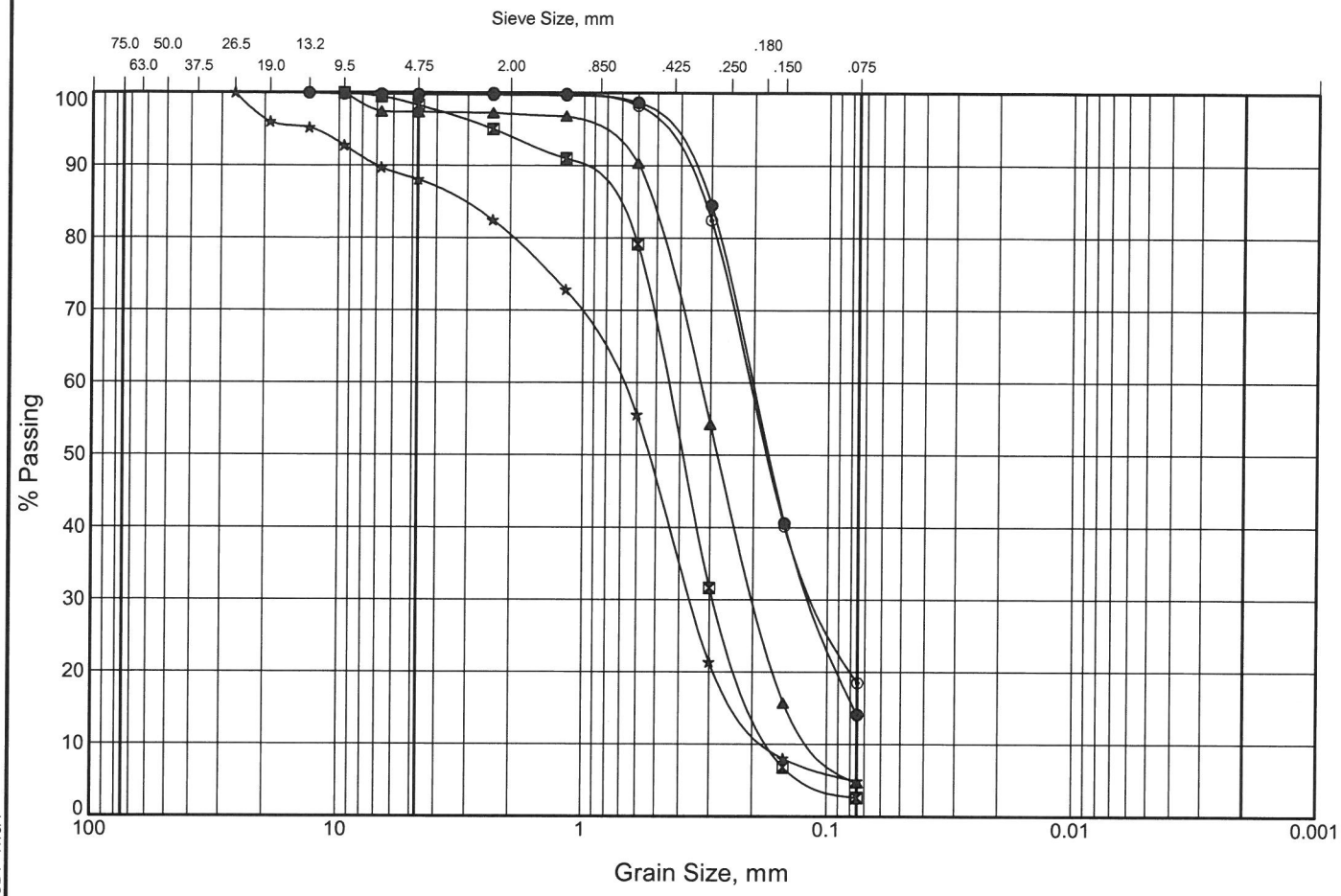
MOREY HOULE CHEVRIER
ENGINEERING LTD
2204 Abbott Road, RR 5, Kemptville, Ontario, K0G 1J0
ph: 258-3742 fax: 258-4541

Issued by: C.R. Morey, P.Eng.

Date:

GRAIN SIZE DISTRIBUTION

FIGURE A1



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt & Clay
●	17-1	9	4.9 - 5.5	0	86	14
⊠	17-1	14	11.6 - 9.1	2	96	3
▲	17-2	10	5.5 - 6.1	3	93	5
★	17-2	16	9.1 - 9..75	12	83	5
⊙	17-3	6	3.0 - 3.7	0	81	19

Houle Chevrier Engineering

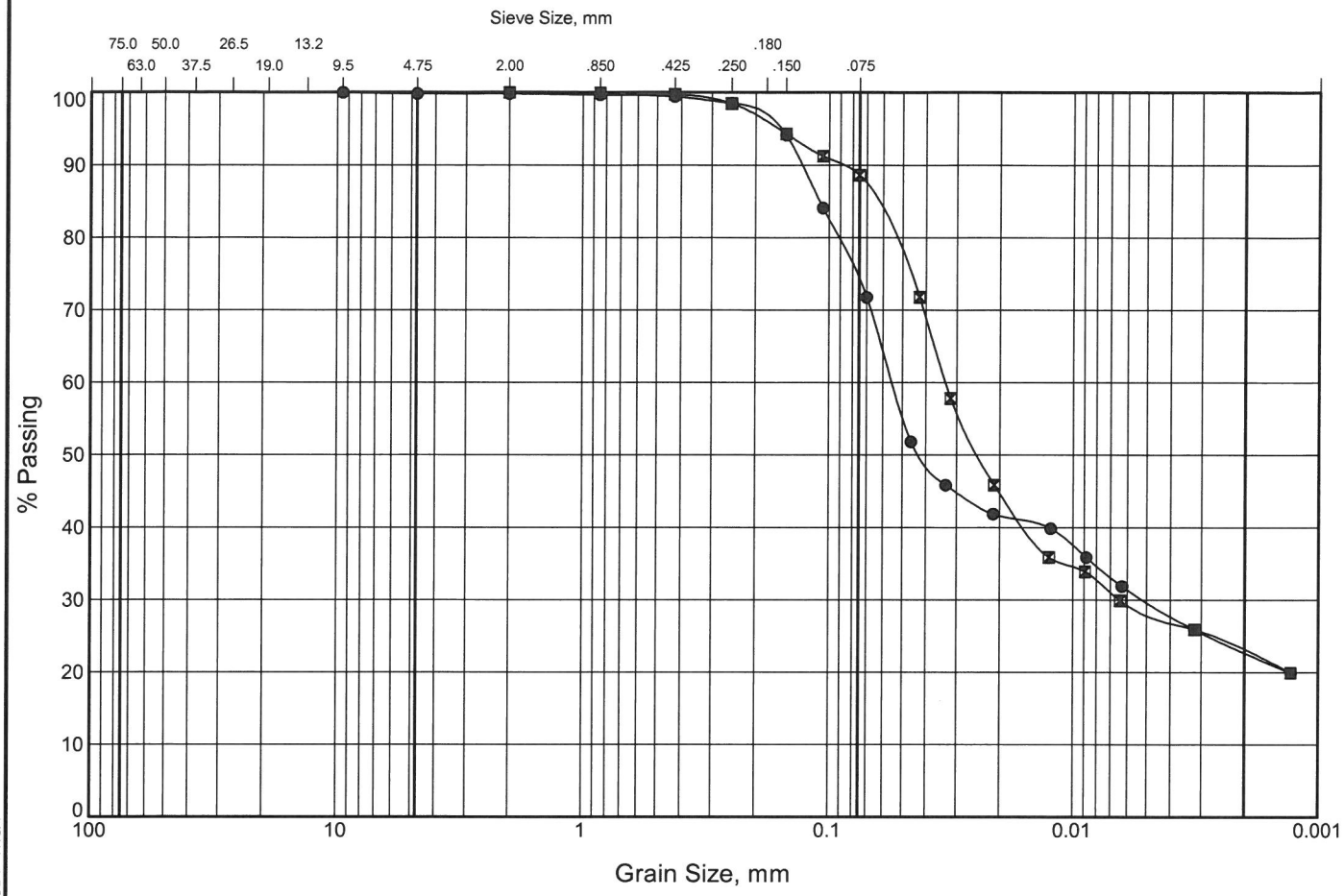
Date: August 2017

Project: 61318.15

SOILS GRAIN SIZE GRAPH UNIFIED % (SIEVE) 61318.15_GNT_2017-07-17.GPJ HOULE CHEVRIER FEB 9 2011.GDT 17/8/1

GRAIN SIZE DISTRIBUTION

FIGURE A2



COBBLES	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY
	GRAVEL		SAND			

Legend	Borehole	Sample	Depth (m)	% Gravel	% Sand	% Silt	% Clay
●	17-2	5	2.4 - 3.0	0	26	51	23
⊠	17-3	11	6.1 - 6.7	0	11	66	23

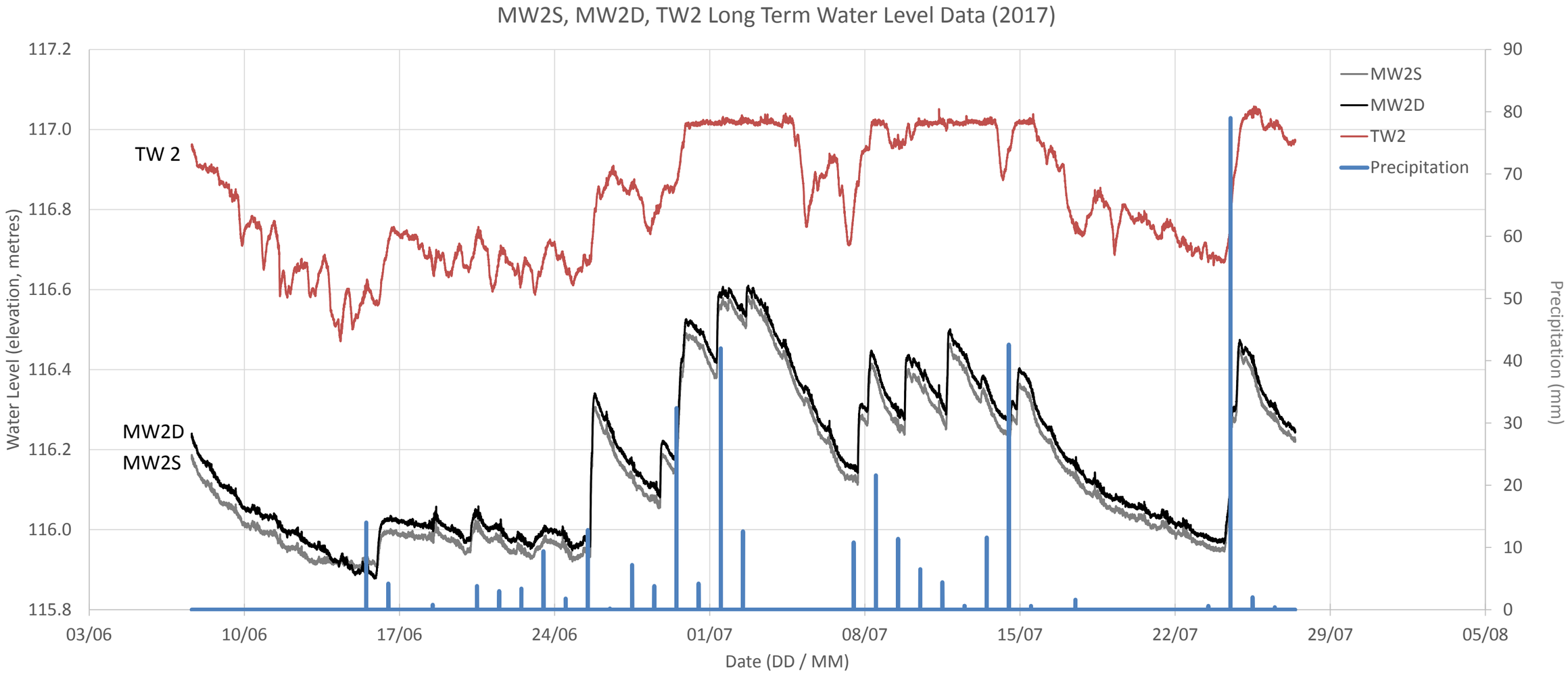
Houle Chevrier Engineering

Date: August 2017

Project: 61318.15

APPENDIX F

Long-Term Water Level Data



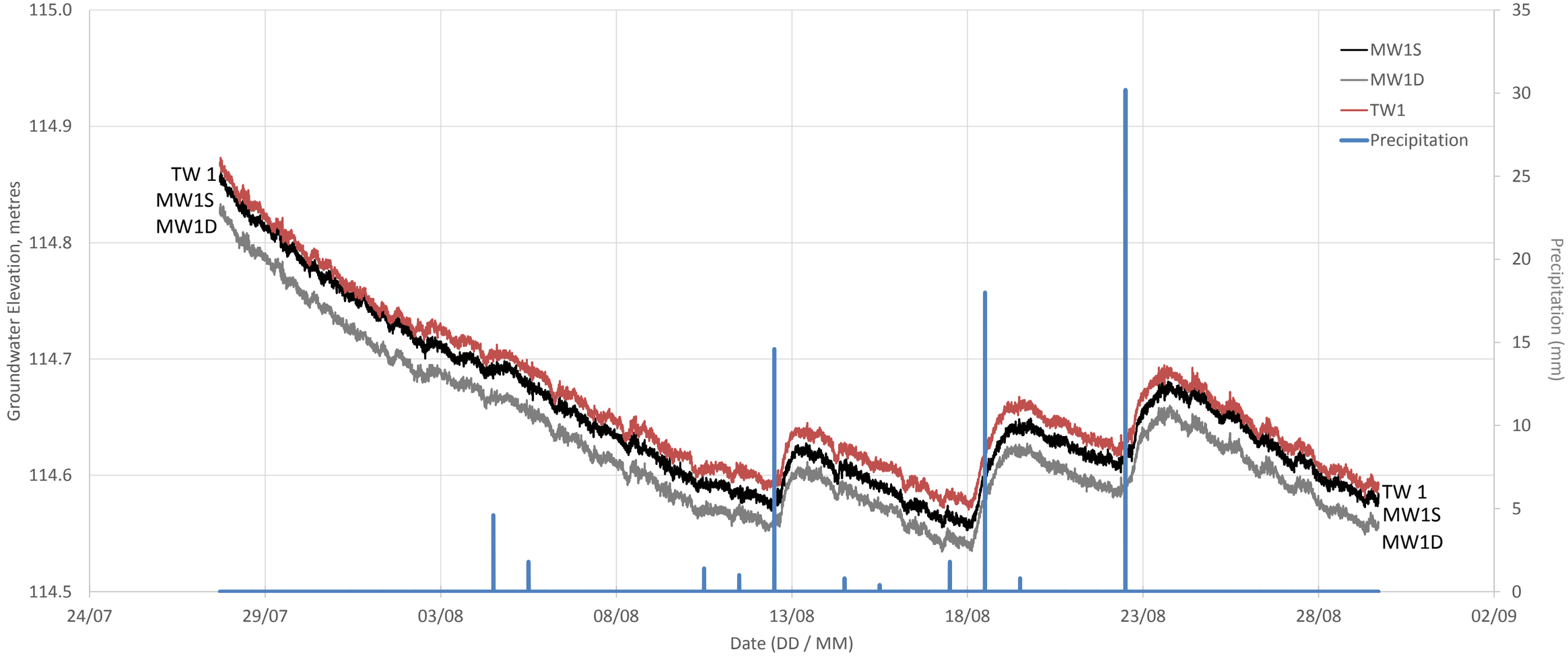
Note: Precipitation data input as single daily entry (12 pm)

GEMTEC
Consulting Engineers and Scientists

Project: 61318.15

Date: November 2017

MW1S, MW1D, TW1 Long Term Water Level Data (2017)



Note: Precipitation data input as single daily entry (12 pm)

GEMTEC
Consulting Engineers and Scientists

Project: 61318.15

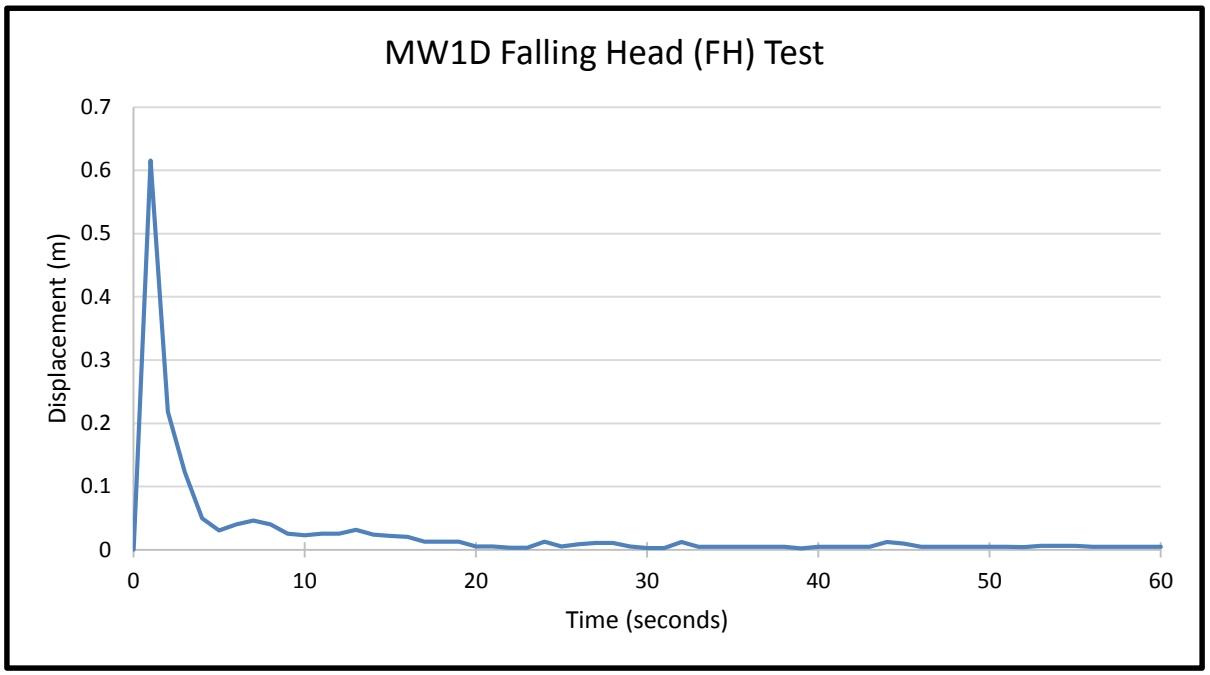
Date: November 2017

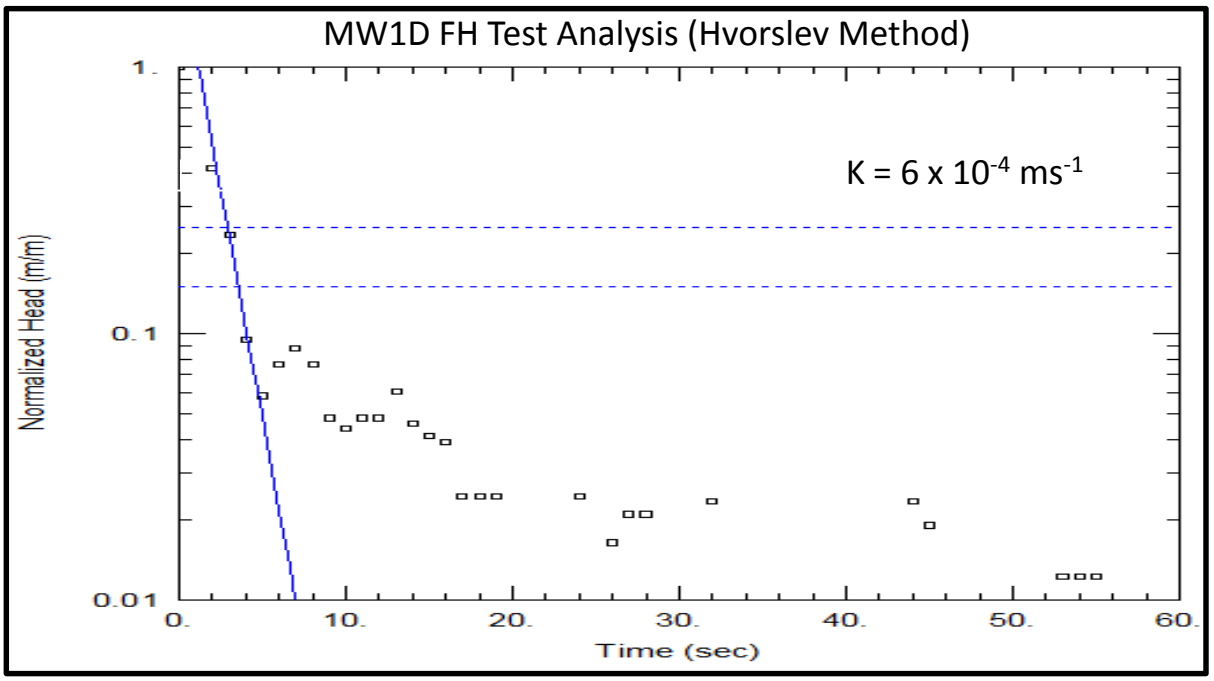
APPENDIX G

Hydraulic Testing – Monitoring Wells

Slug Test Data

FIGURE G1





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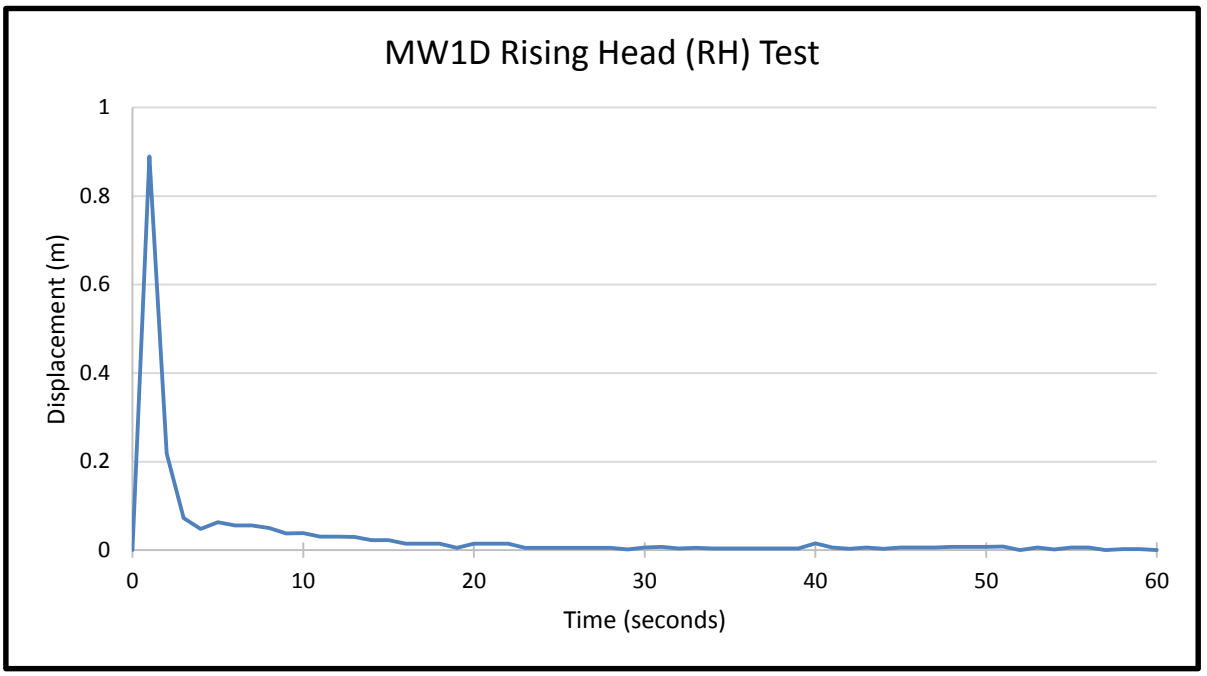
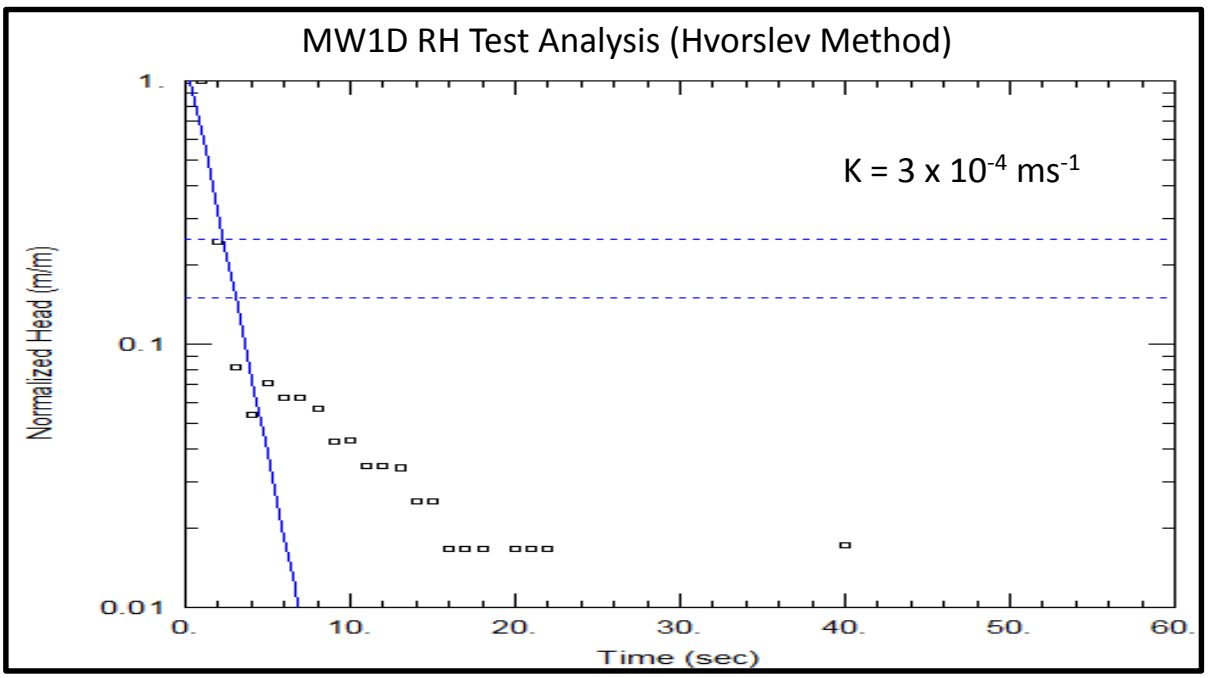
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G2





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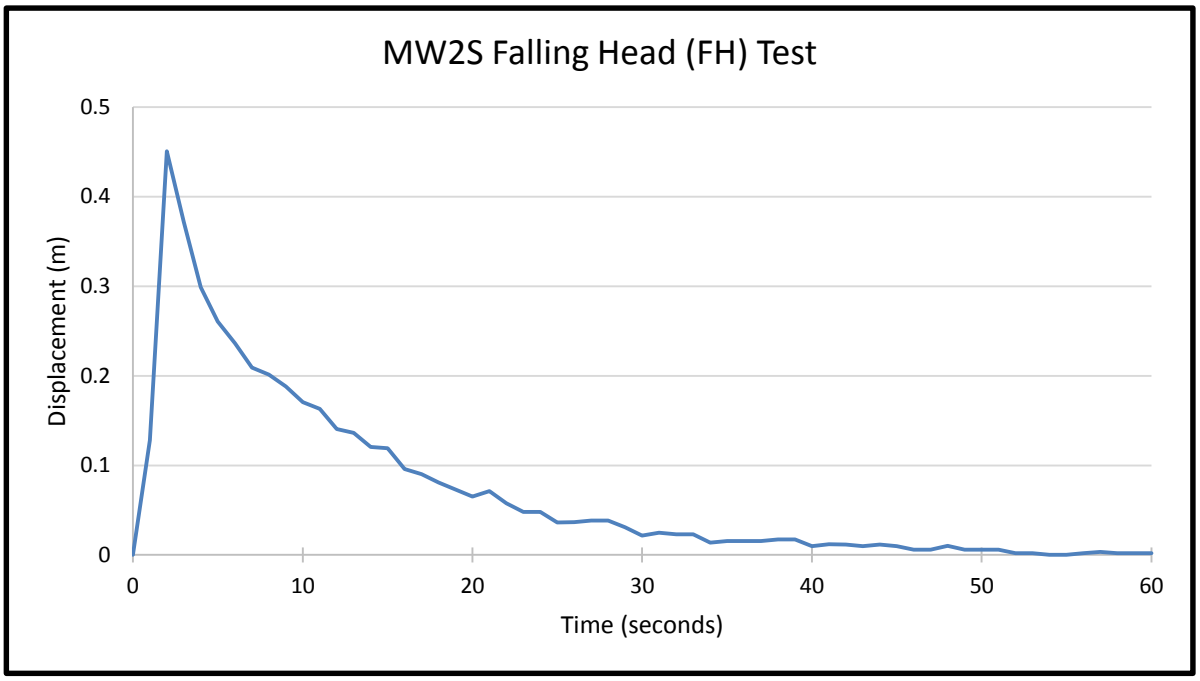
Consulting Engineers and Scientists

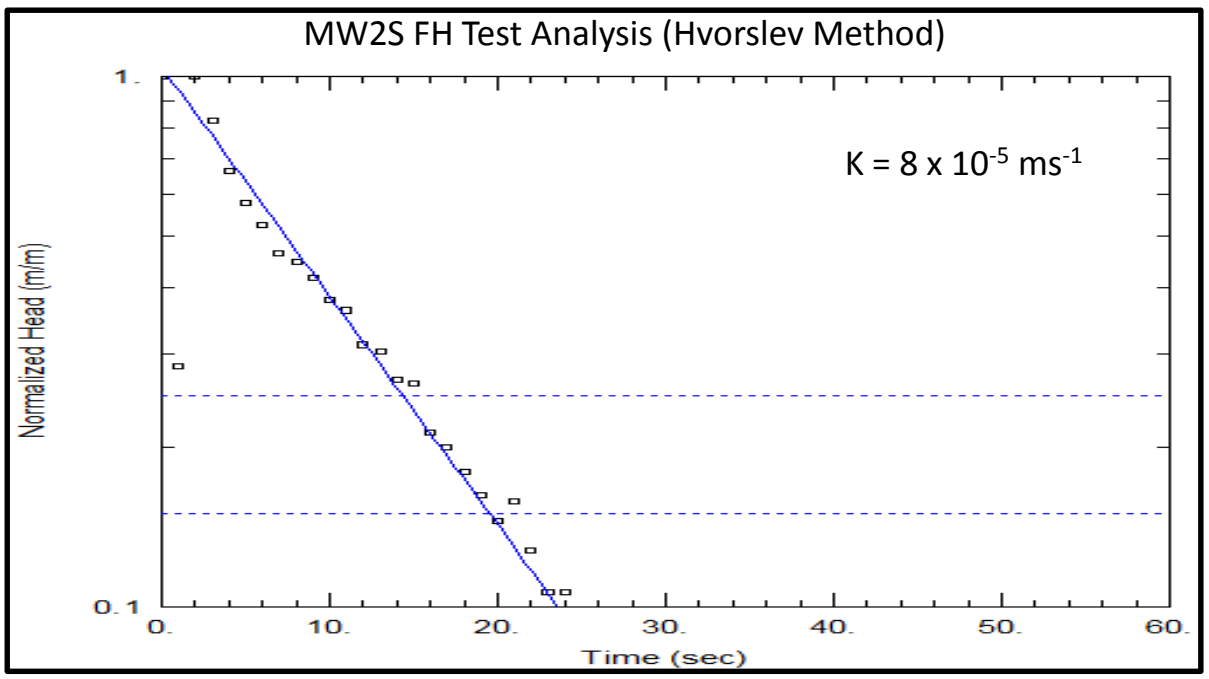
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G3





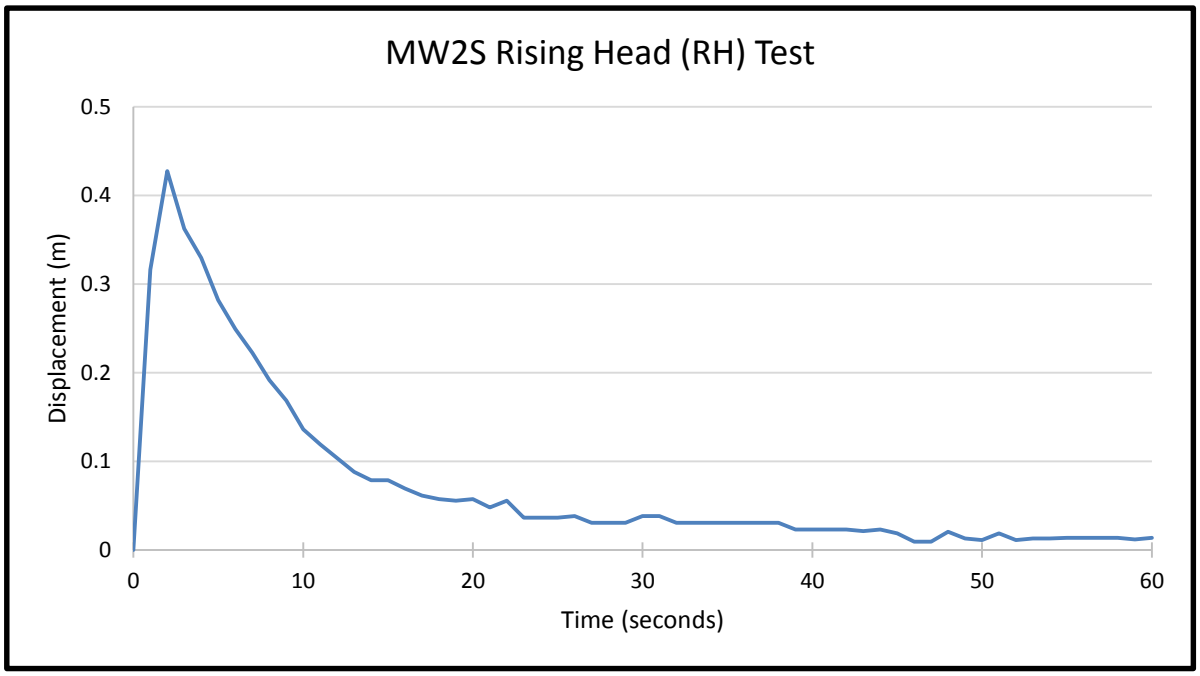
GEMTEC
Consulting Engineers and Scientists

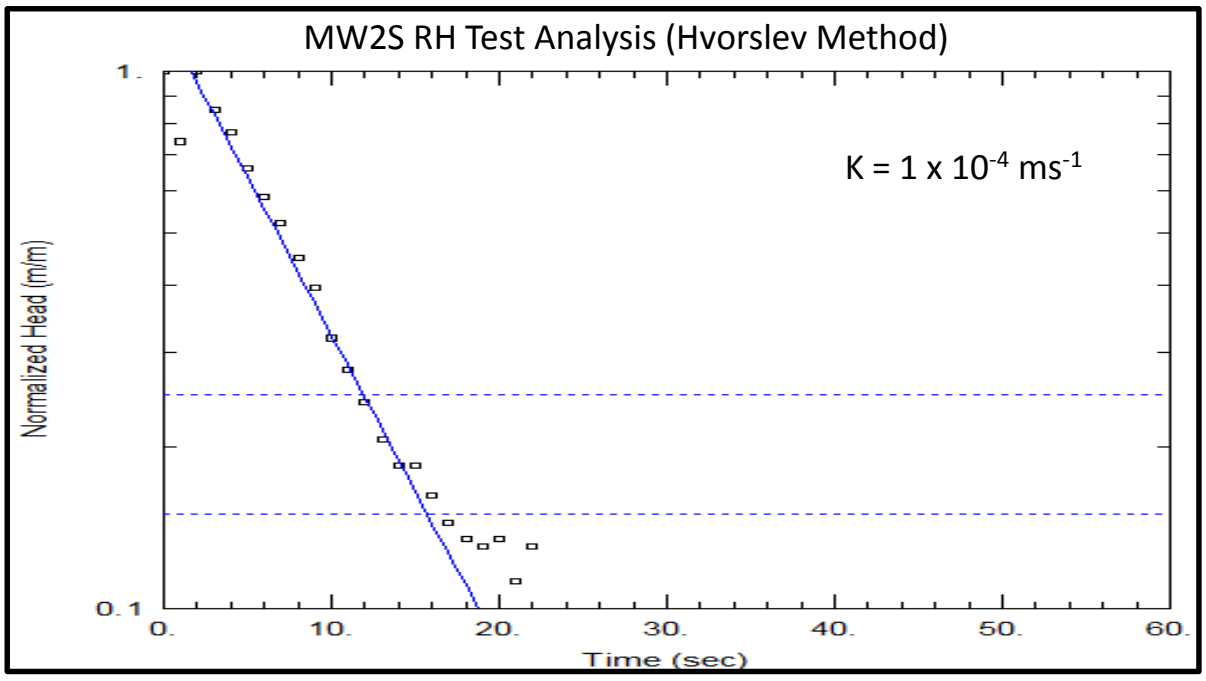
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G4





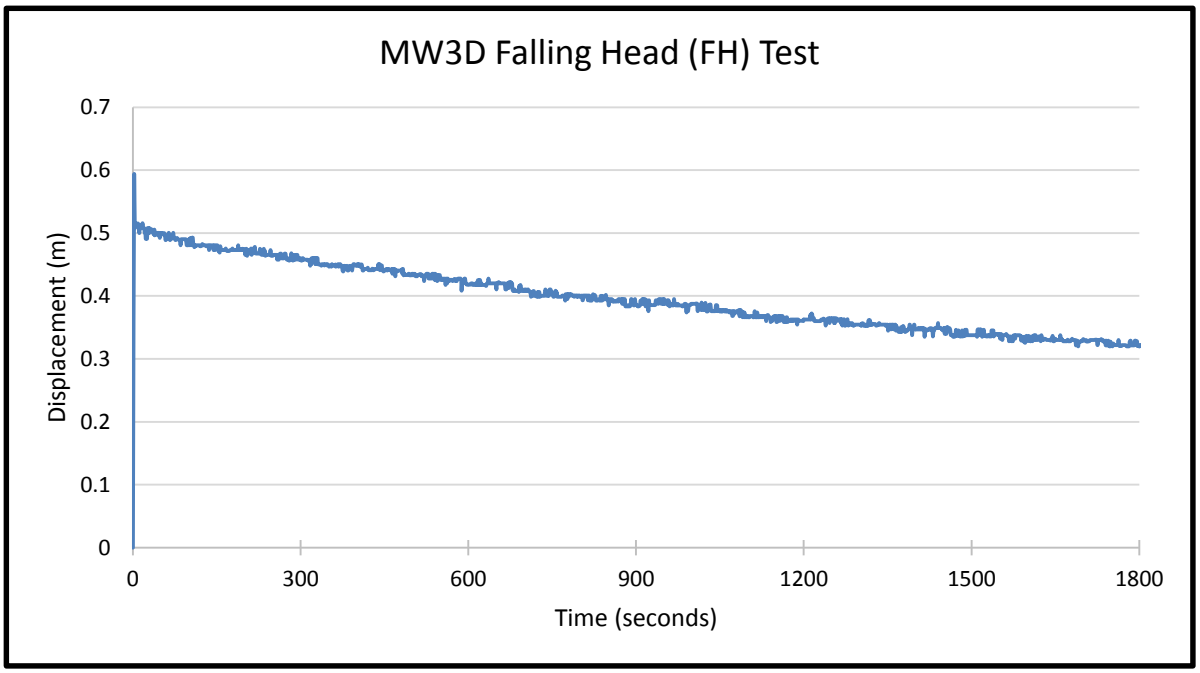
GEMTEC
Consulting Engineers and Scientists

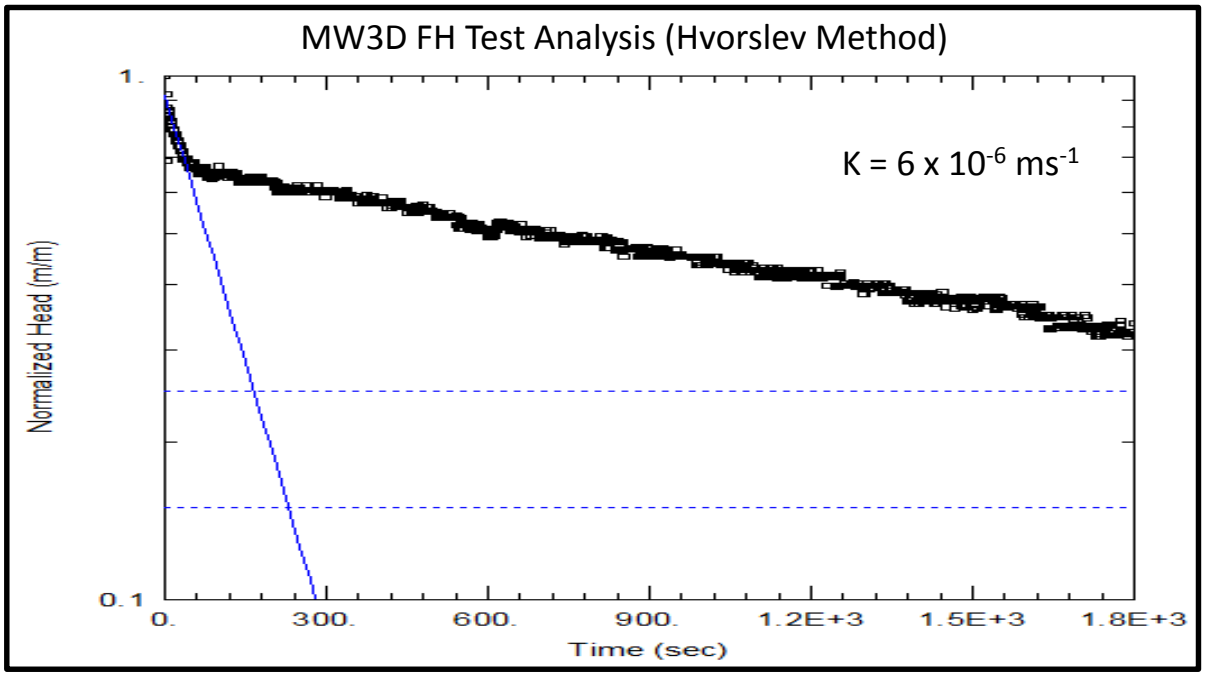
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G5





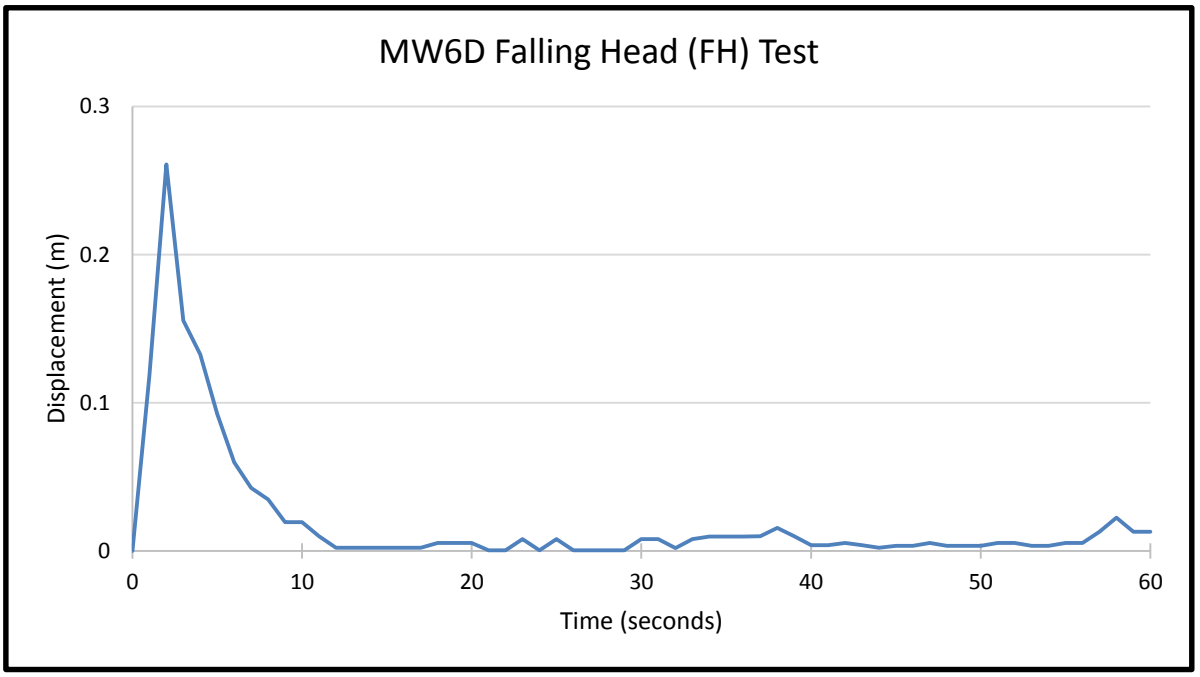
GEMTEC
Consulting Engineers and Scientists

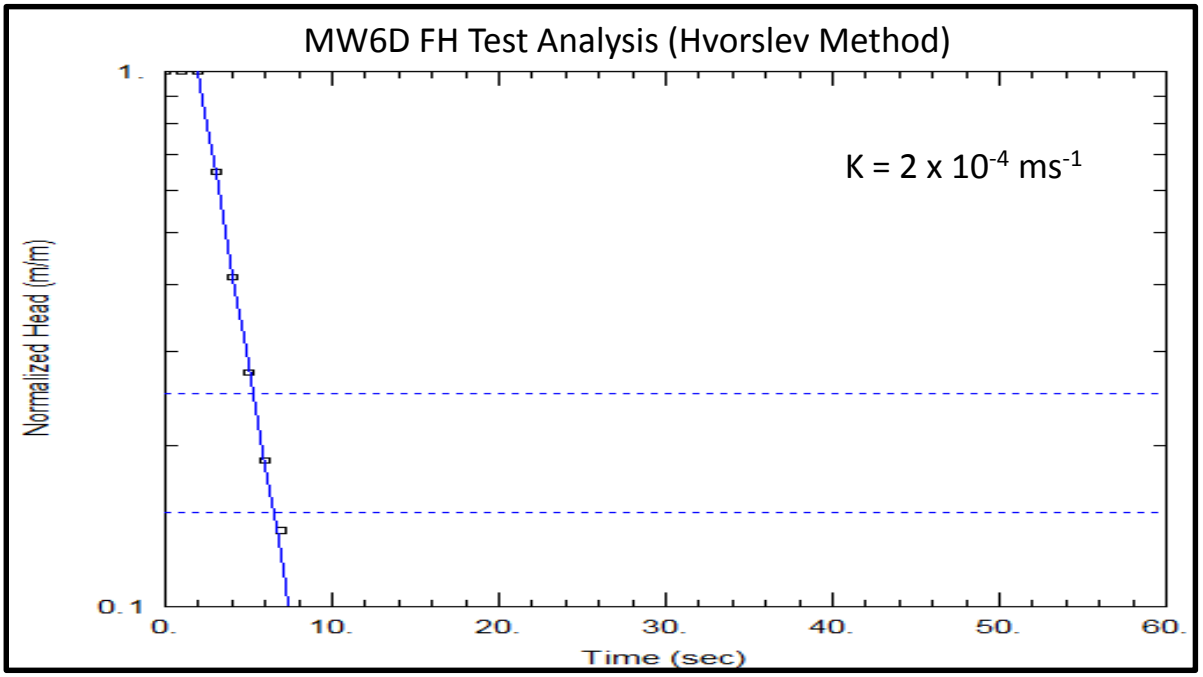
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G6





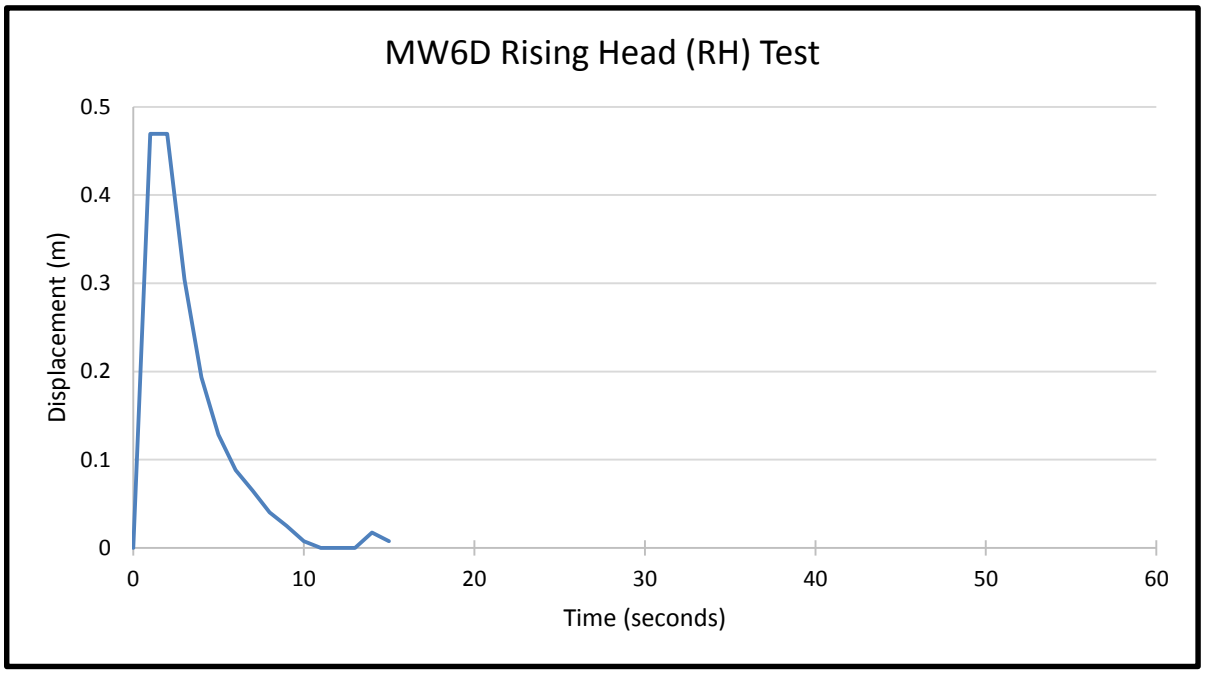
GEMTEC
Consulting Engineers and Scientists

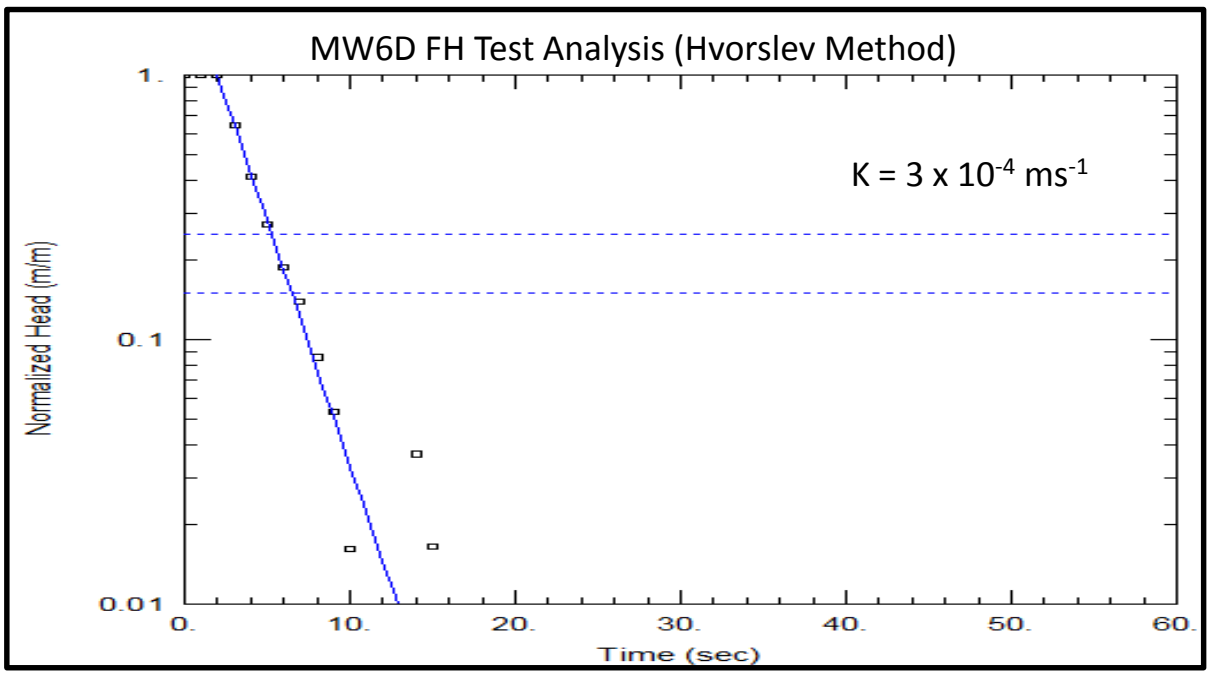
Date: August 2017

Project: 61318.15

Slug Test Data

FIGURE G7





GEMTEC
Consulting Engineers and Scientists

Date: August 2017

Project: 61318.15

APPENDIX H

Nitrate Dilution Calculations

Nitrate Dilution Calculation Worksheet

Nitrate Loading

Commercial Septic Systems (assumes avg. 1,760 L/day/lot)

Number of lots with untreated septic systems =	4	lots
Nitrate loading from untreated septic system =	70.4	grams/lot/day
Total annual nitrate loading from untreated systems =	102784	grams/year

Residential Septic Systems (assumes 1,000 L/day/lot)

Number of lots with untreated septic systems =	78	lots
Nitrate loading from untreated septic system =	40	grams/lot/day
Total annual nitrate loading from untreated systems =	1138800	grams/year

Total Annual Nitrate Loading from all Systems = 1241584 grams/year

Dilution Volumes

Infiltration Factors

Topography factor =	0.2	
Soil factor = (Weighted Avg)	0.345	
Cover factor =	0.1	
Combined infiltration factor =	0.645	

Precipitation Infiltration

Annual water surplus =	0.361	metres/year
Annual infiltration (Water Surplus x Infiltration Factor) =	0.2328	metres/year

Infiltration Area and Infiltration Volumes

Area available for infiltration (Site Area - Hard Surface Area) = 697600 square metres

(assumes varying % HS in residential lots/roadways/walkways and 40% HS in commercial lots, 0% HS in Open Space)

Total Annual Volume of Infiltration (Infiltration x Area) = 162433 cubic metres/year

Annual Flow from Commercial Lots (assuming avg. 1760 L/day/lot)	2570	cubic metres/year
Annual Flow from Residential Lots (assuming 1000 L/day/lot) =	28470	cubic metres/year
Total Annual Volume of Septic Effluent =	31040	cubic metres/year

Total Annual Volume Available for Dilution = 193472 cubic metres/year

Dilution Calculation

$$C_{Nitrate} = \frac{Mass}{Volume} = \frac{Annual\ Nitrate\ Loading(grams/year)}{Annual\ Dilution\ Volume(cubic\ metres/year)} = \frac{grams}{cubic\ metre} = \frac{mg}{L}$$

$$\mathbf{C_{Nitrate} = \frac{1241584\ grams/year}{193472\ cubic\ metres/year} = 6.42\ mg/L}$$

APPENDIX I

Water Well Records and Certificates of Well Compliance

Ontario — Ministry of the Environment and Climate Change

Tag#: A229072 (see Below)

A229072

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	1384341 Ontario Limited (c/o Cavanagh Const)		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
9094 Cavanagh Road	Ashton	On	K0A 1B0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2727 Carp Road	Huntley	P/L 7&8	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottwa-Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	422416	5016516		TEST WELL # 1 OF 3

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	& Gravel		0'	21'
Black & Grey	Limestone			21'	30'
Black & Grey	Limestone			30'	106'
Black & Grey	Limestone			106'	137'
Black & Grey	Limestone			137'	143'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
27'	17'	Neat cement	9.36
17'	0'	Bentonite slurry	8.4

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	27'
6"	Open Hole		27'	143'

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
30 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify ____	0'	27'	9 3/4"
106 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify ____	27'	143'	6"
137 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify ____			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 120

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 96.7'

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

Recommended pump depth (m/ft): 100'

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

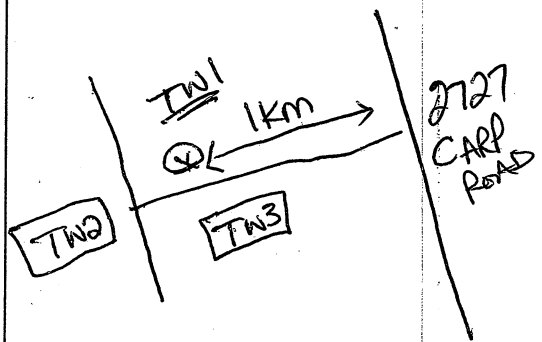
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	2'9"		96.7'
1	13.3	1	81.3"
2	20.4	2	69.3
3	25.9	3	57.1
4	30.4	4	45.7
5	36.1	5	35.9
10	53.2	10	23.6
15	61.2	15	12.7
20	74.8	20	5.6
25	80.5	25	2.9
30	89.8	30	2.9
40	93.6	40	2.9
50	95.4	50	2.9
60	96.7'	60	2'9"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP - 15 GPM SET @ 100 FT (TEST WELL #1 OF 3)

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road, RR#1	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
6138382170	Hogan, Dan	T3058		2017 10 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2017 10 13	2017 10 11

Ministry Use Only

Audit No. Z262255

Received

0506E (2014/11)

Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Tag#: A229073 (see Below)

A229073

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Measurements recorded in: ☐ Metric ☒ Imperial

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	1384341 Ontario Limited (c/o Cavanagh Const)		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
9094 Cavanagh Road	Ashton	On	K0A 1B0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2727 Carp Road	Huntley	P/L 7&	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	422183	5016181		TEST WELL # 2 OF 3

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	& Gravel & Clay		0'	13'
Black & Gray	Limestone			13'	108'
Black & Gray	Limestone			108'	183'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
20'	10'	Neat cement	10.9
10'	0'	Bentonite slurry	8.4

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	20'
6"	Open Hole		20'	183'

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Hole Diameter Depth From (m/ft)	Depth To (m/ft)	Diameter (cm/in)
108 (m/ft) ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0'	20'	9 3/4"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	20'	183'	6"
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, specify Not tested

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 21.4'

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

Recommended pump depth (m/ft): 100'

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

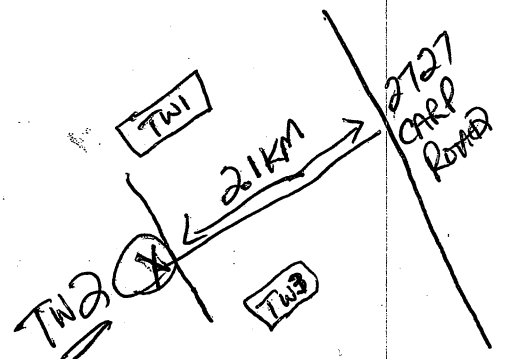
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	7'7"		21.4"
1	12.9	1	14.6
2	15.1	2	10.1
3	16.3	3	8.7
4	17.1	4	7.7
5	17.8	5	7.7
10	19.9	10	7.7
15	20.3	15	7.7
20	20.7	20	7.7
25	21.4	25	7.7
30	21.4	30	7.7
40	21.4	40	7.7
50	21.4	50	7.7
60	21.4"	60	7.7"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP - 15 GPM SET @ 100 FT (TEST WELL # 2 OF 3

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality
6859 Franktown Road, RR#1	Richmond

Province	Postal Code	Business E-mail Address
ON	K0A 2Z0	air-rock@sympatico.ca

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

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
T3058	Kenny	2017 10 31

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Ministry Use Only
☒ Yes ☐ No	2017 10 13	Audit No. Z262257
	Date Work Completed (Y Y Y Y M M D D)	Received
	2017 10 10	

0506E (2014/11) — Ministry's Copy

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

W Tag#: A 229074 (Below)
A229074

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
	1384341 Ontario Limited (c/o Cavanagh Const)		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
9094 Cavanagh Road	Ashton	On	K0A 1B0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
2727 Carp Road	Huntley	P/L 7&	3

County/District/Municipality	City/Town/Village	Province	Postal Code
Ottawa-Carleton	Carp	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	442692	5016337		TEST WELL # 3 OF 3

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	& Grey Clay		0'	14'
Black & Grey	Limestone			14'	28'
Black & Grey	Limestone			28'	98'
Black & Grey	Limestone			98'	133'
Black & Grey	Limestone			133'	143'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
28'	0'	Neat cement	10.9

Method of Construction

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

Well Use

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

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
6 1/4"	Steel	.188"	+2'	20'
6"	Open Hole		20'	143'

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	Gas	Kind of Water	Other, specify
28	☐	☐ Fresh ☒ Untested	X
98	☐	☐ Fresh ☒ Untested	X
134	☐	☐ Fresh ☒ Untested	X

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	20'	9 3/4"
20'	143'	6"

Results of Well Yield Testing

After test of well yield, water was: ☐ Clear and sand free ☐ Other, specify **Not tested**

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 120

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 5.1'

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

Recommended pump depth (m/ft): 100'

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

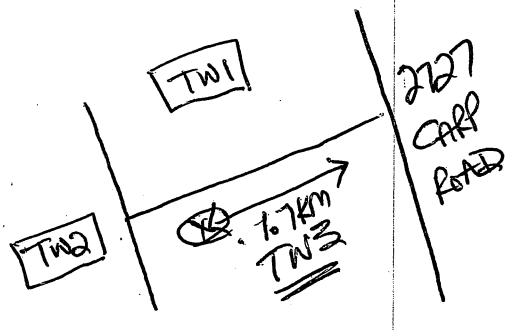
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	3'8"		5.1'
1	4.3	1	3.8
2	4.4	2	3.8
3	4.5	3	3.8
4	4.6	4	3.8
5	4.6	5	3.8
10	4.8	10	3.8
15	4.9	15	3.8
20	5	20	3.8
25	5.1	25	3.8
30	5.1	30	3.8
40	5.1	40	3.8
50	5.1	50	3.8
60	5.1"	60	3'8"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP - 15 GPM SET @ 100 FT (TEST WELL #3 OF 3)

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	1119

Business Address (Street Number/Name)	Municipality	Province	Postal Code	Business E-mail Address
6659 Franktown Road, RR#1	Richmond	ON	K0A 2Z0	air-rock@sympatico.ca

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)	Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
6138382170	Hogan, Dan	T3058		2017 10 31

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

Date Package Delivered: 2017 10 13

Date Work Completed: 2017 10 06

Ministry Use Only

Audit No. Z262256

Received

0506E (2014/11)

Ministry's Copy

CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the property of 1384341 ONTARIO LIMITED (c/o Cavanagh Construction)
located at #2727 CARP ROAD, Carp
Lot/Plan No.) in the City of Ottawa (Geographical Township of [redacted]tHuntley
LOT Part 7 & 8 CONC 3 PLAN# X S/L# X

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

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

Signed this 10TH day of OCTOBER 2017
[signature] Air Rock Drilling Co. Ltd.
Well Driller/Company

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

SIGNED this 2 day of Nov., 2017
A.C. Houle, P.Eng.
Engineer
Gemtec Limited

LICENSED PROFESSIONAL ENGINEER
Nov. 2/17
A. C. HOULE
A.C. Houle
PROVINCE OF ONTARIO

TW# 2 OF 3
2017578
TAG A229073

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8243 Victoria Street
Ottawa, ON K0A 2P0

Ville d'Ottawa
Centre de service
8243, rue Victoria
Ottawa, ON K0A 2P0

2001 International Year of Volunteers
Année internationale des bénévoles

Ottawa

CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the property of 1384341 ONTARIO LIMITED (c/o Cavanagh Construction)
located at #2727 CARP ROAD Carp
Lot/Plan No.) in the City of Ottawa (Geographical Township of [redacted] Huntley
LOT Part 7 & 8 CONC 3 PLAN# X S/L# X

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

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

Signed this 11TH day of OCTOBER 2017

[signature] Air Rock Drilling Co. Ltd.
Well Driller/Company

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

SIGNED this 2 day of Nov. 2017

A.C. Houle, P.Eng.
Engineer

Gemtec Limited

LICENCED PROFESSIONAL ENGINEER
A. C. HOULE
Nov. 2/17
A.C. Houle
PROVINCE OF ONTARIO

TW# 1 OF 3
2017579
TAG A229072

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8243 Victoria Street
Ottawa, ON K0A 2P0

Ville d'Ottawa
Centre de service
8243, rue Victoria
Ottawa, ON K0A 2P0

2001
International Year of Volunteers
Année internationale des volontaires

Ottawa

CERTIFICATE OF WELL COMPLIANCE

I, Ken Desaulniers DO HEREBY CERTIFY that I am licensed to drill wells in the Province of Ontario, and that I have supervised the drilling of a well on the property of 1384341 ONTARIO LIMITED (c/o Cavanagh Construction) located at #2727 CARP ROAD Carp Lot/Plan No.) in the City of Ottawa (Geographical Township of [redacted]ttenHey LOT Pt 7 & 8 CONC 3 PLAN# X S/L# X

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

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

Signed this 6TH day of OCTOBER 2017

Air Rock Drilling Co. Ltd.
Well Driller/Company

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

SIGNED this 2 day of Nov. 2017

A.C. Houle, P.Eng.
Engineer

Gemtec Limited

LICENSED PROFESSIONAL ENGINEER
Nov. 2/17
A. C. HOULE
PROVINCE OF ONTARIO

TW# 3 OF 3
2017577
TAG A229074

Shaping our future together
Ensemble, formons notre avenir

City of Ottawa
Client Service Centre
8243 Victoria Street
Ottawa, ON K0A 2P0

Ville d'Ottawa
Centre de service
8243, rue Victoria
Ottawa, ON K0A 2P0

2001
International Year of Volunteers
Année internationale des volontaires

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 **1533700** Municipality 15005 Con. CON 03

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Ottawa-Carleton	West Carleton	3	8

Address: Carp Rd

Date completed: 17 day 03 month 03 year

21 Northing ... RC Elevation ... RC Basin Code ... ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Sand	Gravel		0	40
Grey	Limestone			40	205

31

32

41 WATER RECORD

Water found at - feet	Kind of water
60	1 ☒ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
145	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	48
8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic		0	46
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic		46	205

SCREEN

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

Material and type | Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
2	48	Bentonite

PUMPING TEST

71 Pumping test method: 1 ☒ Pump 2 ☐ Bailer

Pumping rate: 1 1/2 GPM

Duration of pumping: 1 Hours ... Mins

Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☒ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
11 feet	200 feet	182 feet	164 feet	146 feet	128 feet

If flowing give rate: ... GPM

Pump intake set at: ... feet

Water at end of test: ☐ Clear ☒ Cloudy

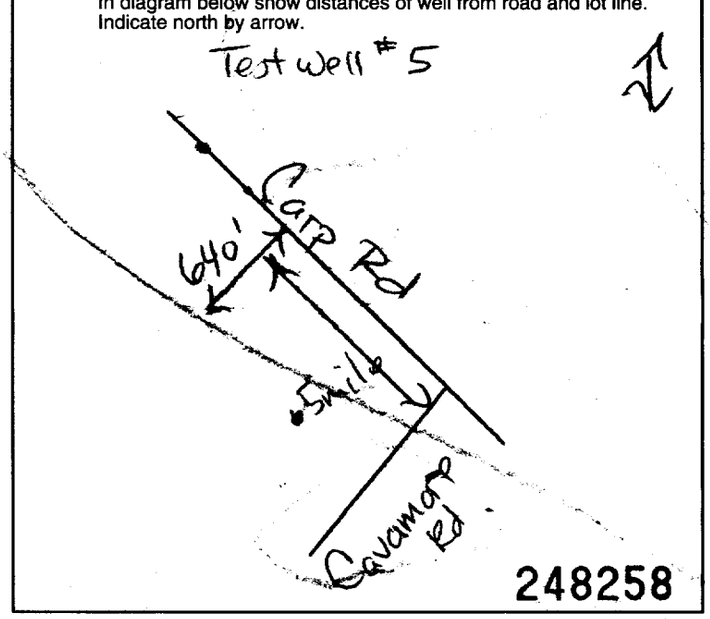
Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump setting: 200 feet

Recommended pump rate: 1 1/2 GPM

LOCATION OF WELL

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



248258

FINAL STATUS OF WELL

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

WATER USE

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

METHOD OF CONSTRUCTION

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

Name of Well Contractor	Well Contractor's Licence No.
Air-Rock Drilling Co Ltd	1119
Address: RR # 1 Richmond, Ont	
Name of Well Technician: Ken Desaulniers	Well Technician's Licence No.: T4
Signature of Technician/Contractor	Submission date: 11 day 04 mo 03 yr

MINISTRY USE ONLY

Data source 58 | Contractor 1119 59-62 | Date received MAY 08 2003 63-68 80

Date of inspection | Inspector

Remarks

CSS.ES3

0506 (07/00) Front Form 9

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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 **1533701** Municipality 15005 Con. CON 03

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	West Carleton (Huntley)	3				8

Address: Carp, Ont

Date completed: 7 day 03 month 03 year

21 Drew Hall Corp. — UTM — Northing — RC — Elevation — RC — Basin Code — ii — iii — iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	clay	gravel, sand		0	15
grey	Limestone			15	120

31

32

41 WATER RECORD

Water found at - feet	Kind of water
51	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
113	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	22
8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	20
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		20	120

SCREEN

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

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

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
2	22	bentonite

PUMPING TEST

71 Pumping test method: 1 ☑ Pump 2 ☐ Bailer

Pumping rate: 4 GPM — Duration of pumping: 1 Hours ... Mins

25 Water levels during: 1 ☐ Pumping 2 ☑ Recovery

Static level	Water level end of pumping	15 minutes	30 minutes	45 minutes	60 minutes
16 feet	115 feet	67 feet	19 feet	16 feet	16 feet

If flowing give rate: GPM — Pump intake set at: feet — Water at end of test: ☐ Clear ☑ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 115 feet — Recommended pump rate: 4 GPM

FINAL STATUS OF WELL

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

WATER USE

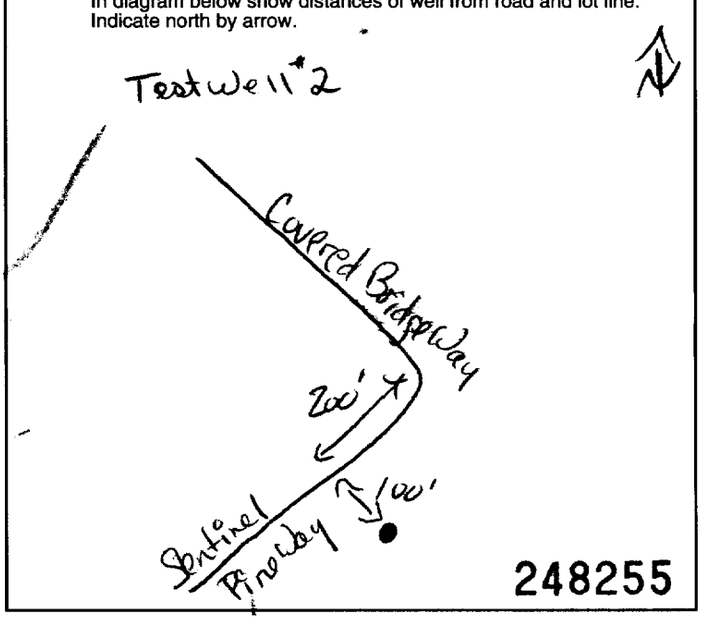
1 ☐ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☑ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



248255

Name of Well Contractor: A. Roch Dr. Unlolted — Well Contractor's Licence No.: 1119

Address: RR#1 Richmond, Ont

Name of Well Technician: Shannon Purcell — Well Technician's Licence No.: TQ122

Signature of Technician/Contractor — Submission date: 4 day 04 mo 03 yr

MINISTRY USE ONLY: Data source — Contractor: 1119 — Date received: MAY 08 2003

Date of inspection — Inspector

Remarks: CSS.ES3

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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 **1533704** Municipality 150 05 Con CON 03

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	West Carleton (Huntley)	3				8

Address: Carp, Ont — Date completed: 14 (day) 03 (month) 03 (year)

21 Newell Corp. — UTM: Northing | RC | Elevation | RC | Basin Code (ii, iii, iv)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
grey	Clay			0	33
brown	Shale			33	168
grey	Limestone			168	181

31

32

41 WATER RECORD

Water found at - feet	Kind of water
135	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas — NOT USED
170	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas — NOT USED
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	42
8 3/4	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	40
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		40	181

SCREEN

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

Material and type | Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
2	42	bentonite

PUMPING TEST

71 Pumping test method: 1 ☑ Pump 2 ☐ Bailer — Pumping rate: 7 GPM — Duration of pumping: 1 Hours ... Mins

Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☑ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
20 feet	170 feet	85 feet	20 feet	20 feet	20 feet

If flowing give rate: GPM — Pump intake set at: feet — Water at end of test: ☐ Clear ☑ Cloudy

Recommended pump type: ☐ Shallow ☑ Deep — Recommended pump setting: 170 feet — Recommended pump rate: 7 GPM

FINAL STATUS OF WELL

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

WATER USE

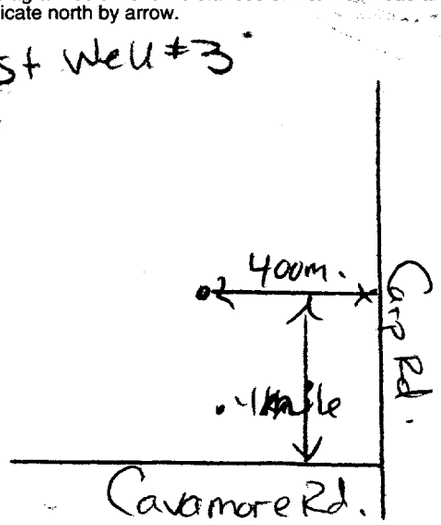
1 ☐ Domestic 2 ☐ Stock 3 ☐ Irrigation 4 ☐ Industrial 5 ☐ Commercial 6 ☐ Municipal 7 ☐ Public supply 8 ☐ Cooling & air conditioning 9 ☑ Not use 10 ☐ Other

METHOD OF CONSTRUCTION

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

LOCATION OF WELL

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



248252

Name of Well Contractor: Air Rock Drilling Ltd — Well Contractor's Licence No.: 1119

Address: RR#1 Richmond, Ont

Name of Well Technician: Ken Desaulniers — Well Technician's Licence No.: T4

Signature of Technician/Contractor — Submission date: 11 (day) 04 (mo) 03 (yr)

MINISTRY USE ONLY

Data source 58 — Contractor 1119 (59-62) — Date received MAY 08 2003 (63-68) 80

Date of inspection — Inspector

Remarks: CSS.ES3

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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 1533703 Municipality 5005 Con. CON 03

County or District: Ottawa Carleton
Township/Borough/City/Town/Village: West Carleton (Huntley)
Con block tract survey, etc.: 3
Lot: 7
Address: Carp, Ont
Date completed: 17 day 03 month 03 year

21 Northing RC Elevation RC Basin Code ii iii iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	Sand	gravel		0	25
grey	Limestone			25	200

31
32

41 WATER RECORD

Water found at - feet	Kind of water
148	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
165	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 5 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6¼	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	33
8¾	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	31
6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		31	200

SCREEN

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

Material and type | Depth at top of screen feet

61 PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
2	33	Bentonite

PUMPING TEST

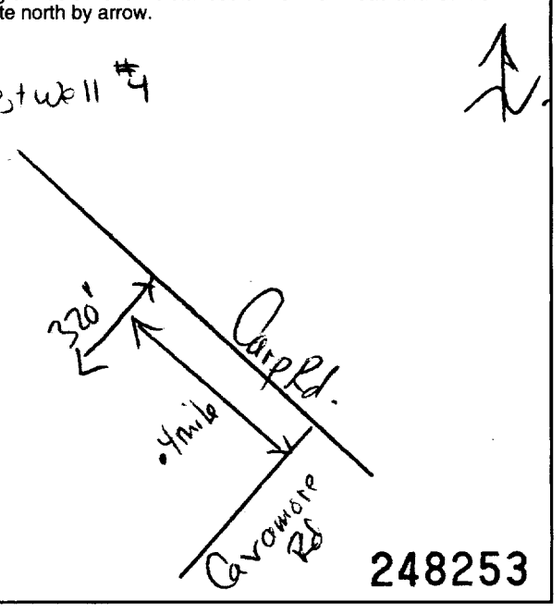
71 Pumping test method: 1 ☑ Pump 2 ☐ Bailer
Pumping rate: 4 GPM
Duration of pumping: 1 Hours Mins

Static level	Water level end of pumping	Water levels during: 1 ☐ Pumping 2 ☑ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
12 feet	180 feet	132 feet	84 feet	36 feet	12 feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☑ Cloudy
Recommended pump type: ☐ Shallow ☑ Deep
Recommended pump setting: 180 feet
Recommended pump rate: 4 GPM

LOCATION OF WELL

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



248253

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: Air Rock Drilling Ltd
Well Contractor's Licence No.: 1119
Address: RR#1 Richmond, ONT
Name of Well Technician: Shannon Purcell
Well Technician's Licence No.: TQ122
Signature of Technician/Contractor:
Submission date: 11 day 04 mo 03 yr

MINISTRY USE ONLY

Data source 58
Contractor: 1119 59-62
Date received: MAY 08 2003 63-68 80
Date of inspection
Inspector
Remarks: CSS.ES3

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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 **1533702** Municipality 15005 Con. CON 03

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	West Carleton (Huntley)	3				8
[redacted]	Address: Carp, Ont	Date completed: 18 day 03 month 03 year				

21 Nepean Corp — UTM: Northing | RC | Elevation | RC | Basin Code | ii | iii | iv

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	Sandy clay			0	3.5
grey	Limestone			3.5	220

31

32

41 WATER RECORD

Water found at - feet	Kind of water
10-13	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
15-18	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
20-23	1 ☐ Fresh 2 ☑ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
25-28	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas
30-33	1 ☐ Fresh 2 ☐ Salty 3 ☐ Sulphur 4 ☐ Minerals 6 ☐ Gas

51 CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
10-11: 6¼	1 ☑ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☐ Open hole 5 ☐ Plastic	188	0	13-16: 22
17-18: 8¾	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		0	20-23: 20
24-25: 6	1 ☐ Steel 2 ☐ Galvanized 3 ☐ Concrete 4 ☑ Open hole 5 ☐ Plastic		20	27-30: 220

SCREEN

Sizes of opening (Slot No.) 31-33	Diameter 34-36 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	To	Material and type (Cement grout, bentonite, etc.)
2 (12-13)	22 (14-17)	Cement grout
18-21	22-25	
26-29	30-33	60

71 PUMPING TEST

Pumping test method 10: 1 ☐ Pump 2 ☐ Bailer
Pumping rate 11-14 GPM
Duration of pumping 15-16 Hours 17-18 Mins

Static level	Water level end of pumping	Water levels during 25: 1 ☐ Pumping 2 ☐ Recovery			
19-21 feet	22-24 feet	15 minutes 26-28 feet	30 minutes 29-31 feet	45 minutes 32-34 feet	60 minutes 35-37 feet

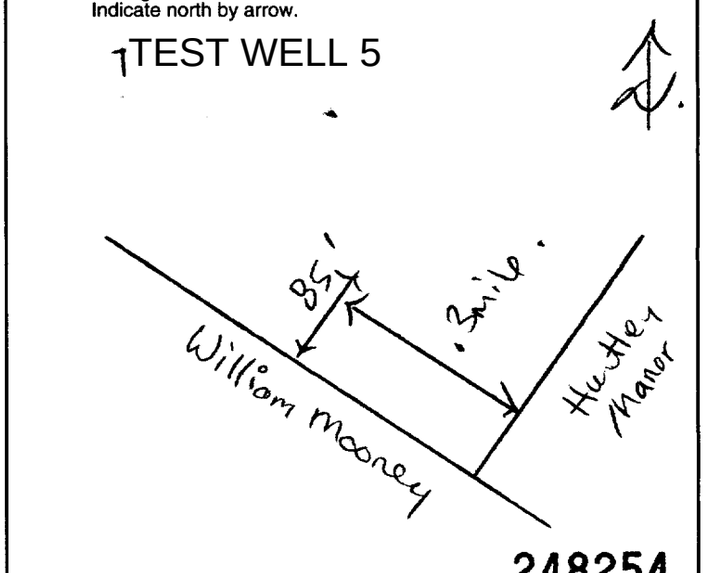
If flowing give rate 38-41 GPM | Pump intake set at feet | Water at end of test 42: ☐ Clear ☐ Cloudy

Recommended pump type: ☐ Shallow ☐ Deep | Recommended pump setting 43-45 feet | Recommended pump rate 46-49 GPM

50-53

LOCATION OF WELL

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



248254

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.
Air Rock Drilling Ltd	1119
Address: RR#1 Richmond, Ont	
Name of Well Technician	Well Technician's Licence No.
Shannon Purcell	7212
Signature of Technician/Contractor	Submission date: 11 day 04 mo 03 yr.

MINISTRY USE ONLY

Data source 58	Contractor 59-62	Date received 63-68	80
	1119	MAY 08 2003	
Date of inspection	Inspector		
Remarks			

CSS.ES3

2 - MINISTRY OF THE ENVIRONMENT COPY

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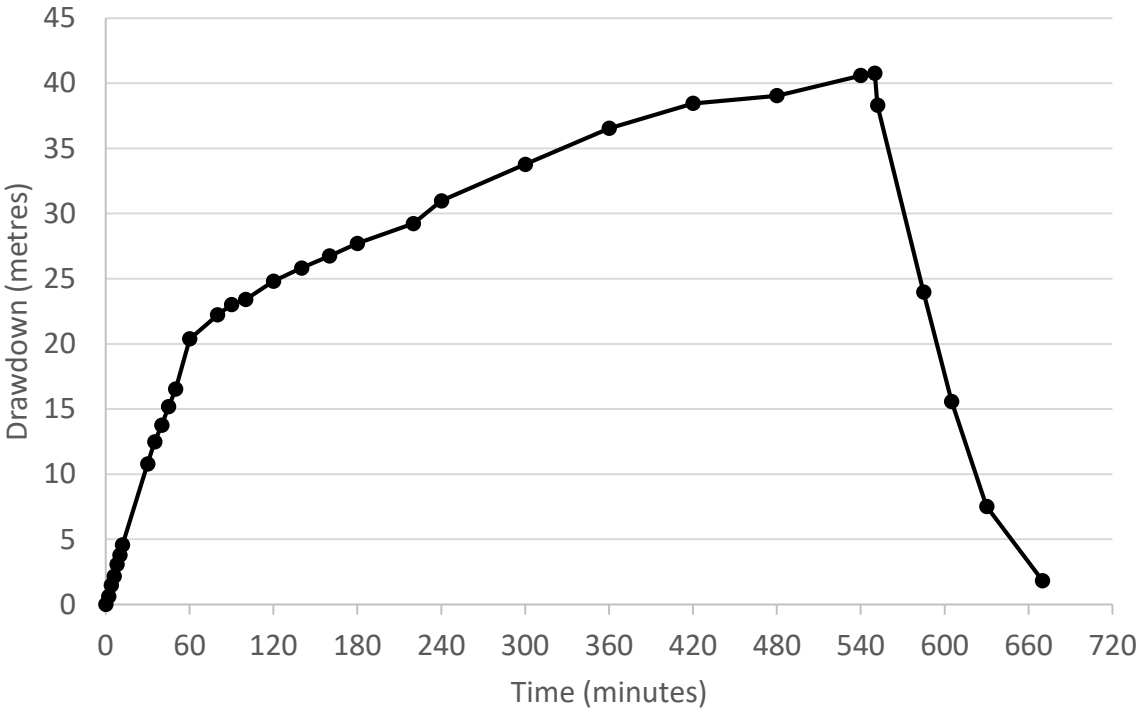
APPENDIX J

Drawdown and Transmissivity Estimates

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW1	P-Test Date: **March 22, 2003**
Analysis Performed by: AP	Method: Water Level Tape	Re-Analysis Date: July 7, 2017
Aquifer Thickness: 58 m	Discharge: Constant 9.0 L/min	Duration: 9 hours

Pumping Test Data (TW1): Drawdown and Recovery

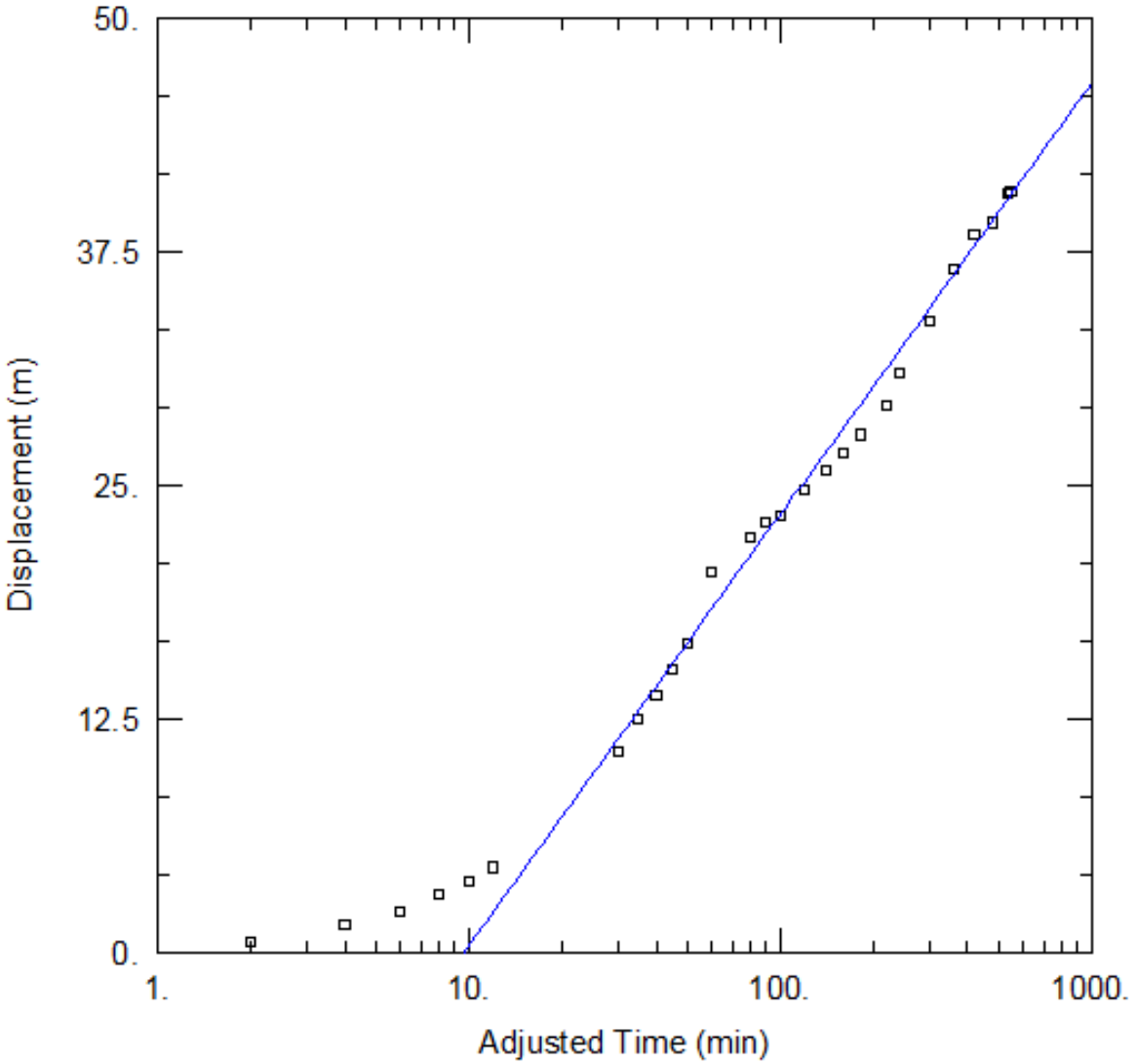


Water Levels (metres below ground surface)
Static : 2.57 m
End of pump test (9-hours): 40.89 m
Final water level following recovery: 4.39 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW1	P-Test Date: **March 22, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: July 7, 2017
Aquifer Thickness: 58 m	Discharge: Constant 9.0 L/min	Duration: 9 hours

Pumping Test Analysis (TW1)

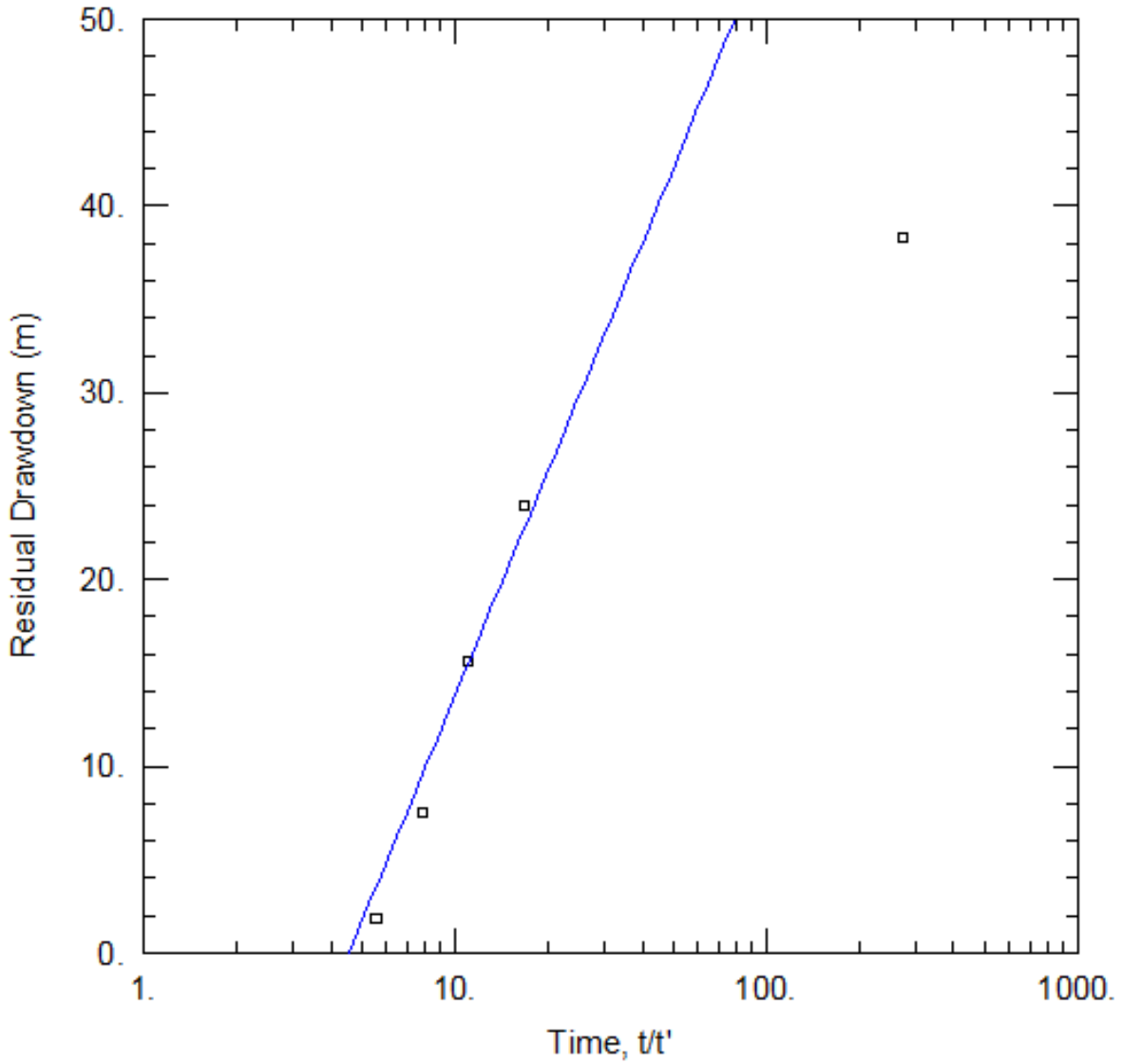


Estimated Transmissivity: 0.10 m^2/day or 1 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW1	P-Test Date: **March 22, 2003**
Analysis Performed by: AP	Method: Theis Analysis	Re-Analysis Date: July 7, 2017
Aquifer Thickness: 58 m	Discharge: Constant 9.0 L/min	Duration: 9 hours

Pumping Test Analysis - Recovery (TW1)

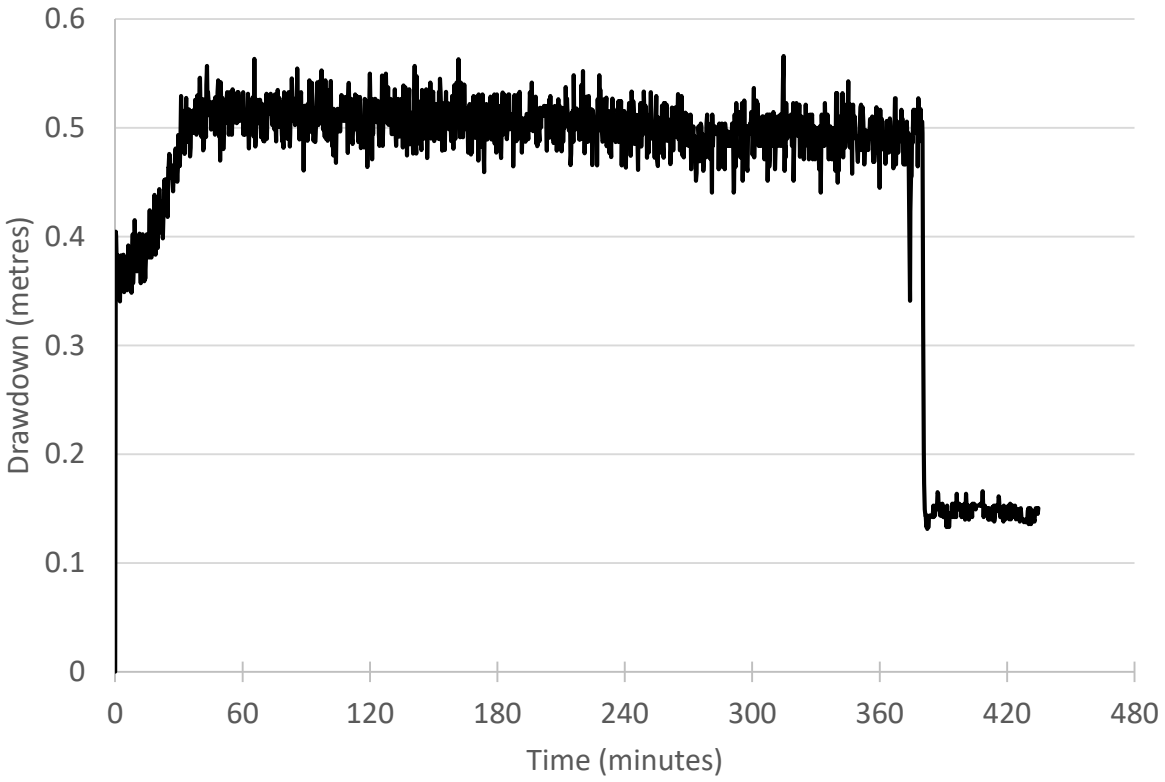


Estimated Transmissivity: 0.06 m^2/day or 7 x 10^{-7} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW1	P-Test Date: **July 5, 2017**
Analysis Performed by: AP	Method: Continuous Datalogger	Analysis Date: July 7, 2017
Aquifer Thickness: 58 m	Discharge: Constant 18.9 L/min	Duration: 6 hours

Pumping Test Data (TW1): Drawdown and Recovery

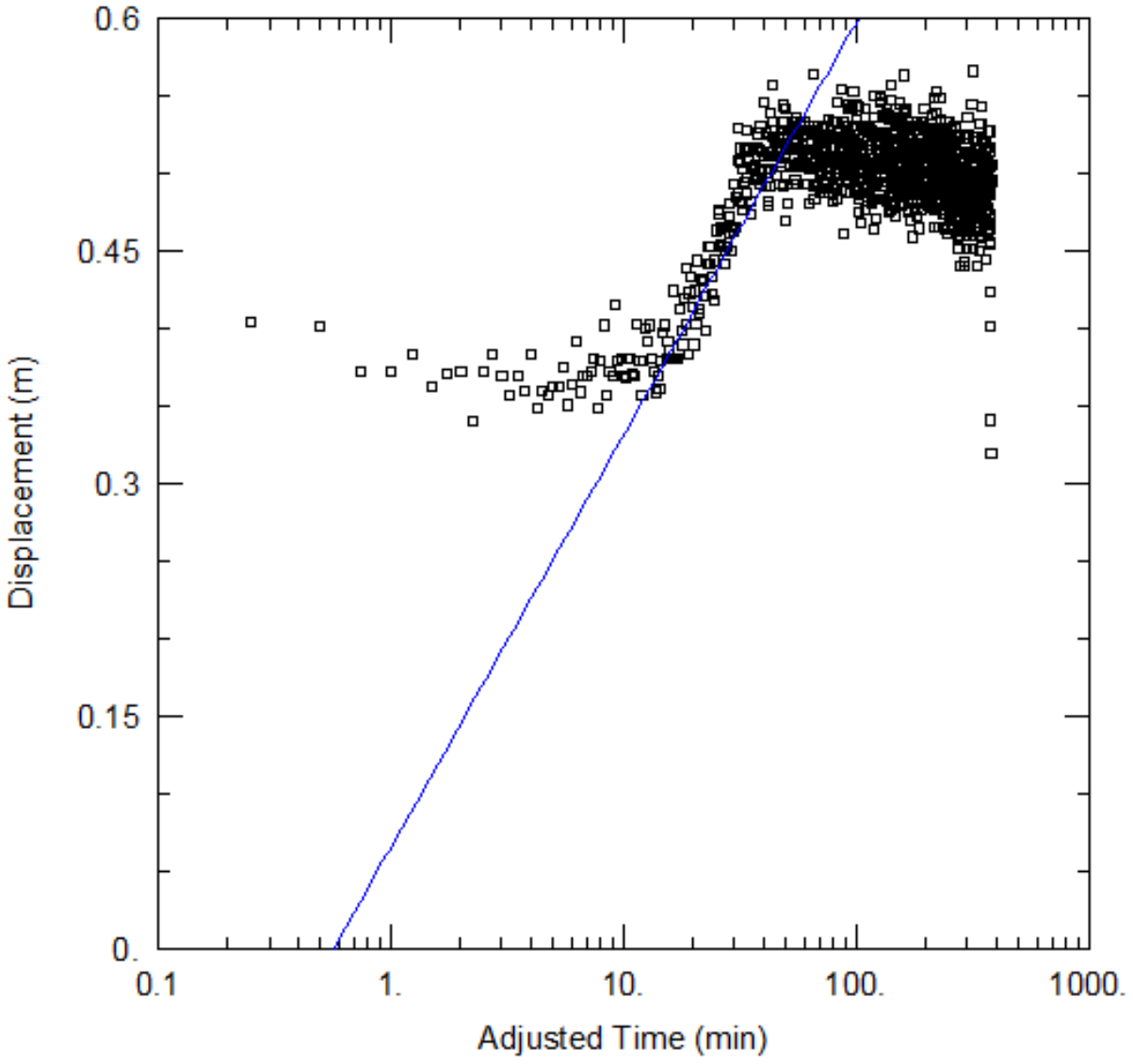


Water Levels (metres below ground surface)
Static : 1.85 m
End of pump test (6-hours): 2.25 m
Final water level following recovery: 1.89 m
Note: Sediment in well clogged pump upon start up, pumping test had to be re-started.

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW1	P-Test Date: **July 5, 2017**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Analysis Date: July 7, 2017
Aquifer Thickness: 58 m	Discharge: Constant 18.9 L/min	Duration: 6 hours

Pumping Test Analysis (TW1)

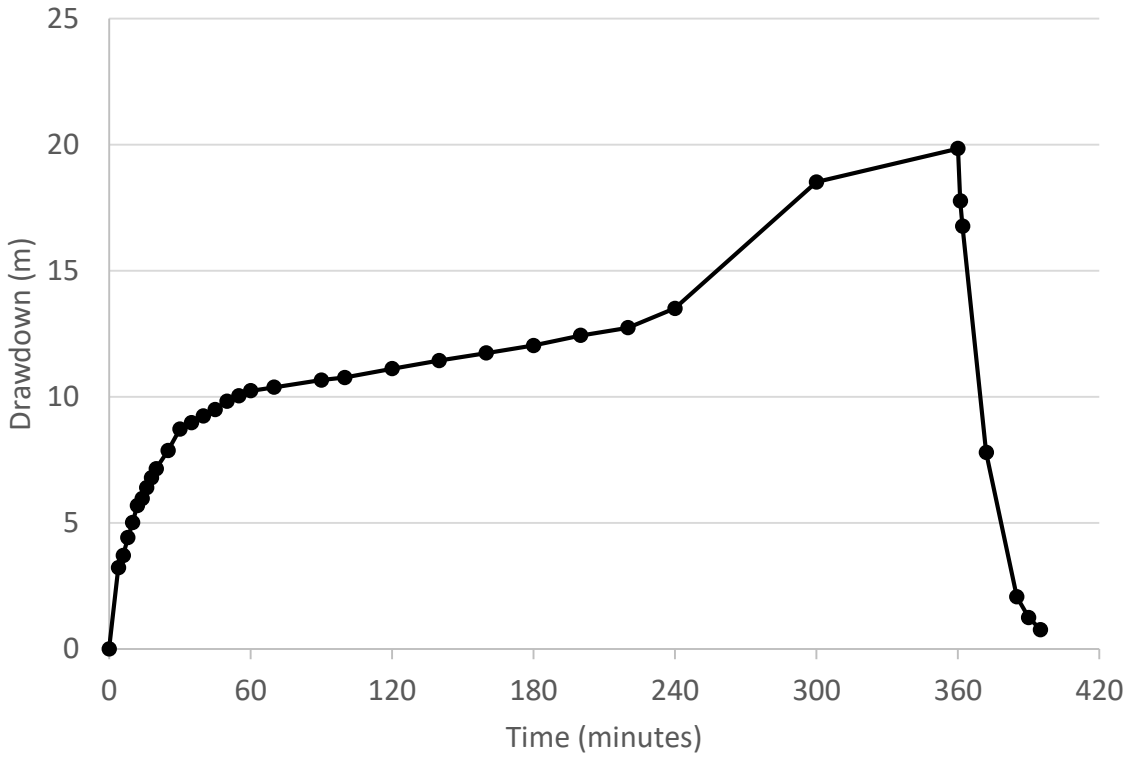


Estimated Transmissivity: 19 m^2/day or 2 x 10^{-4} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW2	P-Test Date: **March 24, 2003**
Analysis Performed by: AP	Method: Water Level Tape	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness: 34 m	Discharge: Constant 23 L/min	Duration: 6 hours

Pumping Test Data (TW2): Drawdown and Recovery

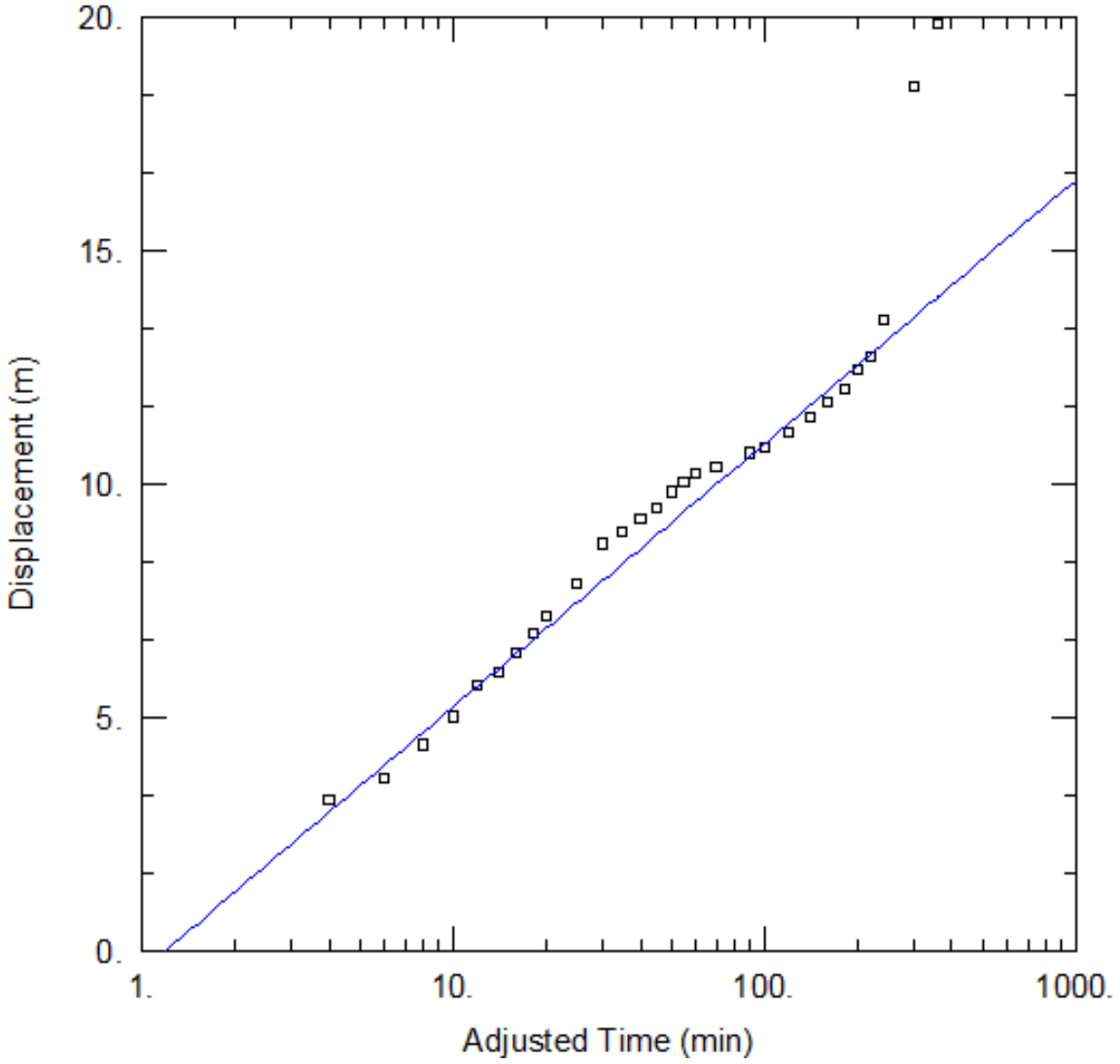


Water Levels (metres below ground surface)
Static : 0.61 m
End of pump test (6-hours): 20.46 m
Final water level following recovery (35 minutes): 1.38 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW2	P-Test Date: **March 24, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness: 34 m	Discharge: Constant 23 L/min	Duration: 6 hours

Pumping Test Analysis (TW2)

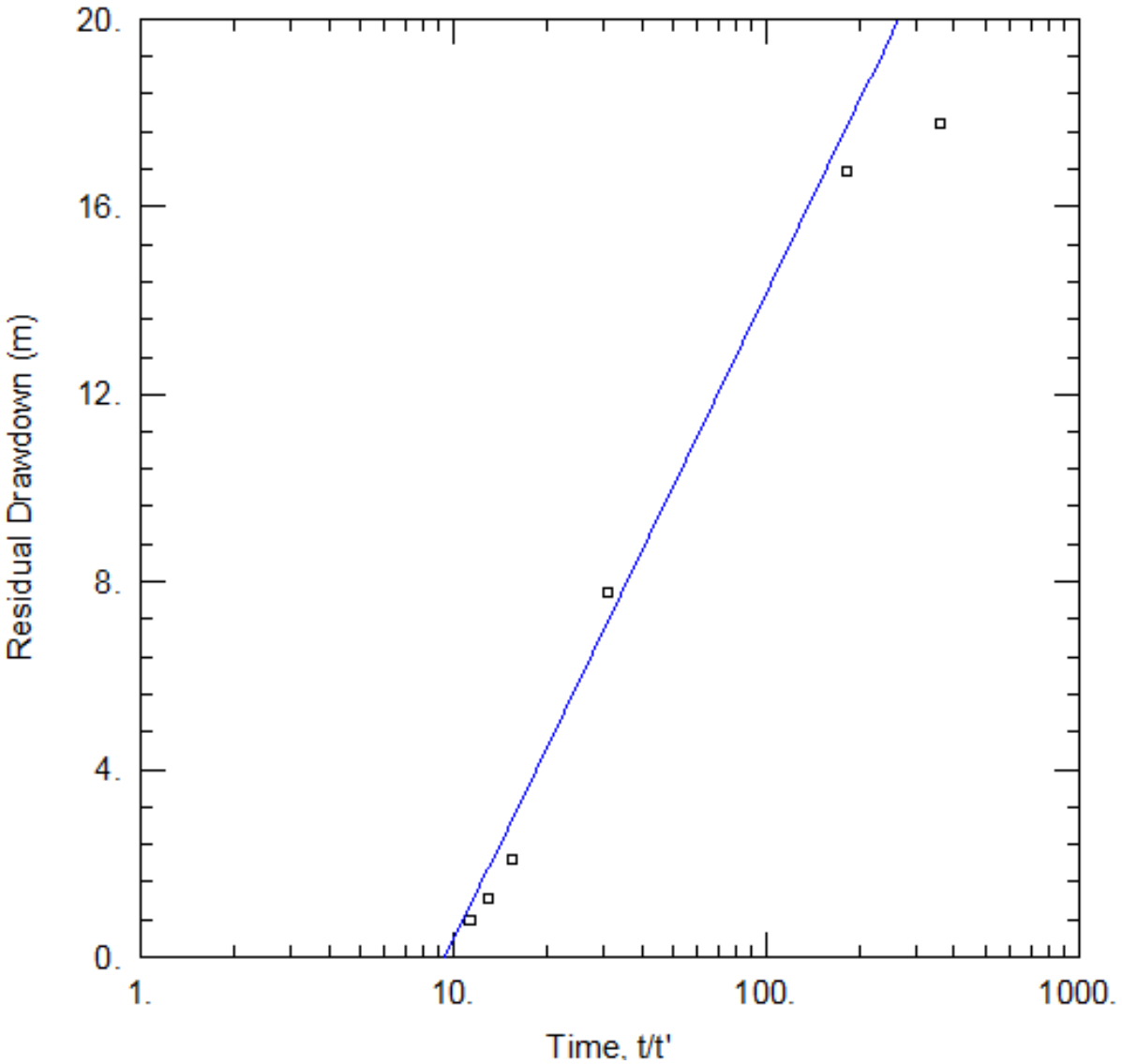


Estimated Transmissivity: 1.1 m^2/day or 1 x 10^{-5} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW2	P-Test Date: **March 24, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness: 34 m	Discharge: Constant 23 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW2)

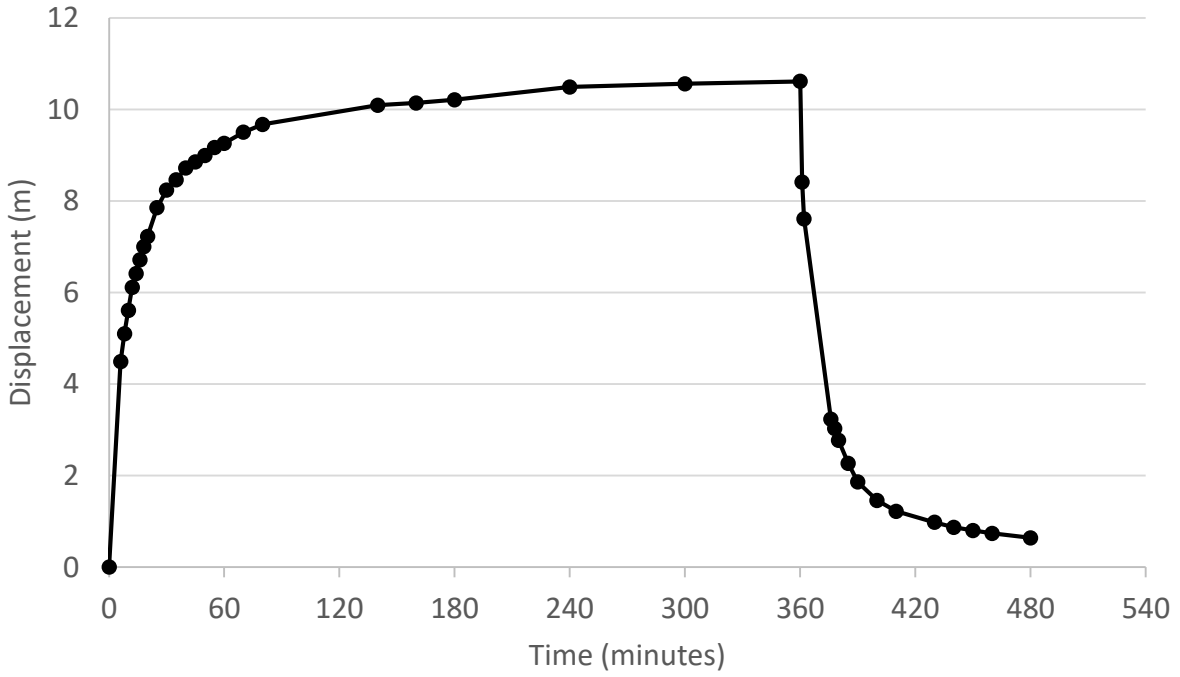


Estimated Transmissivity: 0.4 m^2/day or 5 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW3	P-Test Date: **March 17, 2003**
Analysis Performed by: AP	Method: Water Level Tape	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:53 m	Discharge: Constant 32 L/min	Duration: 6 hours

Pumping Test Data (TW3): Drawdown and Recovery

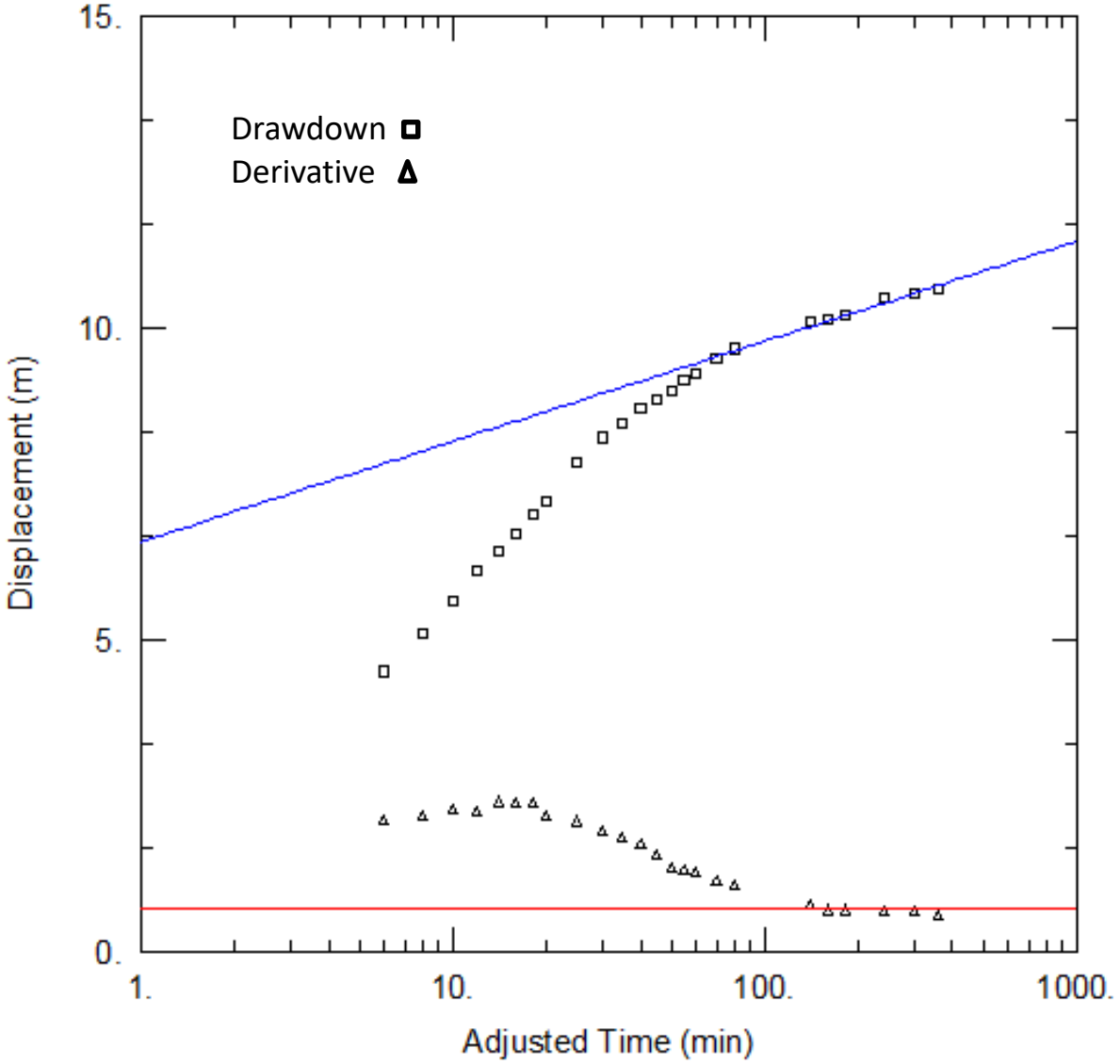


Water Levels (metres below ground surface)
Static : 0.46 m
End of pump test (6-hours): 11.07 m
Final water level following recovery: 1.10 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW3	P-Test Date: **March 17, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:53 m	Discharge: Constant 32 L/min	Duration: 6 hours

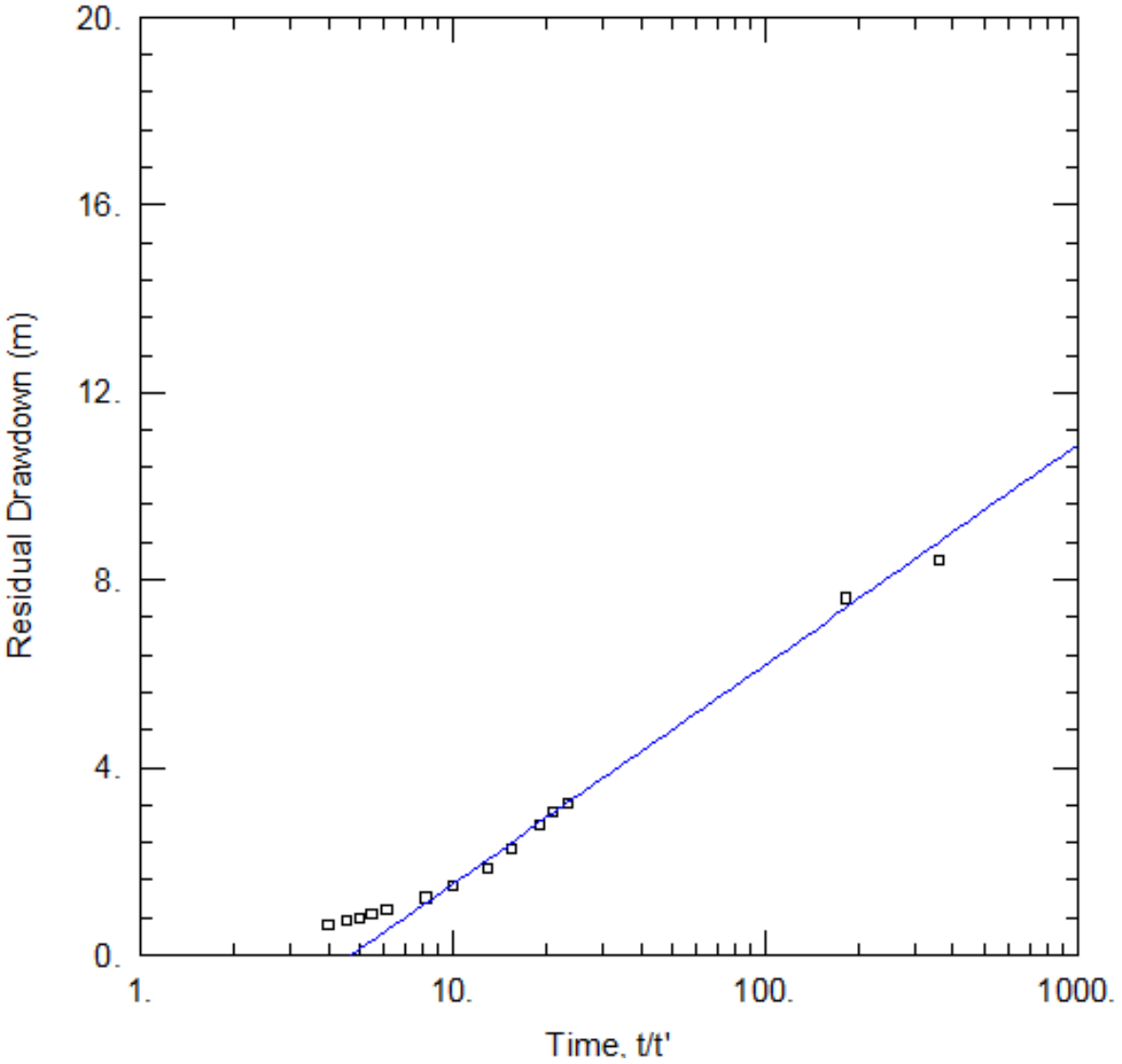
Pumping Test Analysis (TW3)



Estimated Transmissivity: 5.3 m^2/day or 6 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 61318.15	
	Client: 1384341 Ontario Ltd.	
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW3	P-Test Date: **March 17, 2003**
Analysis Performed by: AP	Method: Theis Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:53 m	Discharge: Constant 32 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW3)

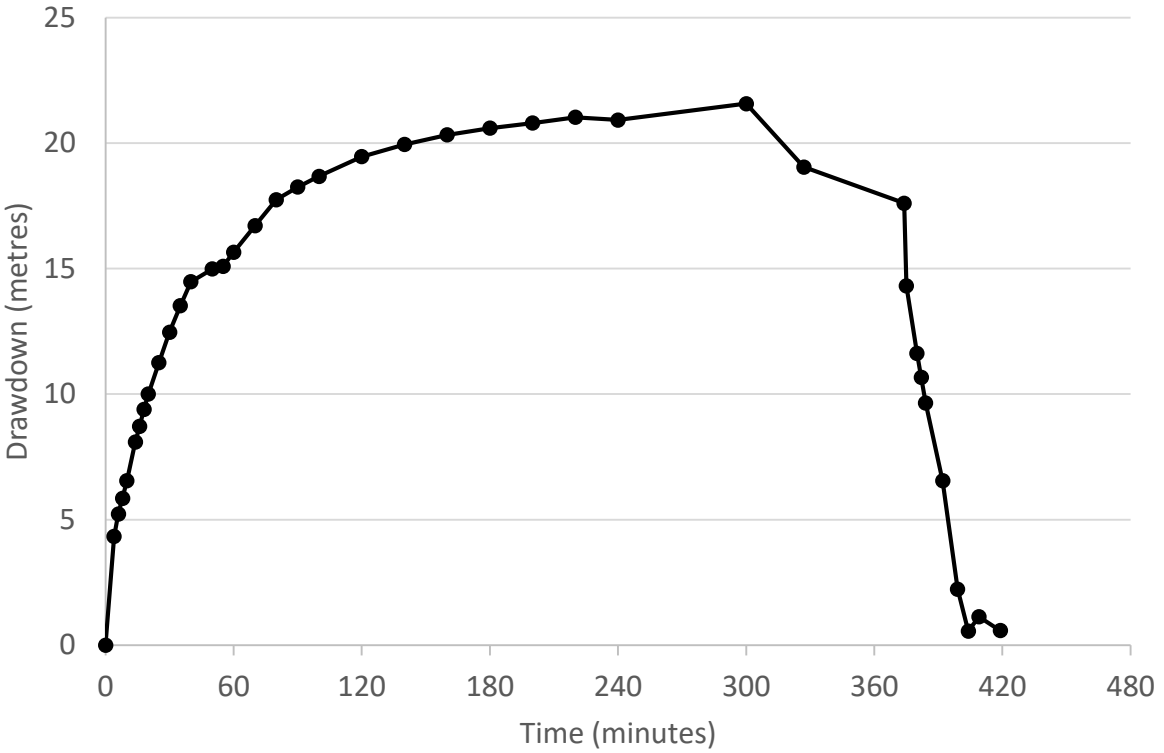


Estimated Transmissivity: 1.8 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW4	P-Test Date: **March 19, 2003**
Analysis Performed by: AP	Method: Water Level Tape	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:56 m	Discharge: Constant 14 L/min	Duration: 6 hours

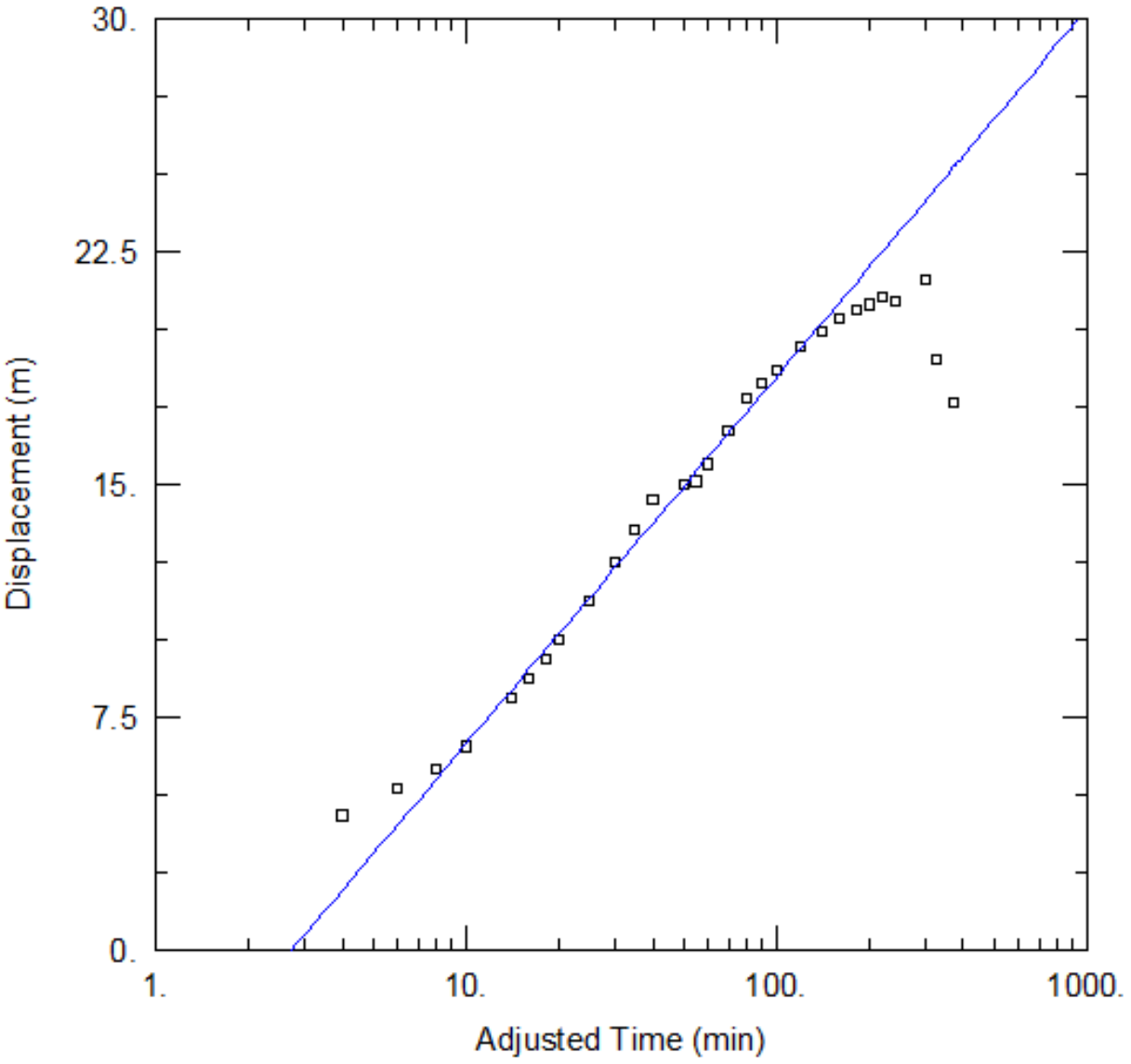
Pumping Test Data (TW4): Drawdown and Recovery



Water Levels (metres below ground surface)
Static : 2.26 m
End of pump test (6-hours): 19.87 m
Final water level following recovery: 2.84 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 61318.15	
	Client: 1384341 Ontario Ltd.	
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW4	P-Test Date: **March 19, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:56 m	Discharge: Constant 14 L/min	Duration: 6 hours

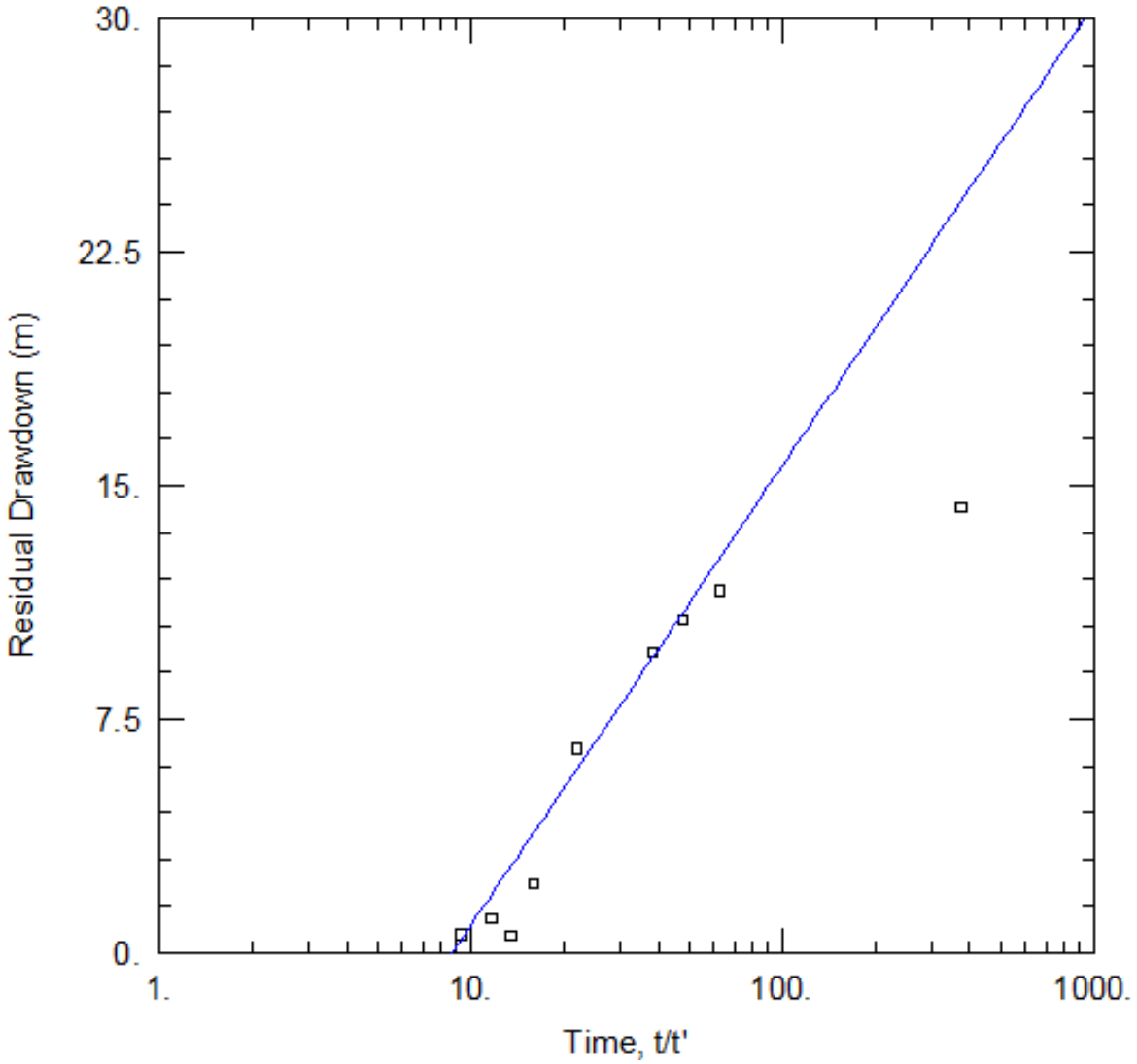
Pumping Test Analysis (TW4)



Estimated Transmissivity: 0.3 m^2/day or 3 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report	
	Project: Hydrogeological Investigation	
	Project Number: 61318.15	
	Client: 1384341 Ontario Ltd.	
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW4	P-Test Date: **March 19, 2003**
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Re-Analysis Date: Nov 7, 2017
Aquifer Thickness:56 m	Discharge: Constant 14 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW4)

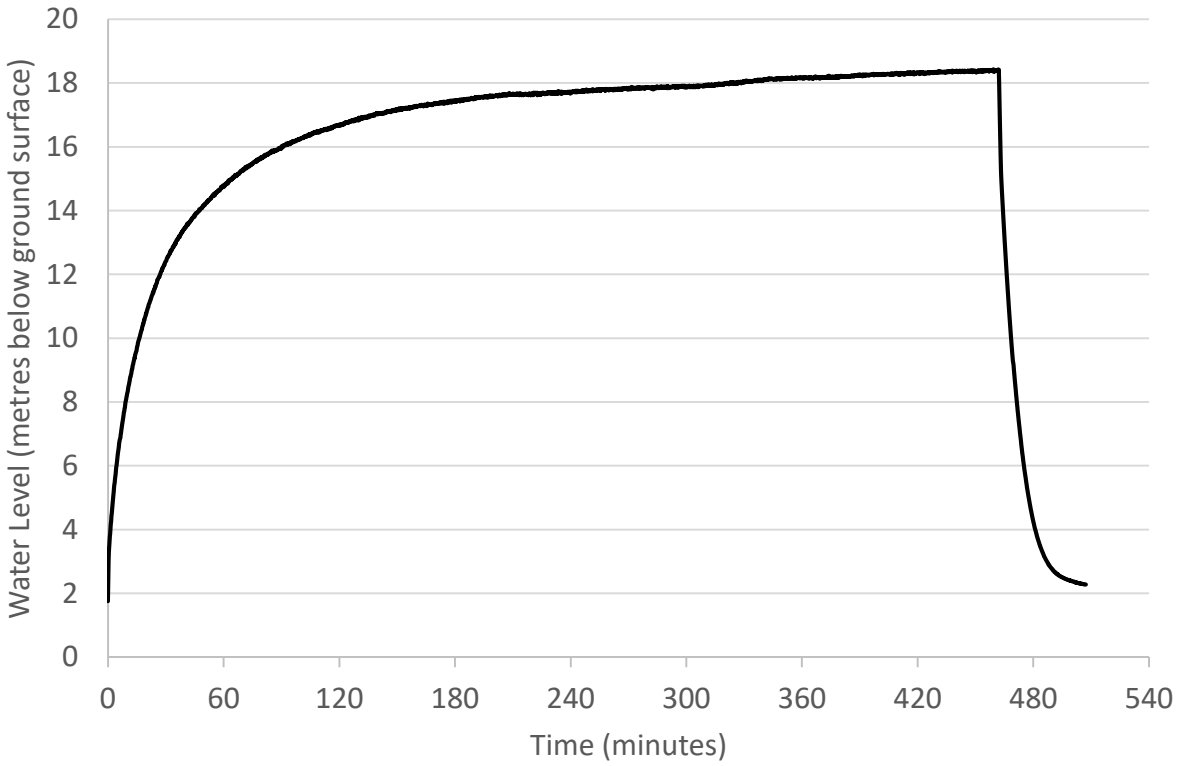


Estimated Transmissivity: 0.3 m^2/day or 3 x 10^{-6} m^2/s

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: GD	Pumping Well: TW 4	P-Test Date: May 16, 2016
Analysis Performed by: AP	Method: Continuous Datalogger	Analysis Date: June 13, 2016
Aquifer Thickness: 53 m	Discharge: Constant 26.5 L/min	Duration: 8 hours

Pumping Test Data (TW4): Drawdown and Recovery

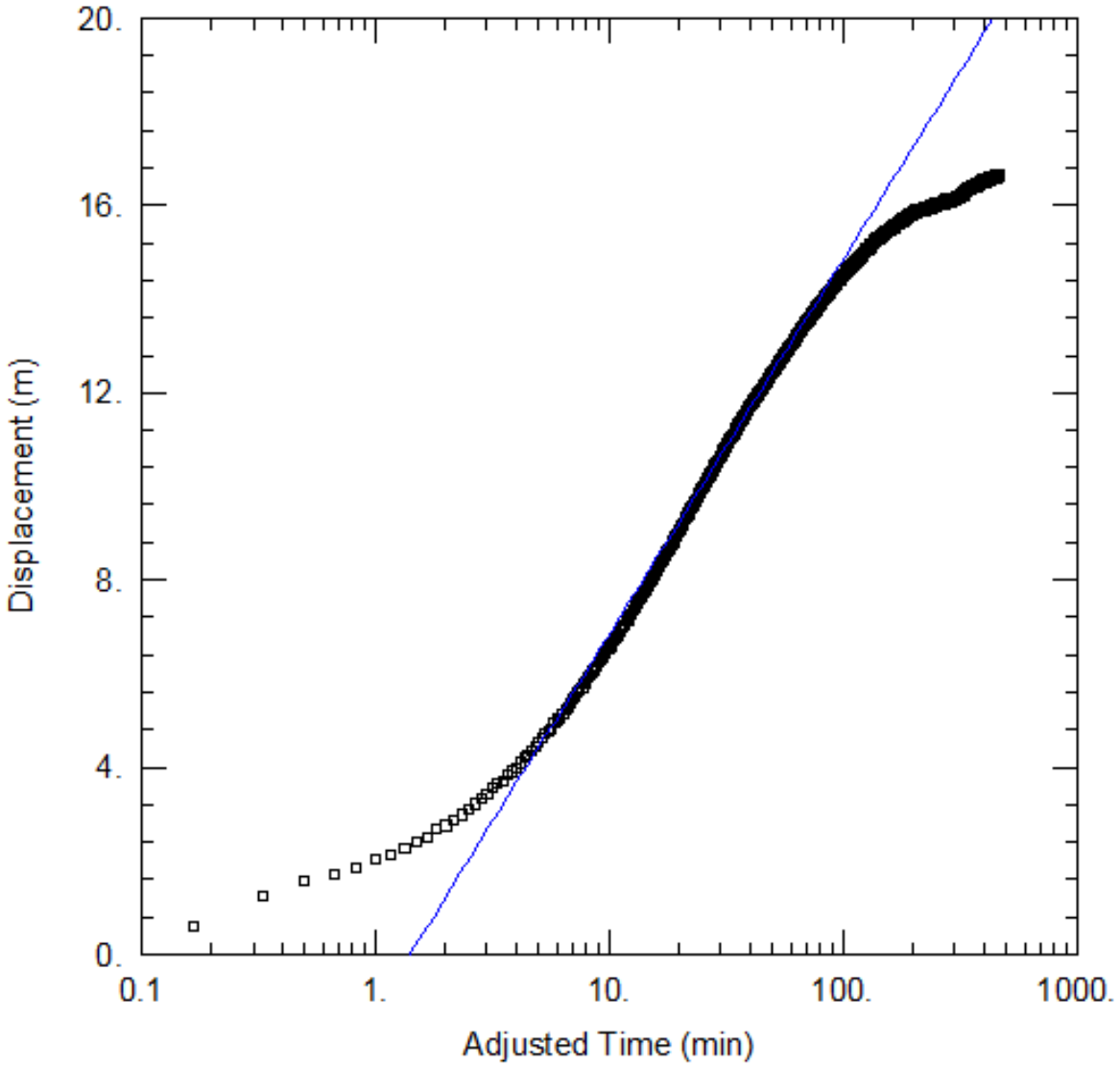


Water Levels (metres below ground surface)
Static : 1.75 m
End of pump test (8-hours): 18.4 m
Final water level following recovery: 2.27 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: GD	Pumping Well: TW 4	P-Test Date: May 16, 2016
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Analysis Date: June 13, 2016
Aquifer Thickness: 53 m	Discharge: Constant 26.5 L/min	Duration: 8 hours

Pumping Test Analysis (TW4)

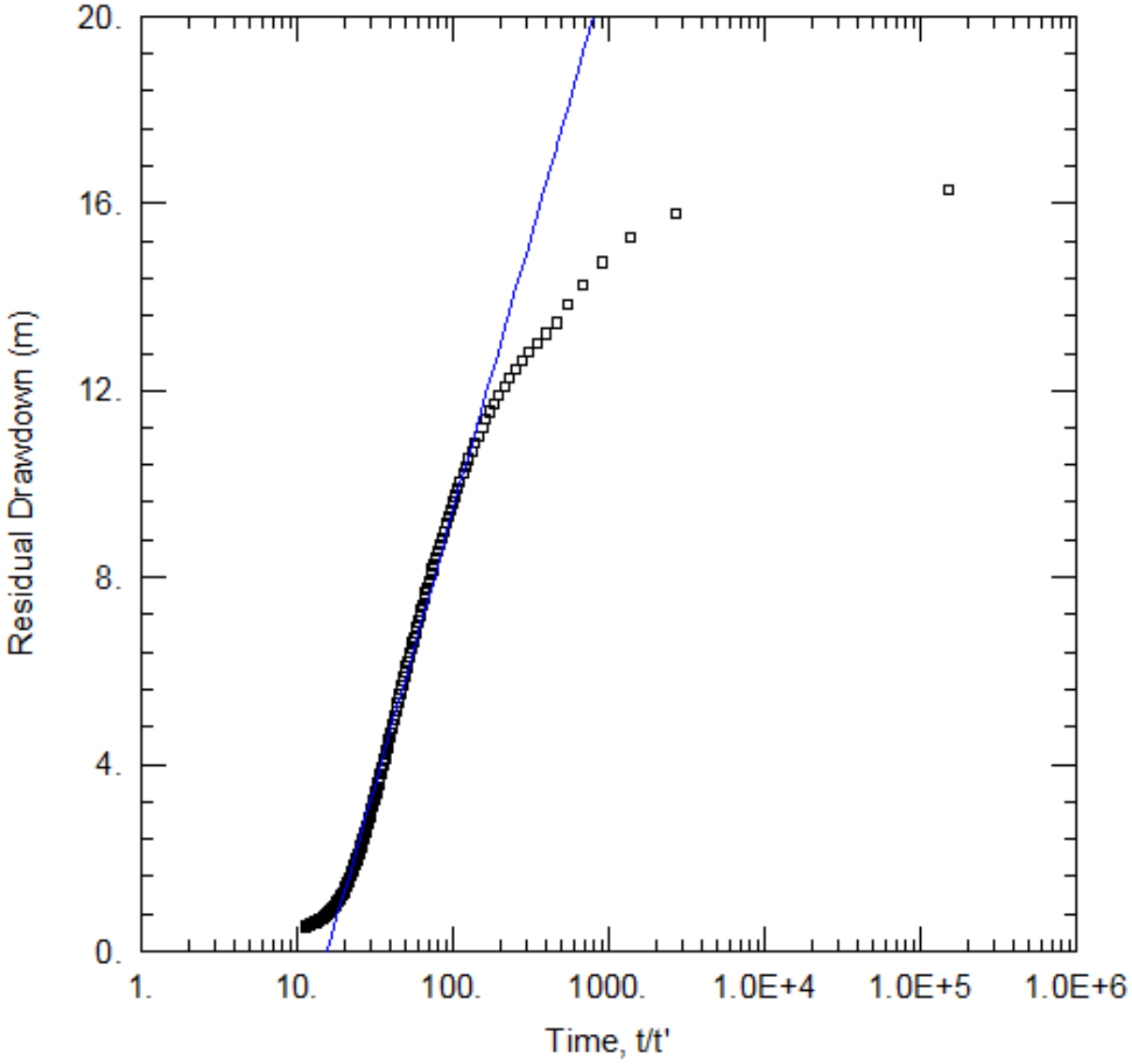


Estimated Transmissivity: 0.9 m^2/day or 1 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: GD	Pumping Well: TW 4	P-Test Date: May 16, 2016
Analysis Performed by: AP	Method: Theis Analysis	Analysis Date: June 13, 2016
Aquifer Thickness: 53 m	Discharge: Constant 26.5 L/min	Duration: 8 hours

Pumping Test Analysis – Recovery (TW4)

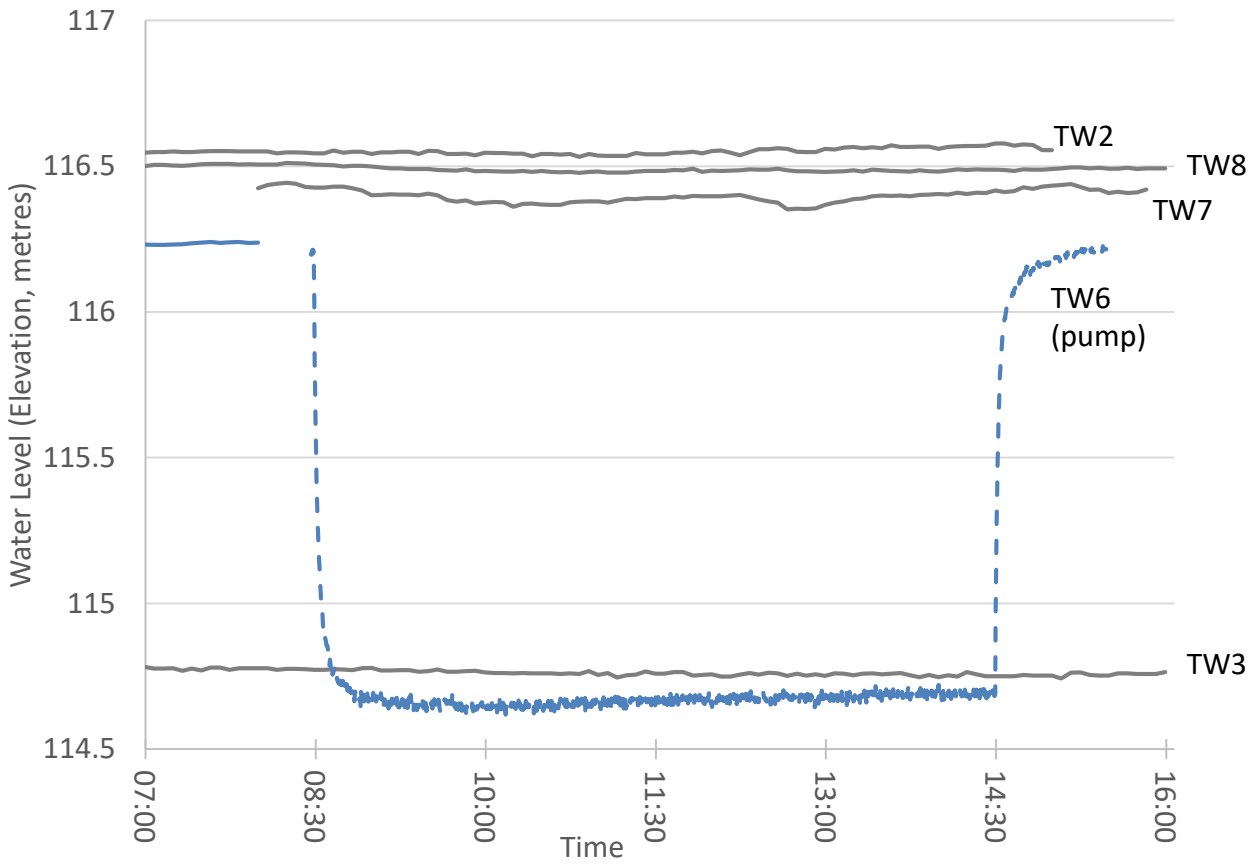


Estimated Transmissivity: 0.6 m^2/day or 7 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 6	P-Test Date: Oct 19, 2017
Analysis Performed by: AP	Method: Continuous Datalogger	Analysis Date: Nov 7, 2017
Aquifer Thickness: 37 m	Discharge: Constant 22 L/min	Duration: 6 hours

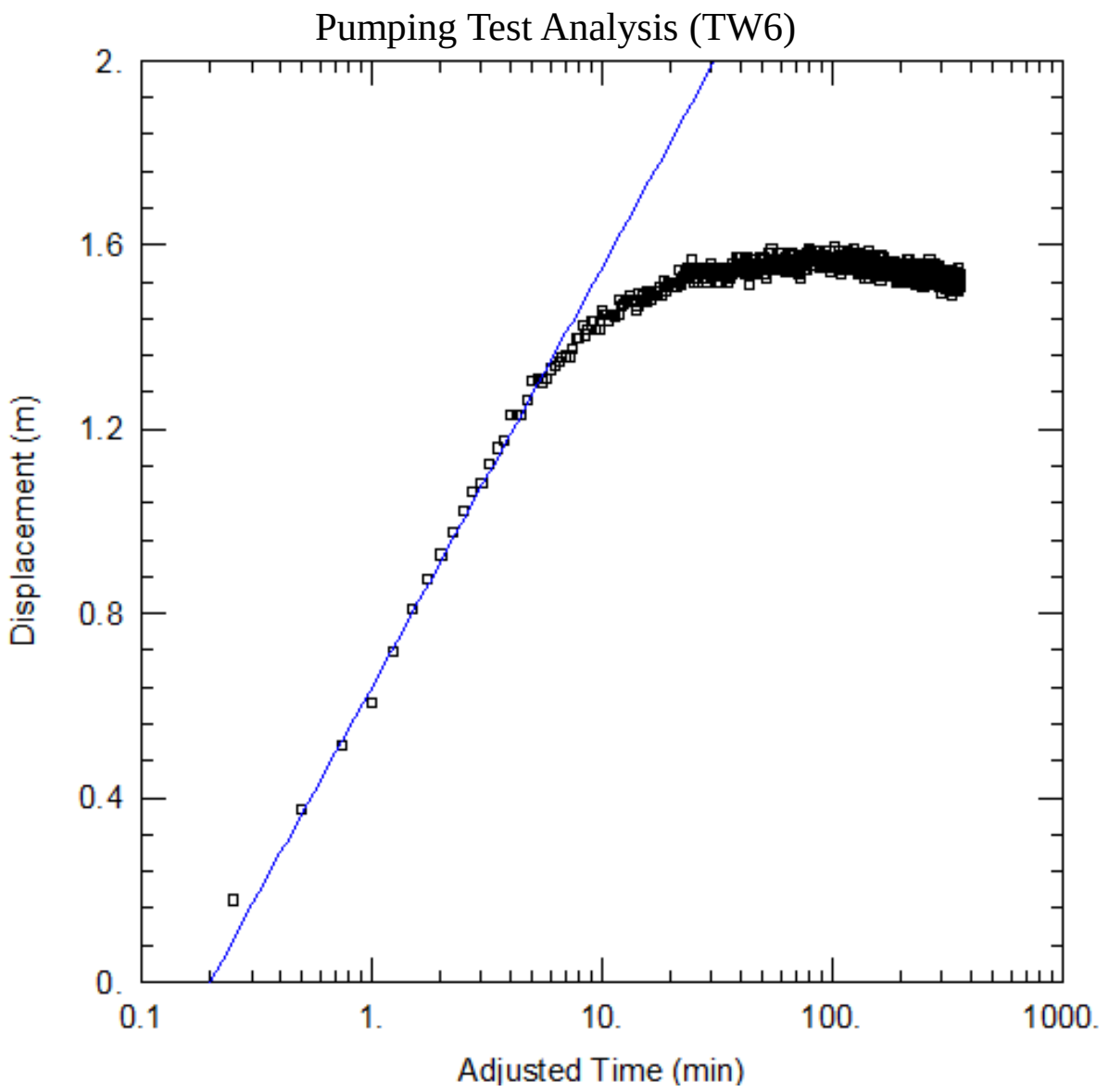
Pumping Test Data (TW6): Drawdown and Recovery



Water Levels (metres below ground surface)
Static : 0.27 m
End of pump test (6-hours): 1.82 m
Final water level following recovery: 0.31 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 6	P-Test Date: Oct 19, 2017
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 37 m	Discharge: Constant 22 L/min	Duration: 6 hours

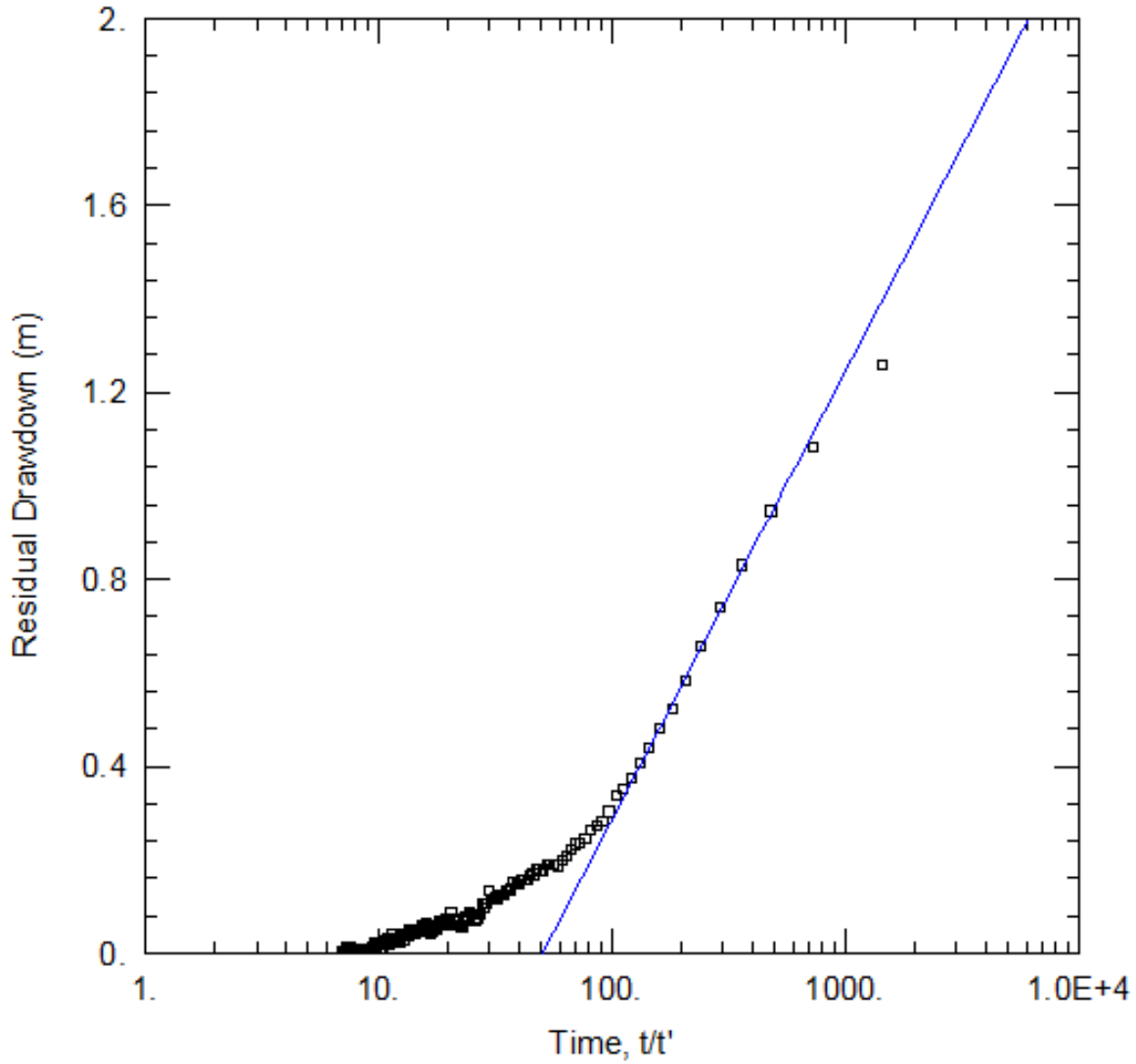


Estimated Transmissivity: 6 m^2/day or 7 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 6	P-Test Date: Oct 19, 2017
Analysis Performed by: AP	Method: Theis Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 37 m	Discharge: Constant 22 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW6)

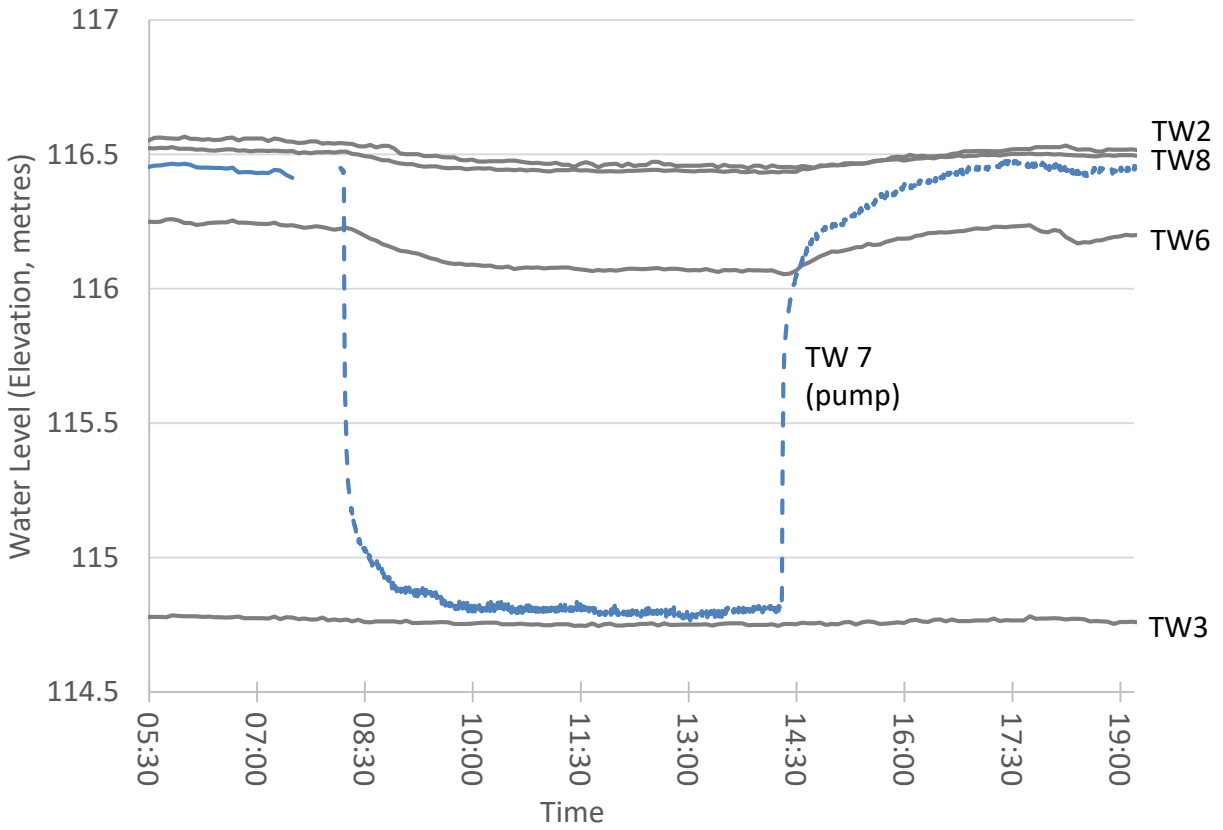


Estimated Transmissivity: 7 m^2/day or 8 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 7	P-Test Date: Oct 18, 2017
Analysis Performed by: AP	Method: Continuous Datalogger	Analysis Date: Nov 7, 2017
Aquifer Thickness: 52 m	Discharge: Constant 38 L/min	Duration: 6 hours

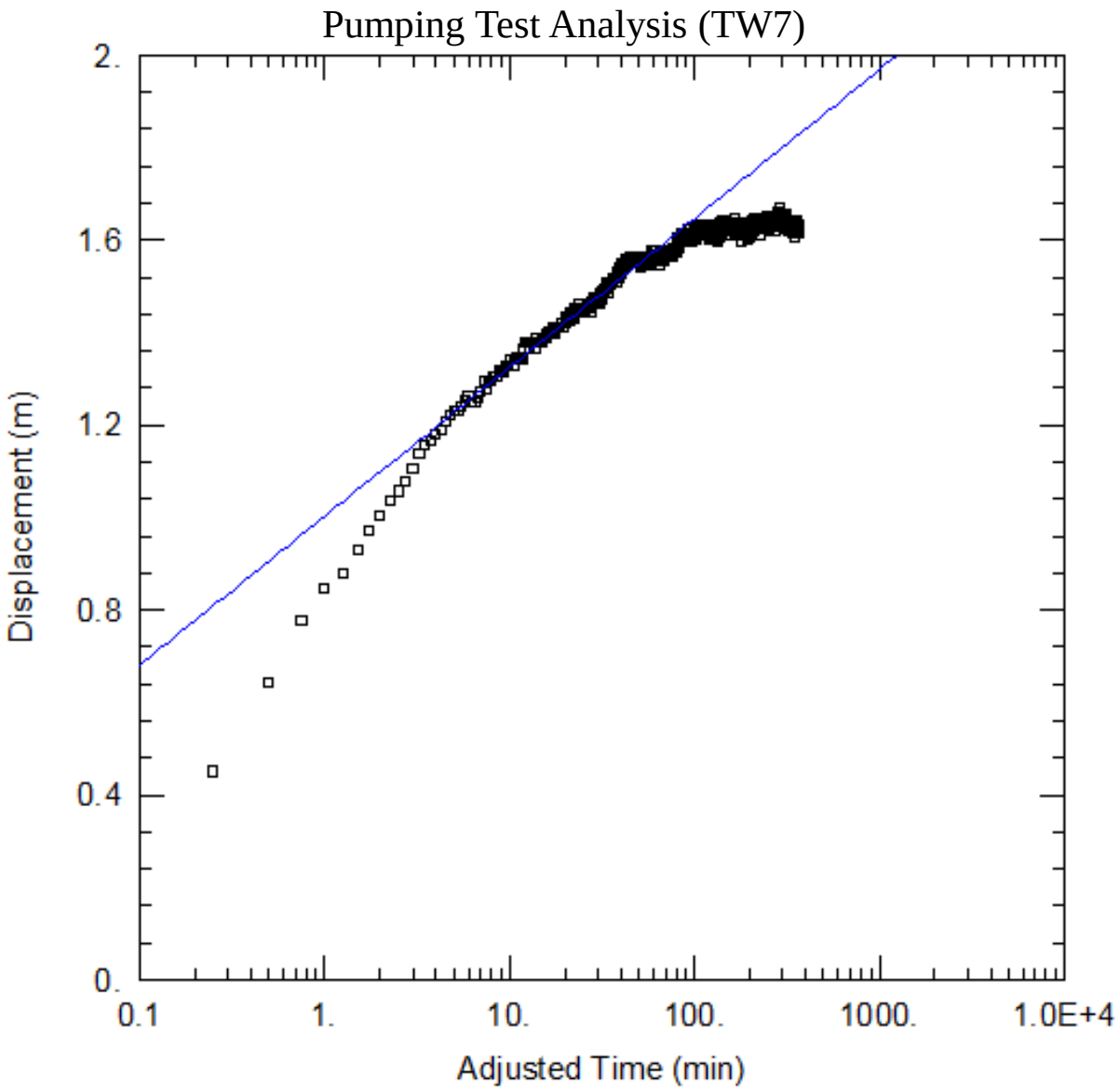
Pumping Test Data (TW7): Drawdown and Recovery



Water Levels (metres below ground surface)
Static : 1.42 m
End of pump test (6-hours): 3.07 m
Final water level following recovery: 1.53 m

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 61318.15		
Client: 1384341 Ontario Ltd.		
Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 7	P-Test Date: Oct 18, 2017
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 52 m	Discharge: Constant 38 L/min	Duration: 6 hours

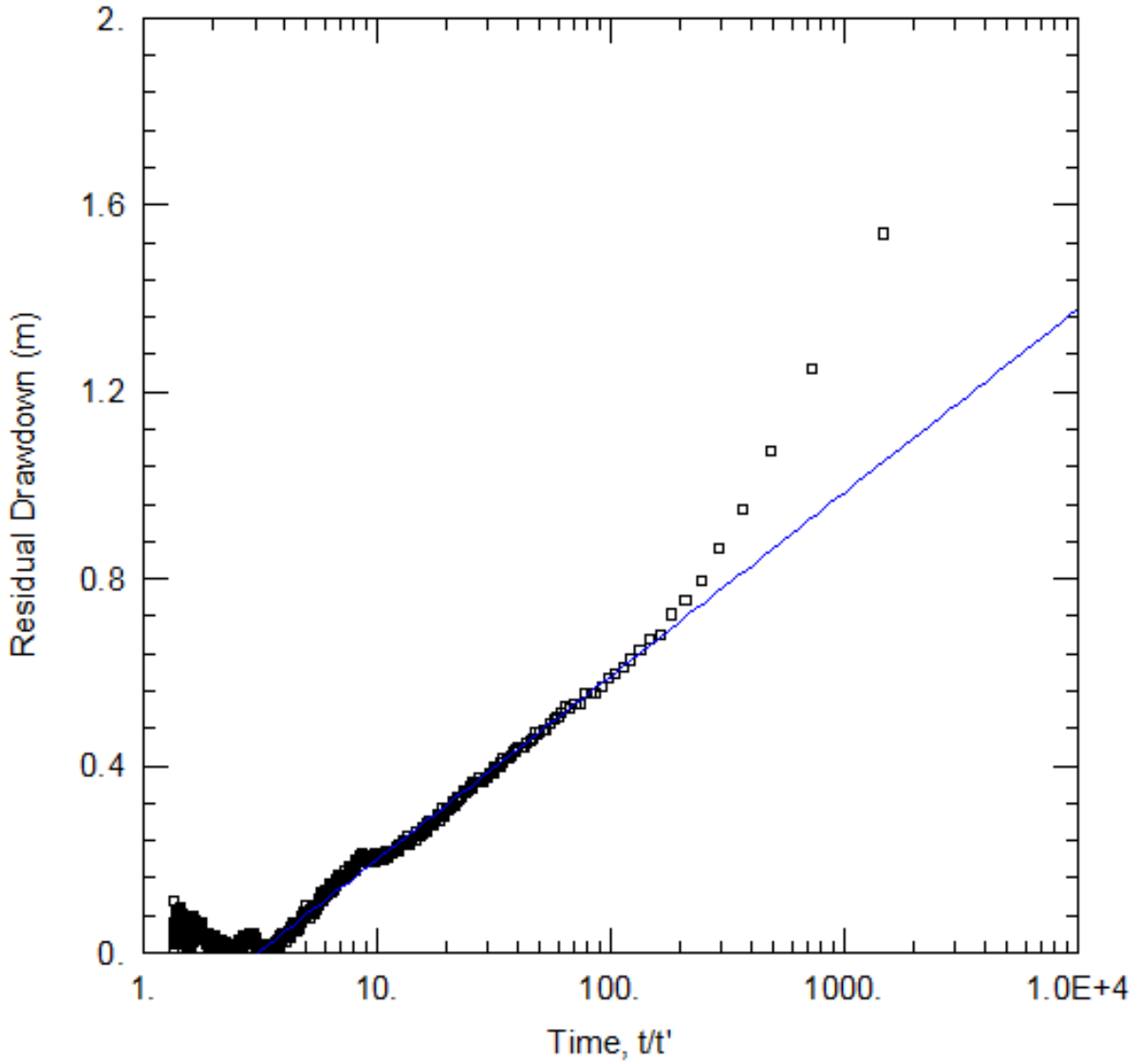


Estimated Transmissivity: 31 m^2/day or 4 x 10^{-4} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 7	P-Test Date: Oct 18, 2017
Analysis Performed by: AP	Method: Theis Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 52 m	Discharge: Constant 38 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW7)

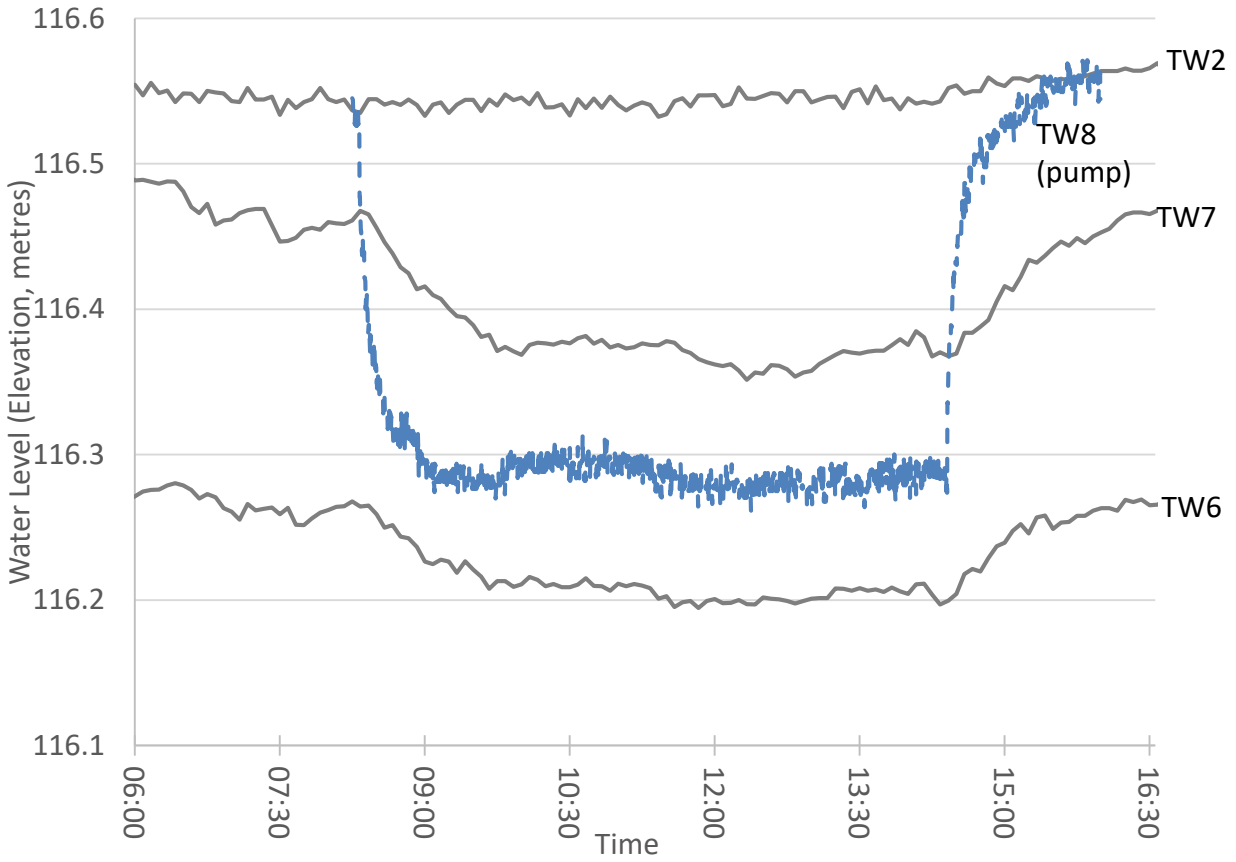


Estimated Transmissivity: 25 m^2/day or 3 x 10^{-4} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 8	P-Test Date: Oct 17, 2017
Analysis Performed by: AP	Method: Continuous Datalogger	Analysis Date: Nov 7, 2017
Aquifer Thickness: 39 m	Discharge: Constant 57 L/min	Duration: 6 hours

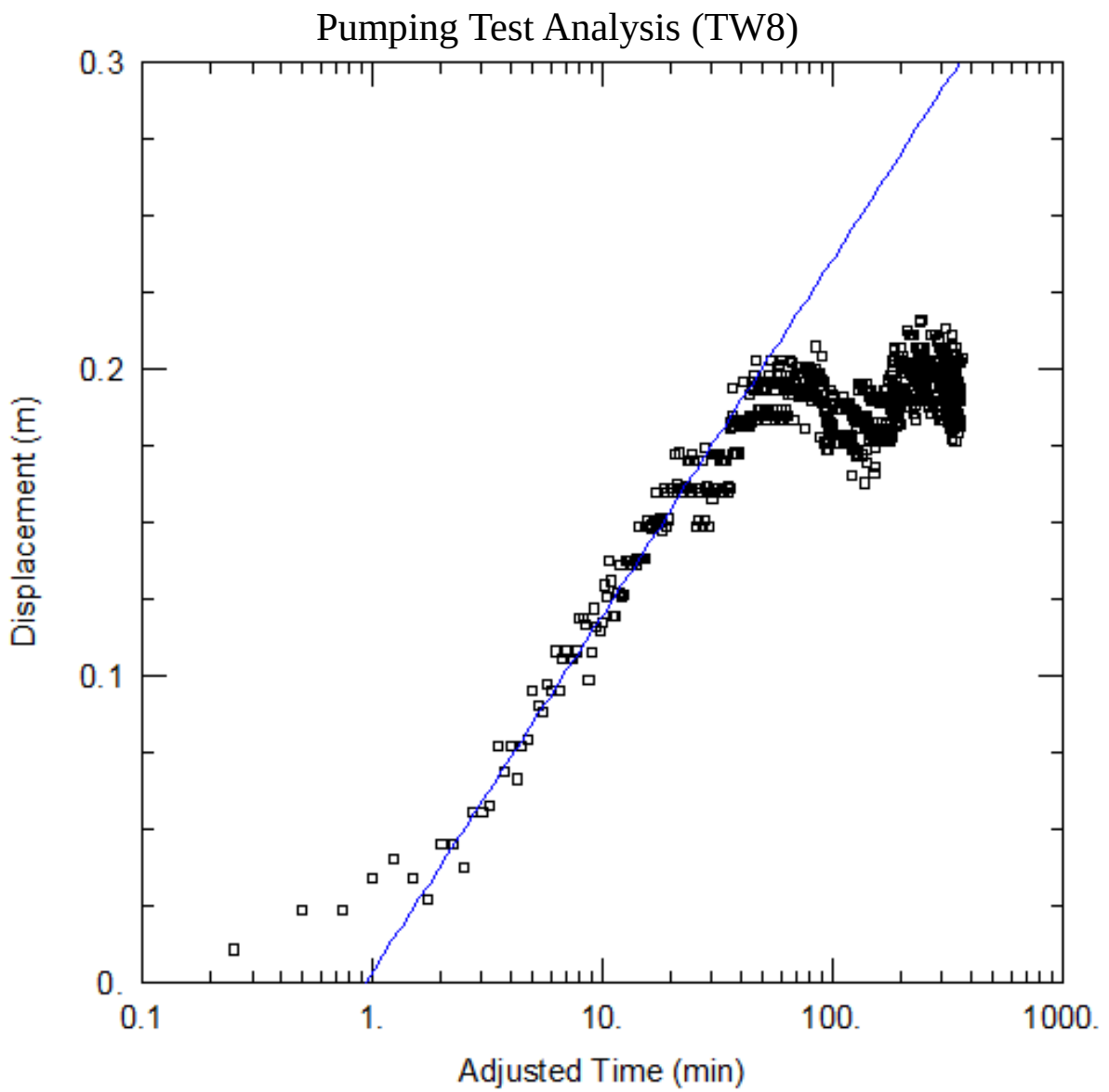
Pumping Test Data (TW8): Drawdown and Recovery



Water Levels (metres below ground surface)
Static : 0.49 m
End of pump test (6-hours): 0.78 m
Final water level following recovery: 0.51 m

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 8	P-Test Date: Oct 17, 2017
Analysis Performed by: AP	Method: Cooper-Jacob Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 39 m	Discharge: Constant 57 L/min	Duration: 6 hours

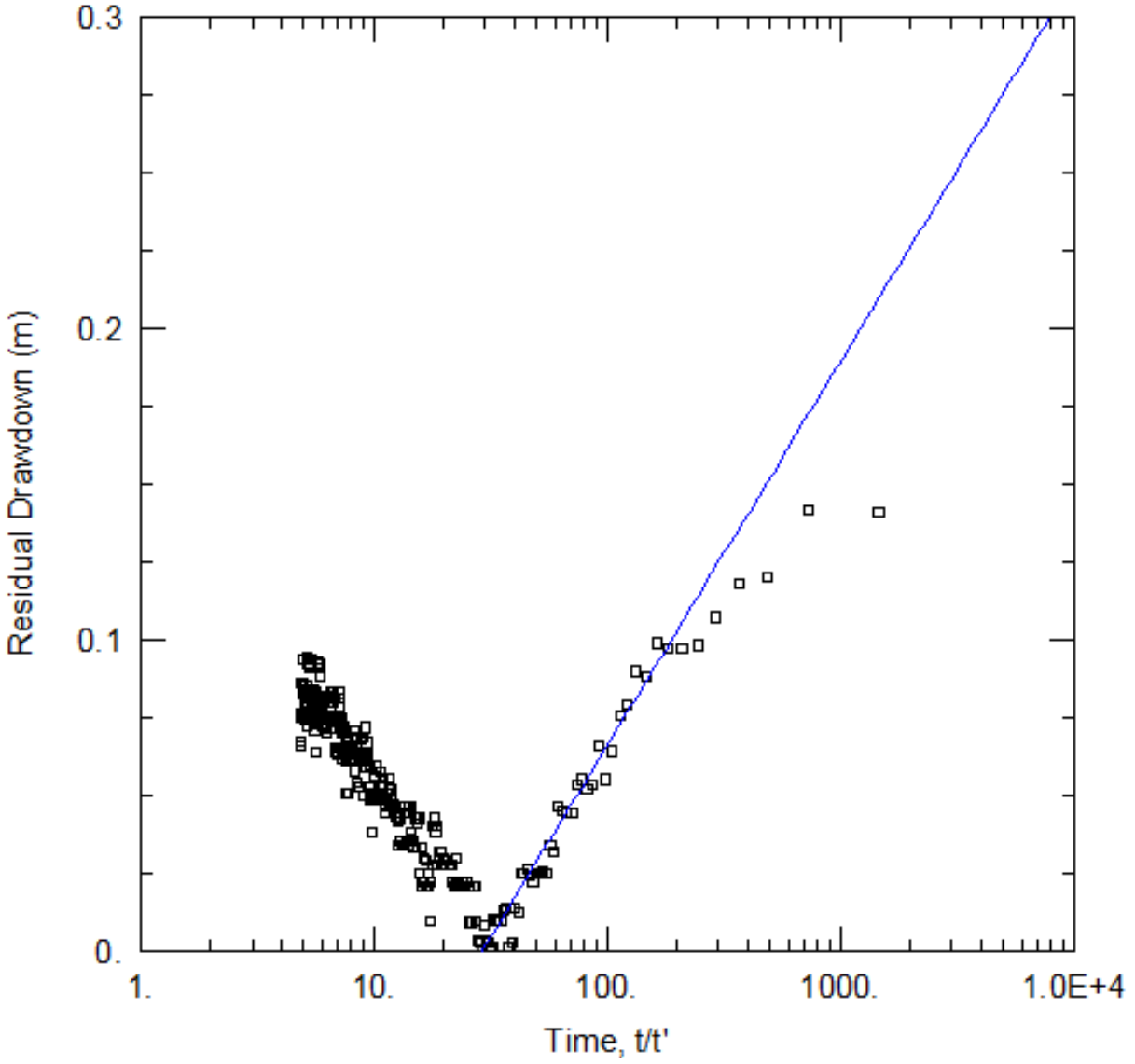


Estimated Transmissivity: 170 m^2/day or 2 x 10^{-3} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 61318.15
	Client: 1384341 Ontario Ltd.

Location: 2727 Carp Road, Ottawa, Ontario		
Test Conducted by: AP	Pumping Well: TW 8	P-Test Date: Oct 17, 2017
Analysis Performed by: AP	Method: Theis Analysis	Analysis Date: Nov 7, 2017
Aquifer Thickness: 39 m	Discharge: Constant 57 L/min	Duration: 6 hours

Pumping Test Analysis - Recovery (TW8)



Estimated Transmissivity: 170 m^2/day or 2 x 10^{-3} m^2/s

APPENDIX K

Pumping Test Water Quality Summary (Field and Lab)

Table 1 (1/2)
Summary Field Parameters – Pumping Tests

Test Well	Date	Hours Since Pumping Started (h)	Temp (°C)	Conductivity (us/cm)	Total Dissolved Solids (ppm)	pH (pH Units)	Turbidity (NTU)	Free Chlorine (ppm)	Sulphide (mg/L)
TW 1	22-Mar-03	2	8.8	377	188	7.8	3.5	0	0
		4	9.1	266	133	6.2	3.9	3	0
		5	9.2	432	216	5.7	-	2.3	0
		6	9.3	460	230	-	0.6	2	0
		7	9.2	465	232	-	0.7	2.2	0
		8	-	407	203	3.6	-	0.6	0
TW 1	05-Jul-17	1	17.3	3363	1681	7.34	127.0	-	-
		2	18.9	1781	890	7.61	35.0	0	-
		3	17.4	1687	843	8.15	24.0	0	-
		4	16.9	1200	600	8.18	9.7	0	-
		5	14.1	1019	509	7.73	3.9	0	-
		6	14.8	1020	510	7.79	4.0	0	-
TW 2	24-Mar-03	1	-	-	-	-	7.1	0	0.2
		2	-	-	-	-	0.3	0	0.2
		3	-	-	-	-	0.4	0	0.2
		4	-	-	-	-	0.9	0	0.2
		5	-	-	-	-	0.7	0	0.2
		6	-	-	-	-	0.4	0	0.3
TW 3	17-Mar-03	1	10.1	416	208	-	194.0	0	5
		3	9.8	406	203	-	121.0	0	5
		5	10	404	202	-	51.0	0	5
		6	9.8	411	205	-	42.0	0	-
TW 3	25-Aug-03	7	-	-	-	-	<1.0	-	-
TW 4	19-Mar-03	1	10.3	482	241	7.9	5.9	0	0
		2	10.6	449	224	7.1	0.8	0	0
		3	10.5	328	164	7.2	0.5	0	0
		4	10.5	230	115	7.7	1.5	0	0
		5	10.7	441	220	7.4	0.8	0	0
		6	9.2	441	220	7	0.4	0	0

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Table 1 (2/2)
Summary Field Parameters – Pumping Tests

Test Well	Date	Hours Since Pumping Started (h)	Temp (°C)	Conductivity (us/cm)	Total Dissolved Solids (ppm)	pH (pH Units)	Turbidity (NTU)	Free Chlorine (ppm)	Sulphide (mg/L)
TW 4	10-May-16	1	10.7	909	454	8.35	22.4	0	-
		2	11.4	903	451	8.13	17.6	0	-
		3	11.4	910	455	8.23	3.0	0	-
		4	12.3	877	438	8.13	1.1	0	-
		5	12.8	864	432	8.07	1.0	0	-
		6	12.9	900	450	8.06	0.9	0	-
		7	13.3	871	435	8.1	0.7	0	-
		8	12.7	845	422	8.15	0.6	0	-
TW 5	12-Jul-17	1	-	-	-	-	-	-	-
TW 6	19-Oct-17	1	10.3	731	365	7.71	36.4	0	-
		2	10.6	722	361	7.47	27.5	0	-
		3	10.7	720	360	7.48	15.0	0	-
		4	10.9	725	362	7.47	5.0	0	-
		5	11.3	720	360	7.41	3.4	0	-
		6	11.2	715	357	7.59	2.7	0	-
TW 7	18-Oct-17	1	8.8	716	358	8.23	16.6	0	-
		2	9.2	720	360	8.04	9.7	0	-
		3	9.6	724	362	8.08	4.7	0	-
		4	9.9	727	363	8.01	4.0	0	-
		5	10	730	365	7.83	2.5	0	-
		6	10.2	734	367	7.9	1.0	0	-
TW 8	17-Oct-17	1	8.6	800	400	7.75	1.0	0	-
		2	9.1	800	400	6.68	0.7	0	-
		3	9.4	799	399	6.68	0.8	0	-
		4	9.3	800	400	6.67	2.2	0	-
		5	9.3	800	400	7.66	0.7	0	-
		6	9.4	799	399	7.68	0.4	0	-

Table 3

Summary of Laboratory Parameters Analyzed (TW 1; Mar 21, 2003)

	Parameter	Units	9Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	NDOGN / 0*	0	MAC
	Fecal Coliform	CFU/100mL	0 / 0*	0	MAC
	Total coliforms	CFU/100mL	0 / 0*	0	MAC
	Heterotrophic Plate Count	CFU/1mL	- / 5*	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	251	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.25	-	-
	Dissolved Organic Carbon (DOC)	mg/L	1.7	5	AO
	Colour	TCU	3	5	AO
	Electrical Conductivity	uS/cm	700	-	-
	Total Hardness (as $CaCO_3$)	mg/L	248	80-100	OG
	pH	pH units	7.99	6.5-8.5	OG
	Phenols	mg/L	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	455	500	AO
	Sulphide (S_2)	mg/L	0.01	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.35	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.10	0.15	OG
	Turbidity	NTU	6.3	5	AO
Anions	Chloride (Cl)	mg/L	66	250	AO
	Fluoride (F)	mg/L	0.23	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.10	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.10	0.1	MAC
	Sulphate (SO_4)	mg/L	19	500	AO
Metals	Calcium (Ca)	mg/L	53	-	-
	Iron (Fe)	mg/L	0.18	0.3	AO
	Magnesium (Mg)	mg/L	28	-	-
	Manganese (Mn)	mg/L	0.016	0.05	AO
	Potassium (K)	mg/L	8	-	-
	Sodium (Na)	mg/L	47	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget
* Sample retaken August 22, 2003 (well chlorinated August 21, 2003)

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Table 4

Summary of Laboratory Parameters Analyzed (TW 1; Jul 5, 2017)

	Parameter	Units	6Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND / ND*	0	MAC
	Fecal Coliform	CFU/100mL	ND / ND*	0	MAC
	Total coliforms	CFU/100mL	7 / ND*	0	MAC
	Heterotrophic Plate Count	CFU/1mL	30 / <10*	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	347	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.16	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.1	5	AO
	Colour	TCU	3	5	AO
	Electrical Conductivity	uS/cm	962	-	-
	Total Hardness (as $CaCO_3$)	mg/L	395	80-100	OG
	pH	pH units	7.8	6.5-8.5	OG
	Phenols	mg/L	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	660	500	AO
	Sulphide (S_2)	mg/L	<0.02	0.05	AO
	Tannins and Lignins	mg phenol/L	0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.2	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	-	0.15	OG
	Turbidity	NTU	12.8	5	AO
Anions	Chloride (Cl)	mg/L	86	250	AO
	Fluoride (F)	mg/L	<0.1	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.1	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	0.1	MAC
	Sulphate (SO_4)	mg/L	74	500	AO
Metals	Calcium (Ca)	mg/L	111	-	-
	Iron (Fe)	mg/L	1	0.3	AO
	Magnesium (Mg)	mg/L	28.3	-	-
	Manganese (Mn)	mg/L	0.096	0.05	AO
	Potassium (K)	mg/L	3.1	-	-
	Sodium (Na)	mg/L	38.8	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget
* Sample retaken November 8, 2017 (well chlorinated November 7, 2017)

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Table 5

Summary of Laboratory Parameters Analyzed (TW 2; Mar 22, 2003)

	Parameter	Units	6Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	0 / 0*	0	MAC
	Fecal Coliform	CFU/100mL	0 / 0*	0	MAC
	Total coliforms	CFU/100mL	NDOGN / 0*	0	MAC
	Heterotrophic Plate Count	CFU/1mL	- / 5*	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	238	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.02	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.5	5	AO
	Colour	TCU	<2	5	AO
	Electrical Conductivity	uS/cm	593	-	-
	Total Hardness (as $CaCO_3$)	mg/L	253	80-100	OG
	pH	pH units	7.72	6.5-8.5	OG
	Phenols	mg/L	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	385	500	AO
	Sulphide (S_2)	mg/L	0.16	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.12	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.10	0.15	OG
	Turbidity	NTU	4.7	5	AO
Anions	Chloride (Cl)	mg/L	43	250	AO
	Fluoride (F)	mg/L	0.43	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.10	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.10	0.1	MAC
	Sulphate (SO_4)	mg/L	17	500	AO
Metals	Calcium (Ca)	mg/L	83	-	-
	Iron (Fe)	mg/L	0.39	0.3	AO
	Magnesium (Mg)	mg/L	11	-	-
	Manganese (Mn)	mg/L	0.014	0.05	AO
	Potassium (K)	mg/L	1	-	-
	Sodium (Na)	mg/L	33	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget
* Sample retaken August 21, 2003 (well chlorinated August 20, 2003)

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Table 6

Summary of Laboratory Parameters Analyzed (TW 3; Mar 17, 2003)

	Parameter	Units	6Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	0	0	MAC
	Fecal Coliform	CFU/100mL	0	0	MAC
	Total coliforms	CFU/100mL	0	0	MAC
	Heterotrophic Plate Count	CFU/1mL	-	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	260	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.21	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.4	5	AO
	Colour	TCU	5	5	AO
	Electrical Conductivity	uS/cm	564	-	-
	Total Hardness (as $CaCO_3$)	mg/L	201	80-100	OG
	pH	pH units	7.80	6.5-8.5	OG
	Phenols	mg/L	0.003	-	-
	Total Dissolved Solids (TDS)	mg/L	367	500	AO
	Sulphide (S_2)	mg/L	3.70	0.05	AO
	Tannins and Lignins	mg phenol/L	0.2	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.35	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.14	0.15	OG
	Turbidity	NTU	50.2 / < 1.0*	5	AO
Anions	Chloride (Cl)	mg/L	30	250	AO
	Fluoride (F)	mg/L	0.83	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.10	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.10	0.1	MAC
	Sulphate (SO_4)	mg/L	11	500	AO
Metals	Calcium (Ca)	mg/L	41	-	-
	Iron (Fe)	mg/L	0.63	0.3	AO
	Magnesium (Mg)	mg/L	24	-	-
	Manganese (Mn)	mg/L	0.018	0.05	AO
	Potassium (K)	mg/L	9	-	-
	Sodium (Na)	mg/L	42	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget
* Field measurement on August 25, 2003 following 7 hours of pumping

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Table 7

Summary of Laboratory Parameters Analyzed (TW 4; Mar 19, 2003)

	Parameter	Units	6Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	0	0	MAC
	Fecal Coliform	CFU/100mL	0	0	MAC
	Total coliforms	CFU/100mL	0	0	MAC
	Heterotrophic Plate Count	CFU/1mL	0	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	237	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.16	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.2	5	AO
	Colour	TCU	4	5	AO
	Electrical Conductivity	uS/cm	651	-	-
	Total Hardness (as $CaCO_3$)	mg/L	275	80-100	OG
	pH	pH units	7.98	6.5-8.5	OG
	Phenols	mg/L	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	423	500	AO
	Sulphide (S_2)	mg/L	0.01	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.24	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.08	0.15	OG
	Turbidity	NTU	6.6	5	AO
Anions	Chloride (Cl)	mg/L	49	250	AO
	Fluoride (F)	mg/L	0.70	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.10	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.10	0.1	MAC
	Sulphate (SO_4)	mg/L	32	500	AO
Metals	Calcium (Ca)	mg/L	74	-	-
	Iron (Fe)	mg/L	0.47	0.3	AO
	Magnesium (Mg)	mg/L	22	-	-
	Manganese (Mn)	mg/L	0.040	0.05	AO
	Potassium (K)	mg/L	3	-	-
	Sodium (Na)	mg/L	32	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

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Table 8

Summary of Laboratory Parameters Analyzed (TW 4; May 10, 2016)

	Parameter	Units	4 Hr	8 Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	NDOGN	NDOGN / ND* & ND**	0	MAC
	Fecal Coliform	CFU/100mL	ND	ND / ND* & ND**	0	MAC
	Total coliforms	CFU/100mL	NDOGN	NDOGN / ND* & ND**	0	MAC
	Heterotrophic Plate Count	CFU/1mL	600	NDOGN / 20* & 55**	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	246	247	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.10	0.10	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.0	2.1	5	AO
	Colour	TCU	<5	<5	5	AO
	Electrical Conductivity	uS/cm	936	929	-	-
	Total Hardness (as $CaCO_3$)	mg/L	342	336	80-100	OG
	pH	pH units	8.10	8.22	6.5-8.5	OG
	Phenols	mg/L	<0.001	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	516	512	500	AO
	Sulphide (S_2)	mg/L	<0.05	<0.05	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.11	0.14	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.01	0.04	0.15	OG
	Turbidity	NTU	3.7	5.0	5	AO
Anions	Chloride (Cl)	mg/L	137	133	250	AO
	Fluoride (F)	mg/L	0.26	0.23	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.05	<0.05	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	<0.05	0.1	MAC
	Sulphate (SO_4)	mg/L	48.6	50.6	500	AO
Metals	Calcium (Ca)	mg/L	92.8	91.5	-	-
	Iron (Fe)	mg/L	0.515	0.458	0.3	AO
	Magnesium (Mg)	mg/L	26.7	26.2	-	-
	Manganese (Mn)	mg/L	0.047	0.045	0.05	AO
	Potassium (K)	mg/L	3.75	3.74	-	-
	Sodium (Na)	mg/L	58.0	56.7	200	AO

NOTES:
MAC = Maximum acceptable concentration NR = Not Reportable OG = Operational guideline
AO = Aesthetic objective ND = Not Detectable NDOGN = No Data; Overgrown with Nontarget
* / ** Samples retaken on May 20, 2016 after 8 hours of pumping (well chlorinated May 19, 2016)

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Table 9

Summary of Laboratory Parameters Analyzed (TW 4; May 16, 2016) - Metals

Parameter	Units	8 Hr	Ontario Drinking Water Standard	Type of Standard
Antimony	ug/L	<1.0	6	MAC
Arsenic	ug/L	<1.0	25	MAC
Barium	ug/L	283	1000	MAC
Beryllium	ug/L	<0.5	-	-
Boron	ug/L	44.1	5000	MAC
Cadmium	ug/L	<0.2	5	MAC
Chromium	ug/L	4.8	50	MAC
Cobalt	ug/L	<0.5	-	-
Copper	ug/L	<1.0	1000	AO
Lead	ug/L	<0.5	10	MAC
Molybdenum	ug/L	<0.5	-	-
Nickel	ug/L	<1.0	-	-
Selenium	ug/L	<1.0	10	MAC
Silver	ug/L	<0.2	-	-
Thallium	ug/L	<0.3	-	-
Uranium	ug/L	<0.5	20	MAC
Vanadium	ug/L	0.4	-	-
Zinc	ug/L	<5.0	5000	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

Table 10

Summary of Laboratory Parameters Analyzed (TW 6; October 19, 2017)

	Parameter	Units	3 Hr	6 Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND	ND	0	MAC
	Fecal Coliform	CFU/100mL	ND	ND	0	MAC
	Total coliforms	CFU/100mL	ND	ND	0	MAC
	Heterotrophic Plate Count	CFU/1mL	<10	<10	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	294	292	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.11	0.10	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.8	2.4	5	AO
	Colour	TCU	9	5	5	AO
	Electrical Conductivity	uS/cm	733	710	-	-
	Total Hardness (as $CaCO_3$)	mg/L	332	332	80-100	OG
	pH	pH units	8.0	8.0	6.5-8.5	OG
	Phenols	mg/L	<0.001	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	480	502	500	AO
	Sulphide (S_2)	mg/L	0.25	0.39	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.2	0.2	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.09	0.1	0.15	OG
	Turbidity	NTU	14.2	3.9	5	AO
Anions	Chloride (Cl)	mg/L	56	57	250	AO
	Fluoride (F)	mg/L	0.5	0.5	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.1	<0.1	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	<0.05	0.1	MAC
	Sulphate (SO_4)	mg/L	44	44	500	AO
Metals	Calcium (Ca)	mg/L	93.8	93.6	-	-
	Iron (Fe)	mg/L	1	0.3	0.3	AO
	Magnesium (Mg)	mg/L	23.7	23.8	-	-
	Manganese (Mn)	mg/L	0.057	0.057	0.05	AO
	Potassium (K)	mg/L	3.0	3.0	-	-
	Sodium (Na)	mg/L	19.2	19.9	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

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Table 11

Summary of Laboratory Parameters Analyzed (TW 6; October 19, 2017) - Metals

Parameter	Units	6 Hr	Ontario Drinking Water Standard	Type of Standard
Mercury	mg/L	ND (0.0001)	0.001	MAC
Aluminum	mg/L	0.030	0.1	MAC
Antimony	mg/L	ND (0.0005)	0.006	MAC
Arsenic	mg/L	ND (0.001)	0.025	MAC
Barium	mg/L	0.332	1	MAC
Beryllium	mg/L	ND (0.0005)	-	-
Boron	mg/L	0.03	5	MAC
Cadmium	mg/L	ND (0.0001)	0.005	MAC
Chromium	mg/L	ND (0.001)	0.05	MAC
Chromium (VI)	mg/L	ND (0.010)	-	-
Cobalt	mg/L	ND (0.0005)	-	-
Copper	mg/L	ND (0.0005)	1	AO
Lead	mg/L	ND (0.0001)	0.01	MAC
Molybdenum	mg/L	ND (0.0005)	-	-
Nickel	mg/L	ND (0.001)	-	-
Selenium	mg/L	ND (0.001)	0.05	MAC
Silicon	mg/L	10.0	-	-
Silver	mg/L	ND (0.0001)	-	-
Strontium	mg/L	0.73	-	-
Thallium	mg/L	ND (0.001)	-	-
Tin	mg/L	ND (0.01)	-	-
Titanium	mg/L	ND (0.005)	-	-
Tungsten	mg/L	ND (0.01)	-	-
Uranium	mg/L	0.0001	0.02	MAC
Vanadium	mg/L	ND (0.0005)	-	-
Zinc	mg/L	ND (0.005)	5	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

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Table 12

Summary of Laboratory Parameters Analyzed (TW 7; October 18, 2017)

	Parameter	Units	3 Hr	6 Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND	ND	0	MAC
	Fecal Coliform	CFU/100mL	ND	ND	0	MAC
	Total coliforms	CFU/100mL	ND	ND	0	MAC
	Heterotrophic Plate Count	CFU/1mL	<10	<10	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	293	294	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.42	0.42	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.0	2.1	5	AO
	Colour	TCU	4	3	5	AO
	Electrical Conductivity	uS/cm	722	724	-	-
	Total Hardness (as $CaCO_3$)	mg/L	228	233	80-100	OG
	pH	pH units	7.9	8.0	6.5-8.5	OG
	Phenols	mg/L	<0.001	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	434	426	500	AO
	Sulphide (S_2)	mg/L	7.00	0.30	0.05	AO
	Tannins and Lignins	mg phenol/L	0.8	0.2	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.5	0.5	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.08	0.1	0.15	OG
	Turbidity	NTU	4.1	12.9	5	AO
Anions	Chloride (Cl)	mg/L	65	69	250	AO
	Fluoride (F)	mg/L	0.7	0.7	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.1	<0.1	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	<0.05	0.1	MAC
	Sulphate (SO_4)	mg/L	21	20	500	AO
Metals	Calcium (Ca)	mg/L	46.1	48.7	-	-
	Iron (Fe)	mg/L	<0.1	<0.1	0.3	AO
	Magnesium (Mg)	mg/L	27.4	27.0	-	-
	Manganese (Mn)	mg/L	0.006	0.006	0.05	AO
	Potassium (K)	mg/L	8.5	8.0	-	-
	Sodium (Na)	mg/L	57.0	54.0	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

GEMTEC
Consulting Engineers and Scientists

Date: November 2017

Project: 61318.15

Table 13

Summary of Laboratory Parameters Analyzed (TW 7; October 18, 2017) - Metals

Parameter	Units	6 Hr	Ontario Drinking Water Standard	Type of Standard
Mercury	mg/L	ND (0.0001)	0.001	MAC
Aluminum	mg/L	0.036	0.1	MAC
Antimony	mg/L	ND (0.0005)	0.006	MAC
Arsenic	mg/L	ND (0.001)	0.025	MAC
Barium	mg/L	0.136	1	MAC
Beryllium	mg/L	ND (0.0005)	-	-
Boron	mg/L	0.14	5	MAC
Cadmium	mg/L	ND (0.0001)	0.005	MAC
Chromium	mg/L	ND (0.001)	0.05	MAC
Chromium (VI)	mg/L	ND (0.010)	-	-
Cobalt	mg/L	ND (0.0005)	-	-
Copper	mg/L	0.0007	1	AO
Lead	mg/L	ND (0.0001)	0.01	MAC
Molybdenum	mg/L	ND (0.0005)	-	-
Nickel	mg/L	ND (0.001)	-	-
Selenium	mg/L	0.006	0.05	MAC
Silicon	mg/L	6.87	-	-
Silver	mg/L	ND (0.0001)	-	-
Strontium	mg/L	2.59	-	-
Thallium	mg/L	ND (0.001)	-	-
Tin	mg/L	ND (0.01)	-	-
Titanium	mg/L	ND (0.005)	-	-
Tungsten	mg/L	ND (0.01)	-	-
Uranium	mg/L	ND (0.0001)	0.02	MAC
Vanadium	mg/L	ND (0.0005)	-	-
Zinc	mg/L	0.006	5	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

Table 14

Summary of Laboratory Parameters Analyzed (TW 8; October 17, 2017)

	Parameter	Units	3 Hr	6 Hr	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters	Escherichia coli	CFU/100mL	ND	ND	0	MAC
	Fecal Coliform	CFU/100mL	ND	ND	0	MAC
	Total coliforms	CFU/100mL	ND	ND	0	MAC
	Heterotrophic Plate Count	CFU/1mL	<10	<10	-	-
General Inorganics	Alkalinity (as $CaCO_3$)	mg/L	278	278	30-500	OG
	Ammonia as N (NH_3)	mg/L	0.11	0.11	-	-
	Dissolved Organic Carbon (DOC)	mg/L	2.5	2.3	5	AO
	Colour	TCU	<2	<2	5	AO
	Electrical Conductivity	uS/cm	794	799	-	-
	Total Hardness (as $CaCO_3$)	mg/L	322	324	80-100	OG
	pH	pH units	7.7	7.7	6.5-8.5	OG
	Phenols	mg/L	<0.001	<0.001	-	-
	Total Dissolved Solids (TDS)	mg/L	416	452	500	AO
	Sulphide (S_2)	mg/L	<0.02	<0.02	0.05	AO
	Tannins and Lignins	mg phenol/L	<0.1	<0.1	-	-
	Total Kjeldahl Nitrogen (TKN)	mg/L	0.3	0.3	-	-
	Organic Nitrogen (TKN - NH3)	mg/L	0.2	0.2	0.15	OG
	Turbidity	NTU	3.3	3.0	5	AO
Anions	Chloride (Cl)	mg/L	79	79	250	AO
	Fluoride (F)	mg/L	0.2	0.2	1.5	MAC
	Nitrate as N (NO_3)	mg/L	<0.1	<0.1	10	MAC
	Nitrite as N (NO_2)	mg/L	<0.05	<0.05	0.1	MAC
	Sulphate (SO_4)	mg/L	57	57	500	AO
Metals	Calcium (Ca)	mg/L	92.5	93.1	-	-
	Iron (Fe)	mg/L	0.9	0.9	0.3	AO
	Magnesium (Mg)	mg/L	22.0	22.2	-	-
	Manganese (Mn)	mg/L	0.191	0.191	0.05	AO
	Potassium (K)	mg/L	1.5	1.5	-	-
	Sodium (Na)	mg/L	31.7	32.1	200	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

GEMTEC
Consulting Engineers and Scientists

Date: November 2017

Project: 61318.15

Table 15

Summary of Laboratory Parameters Analyzed (TW 8; October 17, 2017) - Metals

Parameter	Units	6 Hr	Ontario Drinking Water Standard	Type of Standard
Mercury	mg/L	ND (0.0001)	0.001	MAC
Aluminum	mg/L	ND (0.001)	0.1	MAC
Antimony	mg/L	ND (0.0005)	0.006	MAC
Arsenic	mg/L	ND (0.001)	0.025	MAC
Barium	mg/L	0.109	1	MAC
Beryllium	mg/L	ND (0.0005)	-	-
Boron	mg/L	0.01	5	MAC
Cadmium	mg/L	ND (0.0001)	0.005	MAC
Chromium	mg/L	ND (0.001)	0.05	MAC
Chromium (VI)	mg/L	ND (0.010)	-	-
Cobalt	mg/L	ND (0.0005)	-	-
Copper	mg/L	ND (0.0005)	1	AO
Lead	mg/L	ND (0.0001)	0.01	MAC
Molybdenum	mg/L	0.0023	-	-
Nickel	mg/L	ND (0.001)	-	-
Selenium	mg/L	ND (0.001)	0.05	MAC
Silicon	mg/L	8.00	-	-
Silver	mg/L	ND (0.0001)	-	-
Strontium	mg/L	0.24	-	-
Thallium	mg/L	ND (0.001)	-	-
Tin	mg/L	ND (0.01)	-	-
Titanium	mg/L	ND (0.005)	-	-
Tungsten	mg/L	ND (0.01)	-	-
Uranium	mg/L	0.0009	0.02	MAC
Vanadium	mg/L	ND (0.0005)	-	-
Zinc	mg/L	ND (0.005)	5	AO

NOTES:
MAC = Maximum acceptable concentration
AO = Aesthetic objective
NR = Not Reportable
ND = Not Detectable
OG = Operational guideline
NDOGN = No Data; Overgrown with Nontarget

GEMTEC
Consulting Engineers and Scientists

Date: November 2017

Project: 61318.15

APPENDIX L

Laboratory Certificates of Analysis – Onsite Test and Monitoring Wells

REPORT OF ANALYSIS

Client: **Morey Houle Chevrier Engineering**
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: **Mr. Randy Morey**

Report Number: 2313096
Date: 2003-08-25
Date Submitted: 2003-08-22

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	267773					GUIDELINE		
	Sample Date:	2003-08-22					MOE REG 170/03		
	Sample ID:	TW1							
PARAMETER	**UNITS**	**MDL**					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		5				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Krista Johns
Microbiology Analyst

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2312997
Date: 2003-08-25
Date Submitted: 2003-08-21

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	267397					GUIDELINE		
	Sample Date:	2003-08-21					MOE REG 170/03		
	Sample ID:	TW2 031-040							
PARAMETER	**UNITS**	**MDL**					**TYPE**	**LIMIT**	**UNITS**
Total Coliforms	ct/100mL		0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL		0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL		5				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL		0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL		0						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Peter Haulena
Analytical Services Manager

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering

ATT: Dean Tataryn

Report Number: 2303909
Date: 2003-04-01
Date Submitted: 2003-03-22

Project: 031-040

P.O. Number:
Matrix: Water

		LAB ID:	239667				
		Sample Date:	2003-03-21				
		Sample ID:	TW#1				
PARAMETER	**UNITS**	**MDL**					
Alkalinity as CaCO3	mg/L	5	251				
Ca	mg/L	1	53				
Cl	mg/L	1	66				
Conductivity	uS/cm	5	700				
Colour	TCU	2	3				
DOC	mg/L	0.5	1.7				
F	mg/L	0.10	0.23				
Fe	mg/L	0.01	0.18				
H2S	mg/L	0.01	0.01				
Hardness as CaCO3	mg/L	1	248				
Ion Balance		0.01	0.99				
Mg	mg/L	1	28				
Mn	mg/L	0.005	0.016				
N-NH3	mg/L	0.02	0.25				
N-NO2	mg/L	0.10	<0.10				
N-NO3	mg/L	0.10	<0.10				
pH			7.99				
Phenols	mg/L	0.001	<0.001				
K	mg/L	1	8				
Na	mg/L	2	47				
SO4	mg/L	1	19				
Tannin & Lignin	mg/L	0.1	<0.1				
Total Kjeldahl Nitrogen	mg/L	0.05	0.35				
Turbidity	NTU	0.1	6.3				
TDS (COND - CALC)	mg/L	5	455				

MDL = Method Detection Limit INC = Incomplete Method references available upon request.
Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1 608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering

ATT: Dean Tataryn

Report Number: 2303940
Date: 2003-04-01
Date Submitted: 2003-03-24

Project: 031-040

P.O. Number:
Matrix: Water

			LAB ID:				
			Sample Date:				
			Sample ID:				
PARAMETER	**UNITS**	**MDL**					
Alkalinity as CaCO3	mg/L	5	238				
Background Colonies	ct/100mL		>200				
Ca	mg/L	1	83				
Cl	mg/L	1	43				
Conductivity	uS/cm	5	593				
Colour	TCU	2	<2				
DOC	mg/L	0.5	2.5				
Escherichia Coli	ct/100mL		0				
F	mg/L	0.10	0.43				
Faecal Coliforms	ct/100mL		0				
Faecal Streptococcus	ct/100mL		0				
Fe	mg/L	0.01	0.39				
H2S	mg/L	0.01	0.16				
Hardness as CaCO3	mg/L	1	253				
Ion Balance		0.01	1.03				
Mg	mg/L	1	11				
Mn	mg/L	0.005	0.014				
N-NH3	mg/L	0.02	0.02				
N-NO2	mg/L	0.10	<0.10				
N-NO3	mg/L	0.10	<0.10				
pH			7.72				
Phenols	mg/L	0.001	<0.001				
K	mg/L	1	1				
Na	mg/L	1	33				
Heterotrophic Plate Count	ct/1mL		14				
SO4	mg/L	1	17				
Tannin & Lignin	mg/L	0.1	<0.1				
Total Coliforms	ct/100mL		OG				
Total Kjeldahl Nitrogen	mg/L	0.05	0.12				
Turbidity	NTU	0.1	4.7				

MDL = Method Detection Limit INC = Incomplete Method references available upon request.

Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering

ATT: Dean Tataryn

Report Number: 2303940
Date: 2003-04-01
Date Submitted: 2003-03-24

Project: 031-040

P.O. Number:
Matrix: Water

		LAB ID:	239708				
		Sample Date:	2003-03-22				
		Sample ID:	TW 2				
PARAMETER	UNITS	MDL					
TDS (COND - CALC)	mg/L	5	385				

MDL = Method Detection Limit INC = Incomplete Method references available upon request.
Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering

ATT: Dean Tataryn

Report Number: 2303535
Date: 2003-03-19
Date Submitted: 2003-03-17

Project: 031-040

P.O. Number:
Matrix: Water

			LAB ID:	238148			
			Sample Date:	2003-03-15			
			Sample ID:	TW3			
PARAMETER	UNITS	MDL					
Alkalinity as CaCO3	mg/L	5	260				
Ca	mg/L	1	41				
Cl	mg/L	1	30				
Conductivity	uS/cm	5	564				
Colour	TCU	2	5				
DOC	mg/L	0.5	2.4				
Escherichia Coli	ct/100mL		0				
F	mg/L	0.10	0.83				
Faecal Coliforms	ct/100mL		0				
Faecal Streptococcus	ct/100mL		0				
Fe	mg/L	0.01	0.63				
H2S	mg/L	0.01	3.70				
Hardness as CaCO3	mg/L	1	201				
Ion Balance		0.01	0.96				
Mg	mg/L	1	24				
Mn	mg/L	0.005	0.018				
N-NH3	mg/L	0.02	0.21				
N-NO2	mg/L	0.10	<0.10				
N-NO3	mg/L	0.10	<0.10				
pH			7.80				
Phenols	mg/L	0.001	0.003				
K	mg/L	1	9				
Na	mg/L	2	42				
Heterotrophic Plate Count	ct/1mL		0				
SO4	mg/L	1	11				
Tannin & Lignin	mg/L	0.1	0.2				
Total Coliforms	ct/100mL		0				
Total Kjeldahl Nitrogen	mg/L	0.05	0.35				
Turbidity	NTU	0.1	50.2				
TDS (COND - CALC)	mg/L	5	367				

MDL = Method Detection Limit INC = Incomplete Method references available upon request.

Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering

ATT: Dean Tataryn

Report Number: 2303813
Date: 2003-03-31
Date Submitted: 2003-03-19

Project: 031-040

P.O. Number:
Matrix: Water

			LAB ID:	Sample Date:	Sample ID:			
			239407	2003-03-19	TW#4			
PARAMETER	UNITS	MDL						
Alkalinity as CaCO3	mg/L	5	237					
Ca	mg/L	1	74					
Cl	mg/L	1	49					
Conductivity	uS/cm	5	651					
Colour	TCU	2	4					
DOC	mg/L	0.5	2.2					
Escherichia Coli	ct/100mL		0					
F	mg/L	0.10	0.70					
Faecal Coliforms	ct/100mL		0					
Faecal Streptococcus	ct/100mL		0					
Fe	mg/L	0.01	0.47					
H2S	mg/L	0.01	0.01					
Hardness as CaCO3	mg/L	1	275					
Ion Balance		0.01	1.02					
Mg	mg/L	1	22					
Mn	mg/L	0.005	0.040					
N-NH3	mg/L	0.02	0.16					
N-NO2	mg/L	0.10	<0.10					
N-NO3	mg/L	0.10	<0.10					
pH			7.98					
Phenols	mg/L	0.001	<0.001					
K	mg/L	1	3					
Na	mg/L	2	32					
Heterotrophic Plate Count	ct/1mL		0					
SO4	mg/L	1	32					
Tannin & Lignin	mg/L	0.1	<0.1					
Total Coliforms	ct/100mL		0					
Total Kjeldahl Nitrogen	mg/L	0.05	0.24					
Turbidity	NTU	0.1	6.6					
TDS (COND - CALC)	mg/L	5	423					

MDL = Method Detection Limit INC = Incomplete Method references available upon request.
Comment:

APPROVAL:

Ewan McRobbie
Inorganic Lab Supervisor

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

APPENDIX B

RESULTS OF LABORATORY TESTING OF MONITORING WELL WATER SAMPLES

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

			350540					GUIDELINE		
			2004-10-23							
			TW #3							
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
Picloram	ug/L	5	<5							
CARBAMATES										
Aldicarb	ug/L	9	<9							
Bendiocarb	ug/L	2	<2							
Carbaryl	ug/L	5	<5							
Carbofuran	ug/L	5	<5							
TRIAZINE & RELATED HERBICIDES										
Alachlor	ug/L	0.5	<0.5							
Atrazine	ug/L	0.2	<0.2							
De-ethylated atrazine	ug/L	0.5	<0.5							
Atrazine + *N*-dealkylated metabolites	ug/L	0.2	<0.2							
Cyanazine	ug/L	1	<1							
Metolachlor	ug/L	0.5	<0.5							
Metribuzin	ug/L	5	<5							
Prometryne	ug/L	0.25	<0.25							
Simazine	ug/L	1	<1							
ORGANOPHOSPHOROUS PESTICIDES										
Azinphos-methyl	ug/L	2	<2							
Chlorpyrifos	ug/L	1	<1							
Diazinon	ug/L	1	<1							
Diclofop-methyl	ug/L	0.9	<0.9							
Dimethoate	ug/L	2.5	<2.5							
Malathion	ug/L	5	<5							
Parathion	ug/L	1	<1							
Phorate	ug/L	0.5	<0.5							
Temephos	ug/L	10	<10							
Terbufos	ug/L	0.4	<0.4							
Triallate	ug/L	1	<1							
Trifluralin	ug/L	1	<1							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Mina Nasrat

LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350540					GUIDELINE		
	Sample Date:	2004-10-23							
	Sample ID:	TW #3							
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
Organochlorine Pesticides (OCPs) & PCBs									
Aldrin	ug/L	0.006	<0.006						
Dieldrin	ug/L	0.006	<0.006						
Aldrin + Dieldrin	ug/L	0.012	<0.012						
a-chlordane	ug/L	0.006	<0.006						
g-chlordane	ug/L	0.006	<0.006						
Oxychlordane	ug/L	0.006	<0.006						
Chlordane (Total)	ug/L	0.018	<0.018						
op-DDT	ug/L	0.006	<0.006						
pp-DDD	ug/L	0.006	<0.006						
pp-DDE	ug/L	0.006	<0.006						
pp-DDT	ug/L	0.006	<0.006						
(DDT) + Metabolites	ug/L	0.024	<0.024						
Heptachlor	ug/L	0.006	<0.006						
Heptachlor epoxide	ug/L	0.006	<0.006						
Heptachlor + Heptachlor Epoxide	ug/L	0.012	<0.012						
Lindane	ug/L	0.006	<0.006						
Methoxychlor	ug/L	0.024	<0.024						
Polychlorinated Biphenyls (PCBs)	ug/L	0.1	<0.1						
CHLOROPHENOLS									
2,3,4,6-tetrachlorophenol	ug/L	0.5	<0.5						
2,4,6-trichlorophenol	ug/L	0.5	<0.5						
2,4-dichlorophenol	ug/L	0.5	<0.5						
Pentachlorophenol	ug/L	0.5	<0.5						
PHENOXYACID HERBICIDES									
2,4,5-trichlorophenoxyacetic acid (2,4,5-T)	ug/L	1	<1						
2,4-dichlorophenoxyacetic acid (2,4-D)	ug/L	1	<1						
Bromoxynil	ug/L	0.5	<0.5						
Dicamba	ug/L	1	<1						
Dinoseb	ug/L	1	<1						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL

Mina Nasrat

...LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350540					GUIDELINE		
	Sample Date:	2004-10-23							
	Sample ID:	TW #3							
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
DIURON & GLYPHOSATE									
Diuron	ug/L	10	<10						
Glyphosate	ug/L	10	<10						
DIQUAT & PARAQUAT									
Diquat	ug/L	7	<7						
Paraquat	ug/L	1	<1						
BENZO (a) PYRENE									
Benzo(a)pyrene	ug/L	0.01	<0.01						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

lient: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
ttention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350534	350535	350536	350537	350538	GUIDELINE		
	Sample Date:	2004-10-23	2004-10-23	2004-10-23	2004-10-23	2004-10-23			
	Sample ID:	TW #1 Deep	TW #1 Shallow	TW#2 Deep	TW #2 Shallow	TW #3 Deep			
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
NO3 (Nitrate)	mg/L	0.10	9.47	4.12	<0.10	<0.10	<0.10		

L = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
mment:

APPROVAL

Ewan McPherson

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

			350539	350541	350542	350543		GUIDELINE		
			2004-10-23	2004-10-23	2004-10-23	2004-10-23				
			TW #3 Shallow	TW #4 Deep	TW #4 Shallow	TW #5 Shallow				
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
N-NO3 (Nitrate)	mg/L	0.10	<0.10	5.76	12.5	<0.10				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL

AGAT Laboratories

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http://www.agatlabs.com

CLIENT NAME: HOULE CHEVRIER
32 STEACIE DRIVE
OTTAWA, ON K2K2A9
(613) 836-1422

ATTENTION TO: James Mcewen

PROJECT: 63978.96

AGAT WORK ORDER: 16Z093547

MICROBIOLOGY ANALYSIS REVIEWED BY: Inesa Alizarchyk, Inorganic Lab Supervisor

WATER ANALYSIS REVIEWED BY: Inesa Alizarchyk, Inorganic Lab Supervisor

DATE REPORTED: May 18, 2016

PAGES (INCLUDING COVER): 12

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Microbiological Analysis (water)

SAMPLE TYPE: Water **SAMPLE ID: 7549793** **DATE RECEIVED: May 11, 2016**

DATE SAMPLED: May 10, 2016 **DATE REPORTED: May 18, 2016**

SAMPLE DESCRIPTION: Set 1 - 4 hr

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Escherichia coli	CFU/100mL	NDOGN	0	1	May 13, 2016	CT	May 12, 2016
Total Coliforms	CFU/100mL	NDOGN	0	1	May 13, 2016	CT	May 12, 2016
Fecal Coliform	CFU/100mL	ND		1	May 13, 2016	CT	May 12, 2016
Heterotrophic Plate Count	CFU/1mL	600		10	May 14, 2016	NB	May 12, 2016

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to SDWA - Microbiology
NDOGN – No Data; Overgrown with nontarget, refers to over-crowding microbial growth;
ND - Not Detected
NDOGHPC- No Data; HPC Plate Overgrown with Target.

Certified By:

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Subdiv. Well Water Supply

SAMPLE TYPE: Water **SAMPLE ID: 7549793** **DATE RECEIVED: May 11, 2016**

DATE SAMPLED: May 10, 2016 **DATE REPORTED: May 18, 2016**

SAMPLE DESCRIPTION: Set 1 - 4 hr

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Electrical Conductivity	uS/cm	936		2	May 13, 2016	PB	May 13, 2016
pH	pH Units	8.10		NA	May 13, 2016	PB	May 13, 2016
Total Hardness (as CaCO3)	mg/L	342		0.5	May 16, 2016	SYS	May 16, 2016
Total Dissolved Solids	mg/L	516		20	May 17, 2016	PB	May 16, 2016
Alkalinity (as CaCO3)	mg/L	246		5	May 13, 2016	PB	May 13, 2016
Fluoride	mg/L	0.26		0.05	May 16, 2016	MM	May 16, 2016
Chloride	mg/L	137		0.50	May 16, 2016	MM	May 16, 2016
Nitrate as N	mg/L	<0.05		0.05	May 16, 2016	MM	May 16, 2016
Nitrite as N	mg/L	<0.05		0.05	May 16, 2016	MM	May 16, 2016
Sulphate	mg/L	48.6		0.10	May 16, 2016	MM	May 16, 2016
Tannins and Lignins	mg phenol/L	<0.1		0.1	May 17, 2016	ME	May 17, 2016
Ammonia as N	mg/L	0.10		0.02	May 16, 2016	SS	May 16, 2016
Total Kjeldahl Nitrogen	mg/L	0.11		0.10	May 16, 2016	OD	May 16, 2016
Dissolved Organic Carbon	mg/L	2.0		0.5	May 13, 2016	ND	May 13, 2016
Phenols	mg/L	<0.001		0.001	May 13, 2016	SN	May 13, 2016
Hydrogen Sulphide	mg/L	<0.05		0.05	May 13, 2016	SN	May 13, 2016
Colour	TCU	<5		5	May 12, 2016	ME	May 12, 2016
Turbidity	NTU	3.7		0.5	May 12, 2016	ME	May 12, 2016
Calcium	mg/L	92.8		0.05	May 16, 2016	AA	May 16, 2016
Magnesium	mg/L	26.7		0.05	May 16, 2016	AA	May 16, 2016
Sodium	mg/L	58.0		0.05	May 16, 2016	AA	May 16, 2016
Potassium	mg/L	3.75		0.05	May 16, 2016	AA	May 16, 2016
Iron	mg/L	0.515		0.010	May 13, 2016	CR	May 13, 2016
Manganese	mg/L	0.047		0.002	May 13, 2016	CR	May 13, 2016
% Difference/ Ion Balance	%	1.85		NA	May 16, 2016	SYS	May 16, 2016

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Sodium:Please note that the analytical results have been confirmed by re-analysis.

Certified By:

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Microbiological Analysis (water)

SAMPLE TYPE: Water **SAMPLE ID: 7549796** **DATE RECEIVED: May 11, 2016**

DATE SAMPLED: May 10, 2016 **DATE REPORTED: May 18, 2016**

SAMPLE DESCRIPTION: Set 2 - 8 hr

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Escherichia coli	CFU/100mL	NDOGN	0	1	May 13, 2016	CT	May 12, 2016
Total Coliforms	CFU/100mL	NDOGN	0	1	May 13, 2016	CT	May 12, 2016
Fecal Coliform	CFU/100mL	ND		1	May 13, 2016	CT	May 12, 2016
Heterotrophic Plate Count	CFU/1mL	NDOGHPC		10	May 14, 2016	NB	May 12, 2016

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to SDWA - Microbiology
NDOGN – No Data; Overgrown with nontarget, refers to over-crowding microbial growth;
ND - Not Detected
NDOGHPC- No Data; HPC Plate Overgrown with Target.

Certified By:

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Certificate of Analysis

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals (Comprehensive) (Water)

SAMPLE TYPE: Water **SAMPLE ID: 7549796** **DATE RECEIVED: May 11, 2016**

DATE SAMPLED: May 10, 2016 **DATE REPORTED: May 18, 2016**

SAMPLE DESCRIPTION: Set 2 - 8 hr

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Antimony	µg/L	<1.0		1.0	May 13, 2016	CR	May 13, 2016
Arsenic	µg/L	<1.0		1.0	May 13, 2016	CR	May 13, 2016
Barium	µg/L	283		2.0	May 13, 2016	CR	May 13, 2016
Beryllium	µg/L	<0.5		0.5	May 13, 2016	CR	May 13, 2016
Boron	µg/L	44.1		10.0	May 13, 2016	CR	May 13, 2016
Cadmium	µg/L	<0.2		0.2	May 13, 2016	CR	May 13, 2016
Chromium	µg/L	4.8		2.0	May 13, 2016	CR	May 13, 2016
Cobalt	µg/L	<0.5		0.5	May 13, 2016	CR	May 13, 2016
Copper	µg/L	<1.0		1.0	May 13, 2016	CR	May 13, 2016
Lead	µg/L	<0.5		0.5	May 13, 2016	CR	May 13, 2016
Molybdenum	µg/L	<0.5		0.5	May 13, 2016	CR	May 13, 2016
Nickel	µg/L	<1.0		1.0	May 13, 2016	CR	May 13, 2016
Selenium	µg/L	<1.0		1.0	May 13, 2016	CR	May 13, 2016
Silver	µg/L	<0.2		0.2	May 13, 2016	CR	May 13, 2016
Thallium	µg/L	<0.3		0.3	May 13, 2016	CR	May 13, 2016
Uranium	µg/L	<0.5		0.5	May 13, 2016	CR	May 13, 2016
Vanadium	µg/L	0.4		0.4	May 13, 2016	CR	May 13, 2016
Zinc	µg/L	<5.0		5.0	May 13, 2016	CR	May 13, 2016

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to T1(All-GW)

Certified By:

AGAT Laboratories

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CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Subdiv. Well Water Supply

SAMPLE TYPE: Water **SAMPLE ID: 7549796** **DATE RECEIVED: May 11, 2016**

DATE SAMPLED: May 10, 2016 **DATE REPORTED: May 18, 2016**

SAMPLE DESCRIPTION: Set 2 - 8 hr

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Electrical Conductivity	uS/cm	929		2	May 13, 2016	PB	May 13, 2016
pH	pH Units	8.22		NA	May 13, 2016	PB	May 13, 2016
Total Hardness (as CaCO3)	mg/L	336		0.5	May 16, 2016	SYS	May 16, 2016
Total Dissolved Solids	mg/L	512		20	May 17, 2016	PB	May 16, 2016
Alkalinity (as CaCO3)	mg/L	247		5	May 13, 2016	PB	May 13, 2016
Fluoride	mg/L	0.23		0.05	May 16, 2016	MM	May 16, 2016
Chloride	mg/L	133		0.50	May 16, 2016	MM	May 16, 2016
Nitrate as N	mg/L	<0.05		0.05	May 16, 2016	MM	May 16, 2016
Nitrite as N	mg/L	<0.05		0.05	May 16, 2016	MM	May 16, 2016
Sulphate	mg/L	50.6		0.10	May 16, 2016	MM	May 16, 2016
Tannins and Lignins	mg phenol/L	<0.1		0.1	May 17, 2016	ME	May 17, 2016
Ammonia as N	mg/L	0.10		0.02	May 16, 2016	SS	May 16, 2016
Total Kjeldahl Nitrogen	mg/L	0.14		0.10	May 16, 2016	OD	May 16, 2016
Dissolved Organic Carbon	mg/L	2.1		0.5	May 13, 2016	ND	May 13, 2016
Phenols	mg/L	<0.001		0.001	May 13, 2016	SN	May 13, 2016
Hydrogen Sulphide	mg/L	<0.05		0.05	May 13, 2016	SN	May 13, 2016
Colour	TCU	<5		5	May 12, 2016	ME	May 12, 2016
Turbidity	NTU	5.0		0.5	May 12, 2016	ME	May 12, 2016
Calcium	mg/L	91.5		0.05	May 16, 2016	AA	May 16, 2016
Magnesium	mg/L	26.2		0.05	May 16, 2016	AA	May 16, 2016
Sodium	mg/L	56.7		0.05	May 16, 2016	AA	May 16, 2016
Potassium	mg/L	3.74		0.05	May 16, 2016	AA	May 16, 2016
Iron	mg/L	0.458		0.010	May 13, 2016	CR	May 13, 2016
Manganese	mg/L	0.045		0.002	May 13, 2016	CR	May 13, 2016
% Difference/ Ion Balance	%	2.45		NA	May 16, 2016	SYS	May 16, 2016

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Sodium:Please note that the analytical results have been confirmed by re-analysis.

Certified By:

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Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: May 18, 2016			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Microbiological Analysis (water)															
Escherichia coli	7549793	7549793	NDOGN	NDOGN	NA	< 1									
Total Coliforms	7549793	7549793	NDOGN	NDOGN	NA	< 1									
Fecal Coliform	7549796	7549796	ND	ND	NA	< 1									
Heterotrophic Plate Count	7549793	7549793	600	595	0.8%	< 10									

Comments: NDOGN – No Data; Overgrown with nontarget, refers to over-crowding microbial growth;
ND - Not Detected
NA - % RPD Not Applicable

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: May 18, 2016

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Subdiv. Well Water Supply															
Electrical Conductivity	7548296		2210	2210	0.0%	< 2	103%	80%	120%	NA			NA		
pH	7548296		8.28	8.26	0.2%	NA	100%	90%	110%	NA			NA		
Total Dissolved Solids	7548281		1010	1020	1.0%	< 20	98%	80%	120%	NA			NA		
Alkalinity (as CaCO3)	7548296		855	849	0.7%	< 5	99%	80%	120%	NA			NA		
Fluoride	7551821		<0.25	<0.25	NA	< 0.05	101%	90%	110%	103%	90%	110%	92%	80%	120%
Chloride	7551821		12.9	13.3	3.1%	< 0.10	99%	90%	110%	109%	90%	110%	110%	80%	120%
Nitrate as N	7551821		<0.25	<0.25	NA	< 0.05	91%	90%	110%	108%	90%	110%	108%	80%	120%
Nitrite as N	7551821		<0.25	<0.25	NA	< 0.05	NA	90%	110%	104%	90%	110%	107%	80%	120%
Sulphate	7551821		17.5	17.8	1.7%	< 0.10	97%	90%	110%	108%	90%	110%	109%	80%	120%
Tannins and Lignins	7549793	7549793	<0.1	<0.1	NA	< 0.1	89%	80%	120%	95%	85%	115%	85%	70%	130%
Ammonia as N	7547451		<0.02	<0.02	NA	< 0.02	90%	90%	110%	93%	90%	110%	105%	80%	120%
Total Kjeldahl Nitrogen	7547464		0.44	0.52	NA	< 0.10	100%	80%	120%	104%	80%	120%	99%	70%	130%
Dissolved Organic Carbon	7549793	7549793	2.0	2.0	NA	< 0.5	102%	90%	110%	100%	90%	110%	97%	80%	120%
Phenols	7547622		<0.001	<0.001	NA	< 0.001	98%	90%	110%	97%	90%	110%	93%	80%	120%
Sulphide	7552576		<0.05	<0.05	NA	< 0.05	99%	80%	120%	101%	85%	115%	102%	70%	130%
Hydrogen Sulphide	7552576		<0.05	<0.05	NA	< 0.05	99%	90%	110%	101%	90%	110%	102%	80%	120%
Colour	7546818		39	40	2.5%	< 5	100%	90%	110%	NA			NA		
Turbidity	7549020		<0.5	<0.5	NA	< 0.5	103%	90%	110%	NA			NA		
Calcium	7550688		98.6	100	1.4%	< 0.05	101%	90%	110%	102%	90%	110%	101%	70%	130%
Magnesium	7550688		41.8	42.0	0.5%	< 0.05	102%	90%	110%	102%	90%	110%	105%	70%	130%
Sodium	7550688		23.6	23.0	2.6%	< 0.05	94%	90%	110%	94%	90%	110%	98%	70%	130%
Potassium	7550688		2.03	2.04	0.5%	< 0.05	95%	90%	110%	94%	90%	110%	97%	70%	130%
Iron	7550206		0.390	0.415	6.2%	< 0.010	100%	90%	110%	100%	90%	110%	100%	70%	130%
Manganese	7550206		0.004	0.005	NA	< 0.002	101%	90%	110%	100%	90%	110%	103%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

O. Reg. 153(511) - Metals (Comprehensive) (Water)

Antimony	7550206		<1.0	<1.0	NA	< 1.0	99%	70%	130%	101%	80%	120%	104%	70%	130%
Arsenic	7550206		<1.0	<1.0	NA	< 1.0	100%	70%	130%	96%	80%	120%	104%	70%	130%
Barium	7550206		10.5	10.9	3.7%	< 2.0	99%	70%	130%	99%	80%	120%	97%	70%	130%
Beryllium	7550206		<0.5	<0.5	NA	< 0.5	109%	70%	130%	106%	80%	120%	112%	70%	130%
Boron	7550206		<10.0	<10.0	NA	< 10.0	97%	70%	130%	99%	80%	120%	100%	70%	130%
Cadmium	7550206		<0.2	<0.2	NA	< 0.2	100%	70%	130%	100%	80%	120%	104%	70%	130%
Chromium	7550206		<2.0	<2.0	NA	< 2.0	100%	70%	130%	100%	80%	120%	97%	70%	130%
Cobalt	7550206		<0.5	<0.5	NA	< 0.5	103%	70%	130%	101%	80%	120%	102%	70%	130%
Copper	7550206		24.5	26.3	7.1%	< 1.0	101%	70%	130%	101%	80%	120%	96%	70%	130%
Lead	7550206		<0.5	<0.5	NA	< 0.5	103%	70%	130%	101%	80%	120%	102%	70%	130%

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Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

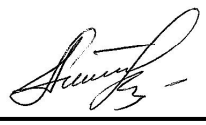
SAMPLED BY:

Water Analysis (Continued)

RPT Date: May 18, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Molybdenum	7550206		<0.5	<0.5	NA	< 0.5	99%	70%	130%	96%	80%	120%	99%	70%	130%
Nickel	7550206		<1.0	<1.0	NA	< 1.0	102%	70%	130%	100%	80%	120%	99%	70%	130%
Selenium	7550206		<1.0	<1.0	NA	< 1.0	99%	70%	130%	96%	80%	120%	113%	70%	130%
Silver	7550206		<0.2	<0.2	NA	< 0.2	95%	70%	130%	104%	80%	120%	106%	70%	130%
Thallium	7550206		<0.3	<0.3	NA	< 0.3	104%	70%	130%	101%	80%	120%	103%	70%	130%
Uranium	7550206		<0.5	<0.5	NA	< 0.5	100%	70%	130%	101%	80%	120%	100%	70%	130%
Vanadium	7550206		<0.4	<0.4	NA	< 0.4	98%	70%	130%	98%	80%	120%	101%	70%	130%
Zinc	7550206		<5.0	<5.0	NA	< 5.0	100%	70%	130%	101%	80%	120%	113%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Heterotrophic Plate Count	MIC-93-7020	SM 9215C	MF/INCUBATOR

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Method Summary

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z093547

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Fluoride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Tannins and Lignins	INOR-93-6058	SM 550B, 21st Edition	SPECTROPHOTOMETER
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Phenols	INOR-93-6050	MOE ROPHEN-E 3179 & SM 5530 D	TECHNICON AUTO ANALYZER
Hydrogen Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER
Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
% Difference/ Ion Balance		SM 1030 E	CALCULATION

AGAT Laboratories
5835 Coopers Avenue
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Short Holding Time
MIB1 + TURBIDITY

DRINKING WATER CHAIN OF CUSTODY RECORD

Lg Cooler

LABORATORY USE ONLY
Arrival Condition: ☑ Good ☐ Poor (complete "notes") Once
Arrival Temperature: 6.1 | 5.4 | 5.9
AGAT Job Number: 162093547
Notes: 6 S2 S4

Client Information
Company: Hake Chevrier Engineering Ltd.
Contact: James McEwen
Address: 39 Stewie Dr. Kenora, ON K2K 2M1
Phone: 613-536-1422 ext. 231 Fax:
PO #:
Client Project #: 63978.96
AGAT Quotation #:

Report Information - reports to be sent to:
1. Name: ~~jmcewen@~~ James McEwen
Email: jmcewen@hceng.ca
2. Name:
Email:

Report Format
☑ Single Sample per Page
☐ Multiple Samples per page
☐ Results by fax

Turnaround Time (TAT) Required*
Regular TAT:
☑ 7 to 14 Days
Rush TAT: (please provide prior notification)
Rush Surcharges Apply
☐ 5 to 7 Working Days
☐ 3 to 5 Working Days
☐ 1 to 3 Working Days
DATE REQUIRED (Rush surcharges may apply):

Facility Type (Check all that are applicable)
☐ Large OR ☑ Small
☑ Residential OR ☐ Non-Residential
☐ Municipal OR ☑ Non-Municipal

+ Water Type (specify in column below)
Raw (R), Treated (TR), Distribution (D), Tap (TP), or Private Well (P)

Regulation (Check applicable regulation)
☑ O. Regulation 170
☐ O. Regulation 243
☐ O. Regulation 318/319
☐ Not Applicable
☐ Other (Please Specify)

IS THIS WATER BEING CONSUMED BY HUMANS? ☐ YES ☐ NO
DO THE RESULTS REQUIRE REPORTING TO THE MOE'S DWIS or MOH's LRMA? ☐ YES ☑ NO
HAS LAB SERVICE NOTIFICATION (LSN) FORM BEEN COMPLETED & SUBMITTED TO THE MOE/PHU? ☐ YES ☑ NO

ALL "NOTIFICATION INFORMATION" MUST BE COMPLETED BELOW UPON SUBMISSION OF SAMPLES. LABORATORY ANALYSIS WILL NOT COMMENCE UNTIL ALL INFORMATION HAS BEEN PROVIDED

Sample Identification / Location	Date Sampled	Time Sampled	Water Type+	# of Containers	Chlorine Residual (incl. Units)	Standing	Flushed	Comments / Standing Time (in minutes)	Inorganics (Sch. 23)	Organics (Sch. 24)	Lead	Fluoride	Sodium	Turbidity	Nitrate, Nitrite	Trihalomethanes	E.coli, Total Coliforms	Heavy Metals
Set 1 - 4 hr	05/10/16	12:30	Drinking	12				submission etg.	✓									✓
Set 2 - 8 hr	05/10/16	16:30	Drinking	12				submission pics.	✓									✓

Please see attached email!

Samples Taken By (Print Name and Sign):

* TAT is exclusive of weekends & statutory holidays. Prior arrangements must be made with the laboratory in order to submit Microbiology samples on Fridays

NOTIFICATION INFORMATION - (required to report adverse results as per the Safe Drinking Water Act) - **Laboratory analysis will not commence until all information is received.**

Information for Adverse Reporting			Medical Officer Of Health (MOH)	
Waterworks Name:	Ph #:	Fax #:	Region:	
MOE# (i.e. waterworks#):	Aft. Hours Ph. #:		PHU Contact:	
Contact:	Address/Location (if different from client info above):		Ph #:	Fax #:
Email:			Email:	

Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time	
Greg Davidson - Greg Davidson	05/11/16 8:00	Bernhard Schmitt	11-May-16 8h10	Pink Copy - Client Golden/Yellow Copy - AGAT White Copy - AGAT
Samples Relinquished By (print name & sign)	Date/Time	Samples Received By (print name & sign)	Date/Time	NO: DW 49143
		Simon Jan 16/12/5	9:00	

PAGE 1 of 1

AGAT Laboratories

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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: HOULE CHEVRIER
32 STEACIE DRIVE
OTTAWA, ON K2K2A9
(613) 836-1422

ATTENTION TO: James Mcewen

PROJECT: 63978.96

AGAT WORK ORDER: 16Z097017

MICROBIOLOGY ANALYSIS REVIEWED BY: Inesa Alizarchyk, Inorganic Lab Supervisor

DATE REPORTED: May 31, 2016

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 16Z097017

PROJECT: 63978.96

CLIENT NAME: HOULE CHEVRIER

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Microbiological Analysis (water)

DATE RECEIVED: 2016-05-20

DATE REPORTED: 2016-05-31

		SAMPLE DESCRIPTION:		R-1(1-2)	R-2(1-2)
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		5/20/2016	5/20/2016
Parameter	Unit	G / S	RDL	7573859	7573866
Escherichia coli	CFU/100mL	0	**1**	ND	ND
Total Coliforms	CFU/100mL	0	**1**	ND	ND
Fecal Coliform	CFU/100mL		1	ND	ND
Heterotrophic Plate Count	CFU/1mL		10	20	55

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to SDWA - Microbiology

7573859-7573866 ND - Not Detected.

Certified By:

AGAT Laboratories

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Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z097017

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: May 31, 2016			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Microbiological Analysis (water)															
Escherichia coli	7572225		ND	ND	NA	< 1									
Total Coliforms	7572225		ND	ND	NA	< 1									
Fecal Coliform	7573859	7573859	ND	ND	NA	< 1									
Heterotrophic Plate Count	7573859	7573859	ND	ND	NA	< 10									

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By:

AGAT Laboratories

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Method Summary

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z097017

PROJECT: 63978.96

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Heterotrophic Plate Count	MIC-93-7020	SM 9215C	MF/INCUBATOR

AGAT Laboratories
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Mississauga, ON
L4Z 1Y2
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Drinking Water Chain of Custody Record

Laboratory Use Only
Arrival Condition: ☑ Good ☐ Poor (complete notes)
Arrival Temperature: 7.9 / 8.5 / 8.8
AGAT Job Number: 1672097017
Notes: 7 7 8 4 8 8

Client Information
Company: Haule Chevrier Engineering LTD
Contact: James McEwen
Address: 32 Steacie Dr. Kanata, ON K2K 2A9
Phone: 613-836-1422 Fax:
PO #:
Client Project #: 63478.96
AGAT Quotation #:

Report Information
1. Name: James McEwen
Email: jmcewen@hceng.ca
2. Name:
Email:

Report Format
☑ Single Sample per page
☐ Multiple Samples per page

Turnaround Time Required (TAT) *
Regular TAT 7 to 14 business days ☑
Rush TAT (Please provide prior notification)
5 to 7 business days ☐
3 to 5 business days ☐
1 to 3 business days ☐
Rush surcharges apply
Date Required (Rush surcharges may apply):

Facility Type (Check all that are applicable)
☐ Large OR ☑ Small
☑ Residential OR ☐ Non-Residential
☐ Municipal OR ☐ Non-Municipal

+ Water Type
(Specify in column below)
Raw (R), Treated (TR), Distribution (D), Tap (TP), Private Well (P)

Requirements (Check one)
☑ O. Regulation 170
☐ O. Regulation 243
☐ O. Regulation 318/319
☐ Not Applicable
☐ Other (Please Specify)

IS THIS WATER BEING CONSUMED BY HUMANS? ☐ Yes ☑ No
DO THE RESULTS REQUIRE REPORTING TO THE MOECC'S DWIS OR MOH'S LRMA? ☐ Yes ☑ No
CLIENT IS RESPONSIBLE TO COMPELTE AND SUBMIT LAB SERVICE NOTIFICATION (LSN) FORM TO THE MOECC/PHU. FAILURE TO DO SO MAY DELAY REPORTING.
"NOTIFICATION INFORMATION" MUST BE COMPLETE BELOW UPON SUBMISSION OF SAMPLES. LABORATORY ANALYSIS WILL NOT COMMENCE UNTIL ALL INFORMATION HAS BEEN PROVIDED.

SAMPLE IDENTIFICATION/LOCATION	DATE SAMPLED	TIME SAMPLED	WATER TYPE +	# OF CONTAINERS	CHLORINE RESIDUAL (incl. Units)	STANDING	FLUSHED	COMMENTS/STANDING TIME (IN MINUTES)	Inorganics (Sch. 23)	Organics (Sch. 24)	Lead	Fluoride	Sodium	Turbidity	Nitrate, Nitrite	Trihalomethanes	E.coli, Total Coliforms	MIBI X4		
R1-2 / R1-1	May 20/16	14:02	Drinking	2														✓		
R2-1 / R2-2	May 20/16	14:15	Drinking	2														✓		

Samples Taken By (Print Name and Sign):

* TAT is exclusive of weekends and statutory holidays. Prior arrangements must be made with the laboratory in order to submit Microbiology samples on Fridays

NOTIFICATION INFORMATION - (required to report adverse results as per the *Safe Drinking Water Act*) - **Laboratory analysis will not commence until all information is received.**

INFORMATION FOR ADVERSE REPORTING			MEDICAL OFFICER OF HEALTH (MOH)	
Waterworks Name:	Phone:	Fax:	Region:	
MOECC# (ie: Waterworks #):	After Hours Phone:		PHU Contact:	
Contact:	Address/Location (if different from client above)		Phone:	Fax:
Email:			Email:	

Samples Relinquished By (Print Name and Sign):	Date/Time	Samples Received By (Print Name and Sign):	Date/Time
Greg Davidson	May 20/16 14:45	C Berthelet/D Brun	20-May-16 14h45
C Berthelet/D Brun Friedrich	20-May-16 16h45	Dina	16/5/21 10:14

Pink Copy - Client
Yellow/Golden Copy - AGAT
White Copy- AGAT

Page 1 of 1

N°: DW

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Certificate of Analysis

Houle Chevrier

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 61318.15
Custody: 6642

Report Date: 12-Jul-2017
Order Date: 6-Jul-2017

Order #: 1727266

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

Paracel ID	Client ID
1727266-01	TW1-6

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 12-Jul-2017
Order Date: 6-Jul-2017
Project Description: 61318.15

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	6-Jul-17	6-Jul-17
Ammonia, as N	EPA 351.2 - Auto Colour	11-Jul-17	11-Jul-17
Anions	EPA 300.1 - IC	7-Jul-17	7-Jul-17
Colour	SM2120 - Spectrophotometric	6-Jul-17	6-Jul-17
Conductivity	EPA 9050A- probe @25 °C	6-Jul-17	6-Jul-17
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	12-Jul-17	12-Jul-17
E. coli	MOE E3407	6-Jul-17	6-Jul-17
Fecal Coliform	SM 9222D	6-Jul-17	6-Jul-17
Heterotrophic Plate Count	SM 9215C	6-Jul-17	6-Jul-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	7-Jul-17	7-Jul-17
pH	EPA 150.1 - pH probe @25 °C	6-Jul-17	6-Jul-17
Phenolics	EPA 420.2 - Auto Colour, 4AAP	7-Jul-17	11-Jul-17
Subdivision Package	Hardness as CaCO3	7-Jul-17	7-Jul-17
Sulphide	SM 4500SE - Colourimetric	11-Jul-17	11-Jul-17
Tannin/Lignin	SM 5550B - Colourimetric	7-Jul-17	7-Jul-17
Total Coliform	MOE E3407	6-Jul-17	6-Jul-17
Total Dissolved Solids	SM 2540C - gravimetric, filtration	6-Jul-17	7-Jul-17
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	11-Jul-17	12-Jul-17
Turbidity	SM 2130B - Turbidity meter	6-Jul-17	7-Jul-17

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 12-Jul-2017
Order Date: 6-Jul-2017
Project Description: 61318.15

	Client ID:	TW1-6	-	-	-
	Sample Date:	05-Jul-17	-	-	-
	Sample ID:	1727266-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	7	-	-	-
Heterotrophic Plate Count	10 CFU/mL	30	-	-	-
General Inorganics					
Alkalinity, total	5 mg/L	347	-	-	-
Ammonia as N	0.01 mg/L	0.16	-	-	-
Dissolved Organic Carbon	0.5 mg/L	2.1	-	-	-
Colour	2 TCU	3	-	-	-
Conductivity	5 uS/cm	962	-	-	-
Hardness	mg/L	395	-	-	-
pH	0.1 pH Units	7.8	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-
Total Dissolved Solids	10 mg/L	660	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-
Tannin & Lignin	0.1 mg/L	0.1	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	-	-	-
Turbidity	0.1 NTU	12.8	-	-	-
Anions					
Chloride	1 mg/L	86	-	-	-
Fluoride	0.1 mg/L	<0.1	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-
Sulphate	1 mg/L	74	-	-	-
Metals					
Calcium	0.1 mg/L	111	-	-	-
Iron	0.1 mg/L	1	-	-	-
Magnesium	0.2 mg/L	28.3	-	-	-
Manganese	0.005 mg/L	0.096	-	-	-
Potassium	0.1 mg/L	3.1	-	-	-
Sodium	0.2 mg/L	38.8	-	-	-

Method Quality Control: Blank

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

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 12-Jul-2017
Order Date: 6-Jul-2017
Project Description: 61318.15

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	86.1	1	mg/L	86.1			0.1	10	
Fluoride	ND	0.1	mg/L	ND				10	
Nitrate as N	ND	0.1	mg/L	ND				20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Sulphate	72.5	1	mg/L	73.7			1.6	10	
General Inorganics									
Alkalinity, total	240	5	mg/L	243			1.2	14	
Ammonia as N	0.141	0.01	mg/L	0.155			9.6	8	QR-05
Dissolved Organic Carbon	2.9	0.5	mg/L	3.3			11.6	37	
Colour	3	2	TCU	3			0.0	12	
Conductivity	566	5	uS/cm	582			2.8	11	
pH	7.5	0.1	pH Units	7.5			0.1	10	
Phenolics	ND	0.001	mg/L	ND				10	
Total Dissolved Solids	628	10	mg/L	660			5.0	10	
Sulphide	ND	0.02	mg/L	ND				10	
Tannin & Lignin	ND	0.1	mg/L	ND			0.0	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	0.23			0.0	10	
Turbidity	0.2	0.1	NTU	0.2			0.0	10	
Metals									
Calcium	10.4	0.1	mg/L	10.4			0.2	20	
Iron	ND	0.1	mg/L	ND			0.0	20	
Magnesium	2.7	0.2	mg/L	2.7			2.0	20	
Manganese	ND	0.005	mg/L	ND			0.0	20	
Potassium	0.7	0.1	mg/L	0.7			0.7	20	
Sodium	21.0	0.2	mg/L	20.6			1.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	7	1	CFU/100 mL	7			0.0	30	
Heterotrophic Plate Count	ND	10	CFU/mL	30			0.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	96.1	1	mg/L	86.1	101	78-112			
Fluoride	0.95	0.1	mg/L	ND	95.5	73-113			
Nitrate as N	0.88	0.1	mg/L	ND	88.2	81-112			
Nitrite as N	1.02	0.05	mg/L	ND	102	76-107			
Sulphate	82.7	1	mg/L	73.7	89.9	75-111			
General Inorganics									
Ammonia as N	0.413	0.01	mg/L	0.155	103	81-124			
Dissolved Organic Carbon	11.7	0.5	mg/L	3.3	84.0	60-133			
Phenolics	0.028	0.001	mg/L	ND	112	69-132			
Total Dissolved Solids	102	10	mg/L		102	75-125			
Sulphide	0.48	0.02	mg/L	ND	85.5	79-115			
Tannin & Lignin	0.9	0.1	mg/L	ND	88.3	71-113			
Total Kjeldahl Nitrogen	2.12	0.1	mg/L		106	81-126			
Metals									
Calcium	958		ug/L		95.8	80-120			
Iron	948		ug/L	6	94.2	80-120			
Magnesium	3420		ug/L	2690	73.5	80-120			QM-07
Manganese	53.1		ug/L	2.83	101	80-120			
Potassium	1550		ug/L	721	82.5	80-120			
Sodium	1190		ug/L		119	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

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

QR-05 : Duplicate RPDs higher than normally accepted. Remaing batch QA\QC was acceptable. May be sample effect.

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.

Paracel ID: 1727266

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Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 6642
1727266	

Client Name:	Hoyle Chevrier	Project Ref:	61318.15	Waterworks Name:	Samples Taken By:
Contact Name:	A. Varnekas	Quote #:		Waterworks Number:	Name:
Address:	32 Steacie Drive	PO #:		Address:	Signature:
After Hours Contact:		E-mail:	avarnekas@hcengr.ca		Page ____ of ____
Telephone:	613-836-1422	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other Oreg 169/03

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Subdivision - Package			
1	TWI-3	TWI-3	R	G	N	-	July 5/17		8	0.0						X			
2	TWI-6	TWI-6	R	G	N	-	July 5/17		8	0.0						X			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: TWI-3 on hold

Method of Delivery: Paracel

Relinquished By (Sign): A. Varnekas	Received By Driver/Depot: T. Steuse	Received at Lab: WINDSOR LON MIS	Verified By:
Relinquished By (Print): A. Varnekas	Date/Time: 06/07/17 10:31 AM	Date/Time: JUL 06 2017 12:12	Date/Time: 070617 12:4pm
Date/Time: July 6, 2017 10:31 am	Temperature: °C	Temperature: 9.0 °C	pH Verified: ☑ By: KW

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Certificate of Analysis

Houle Chevrier

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 61318.15
Custody: 6676

Report Date: 23-Oct-2017
Order Date: 17-Oct-2017

Order #: 1742284

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

Paracel ID	Client ID
1742284-01	NTW3-3hr
1742284-02	NTW3-6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 23-Oct-2017
Order Date: 17-Oct-2017
Project Description: 61318.15

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	18-Oct-17	18-Oct-17
Ammonia, as N	EPA 351.2 - Auto Colour	19-Oct-17	19-Oct-17
Anions	EPA 300.1 - IC	19-Oct-17	19-Oct-17
Chromium, hexavalent - water	MOE E3056 - colourimetric	18-Oct-17	18-Oct-17
Colour	SM2120 - Spectrophotometric	19-Oct-17	19-Oct-17
Conductivity	EPA 9050A- probe @25 °C	18-Oct-17	18-Oct-17
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	19-Oct-17	19-Oct-17
E. coli	MOE E3407	18-Oct-17	18-Oct-17
Fecal Coliform	SM 9222D	18-Oct-17	18-Oct-17
Heterotrophic Plate Count	SM 9215C	18-Oct-17	18-Oct-17
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	23-Oct-17	23-Oct-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	18-Oct-17	18-Oct-17
pH	EPA 150.1 - pH probe @25 °C	18-Oct-17	18-Oct-17
Phenolics	EPA 420.2 - Auto Colour, 4AAP	18-Oct-17	18-Oct-17
Subdivision Package	Hardness as CaCO3	18-Oct-17	18-Oct-17
Sulphide	SM 4500SE - Colourimetric	18-Oct-17	18-Oct-17
Tannin/Lignin	SM 5550B - Colourimetric	20-Oct-17	23-Oct-17
Total Coliform	MOE E3407	18-Oct-17	18-Oct-17
Total Dissolved Solids	SM 2540C - gravimetric, filtration	19-Oct-17	20-Oct-17
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	18-Oct-17	23-Oct-17
Turbidity	SM 2130B - Turbidity meter	19-Oct-17	19-Oct-17

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 23-Oct-2017
Order Date: 17-Oct-2017
Project Description: 61318.15

	Client ID:	NTW3-3hr	NTW3-6hr	-	-
	Sample Date:	17-Oct-17	17-Oct-17	-	-
	Sample ID:	1742284-01	1742284-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	278	278	-	-
Ammonia as N	0.01 mg/L	0.11	0.11	-	-
Dissolved Organic Carbon	0.5 mg/L	2.5	2.3	-	-
Colour	2 TCU	<2	<2	-	-
Conductivity	5 uS/cm	794	799	-	-
Hardness	mg/L	322	324	-	-
pH	0.1 pH Units	7.7	7.7	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	416	452	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	0.3	-	-
Turbidity	0.1 NTU	3.3	3.0	-	-
Anions					
Chloride	1 mg/L	79	79	-	-
Fluoride	0.1 mg/L	0.2	0.2	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	57	57	-	-
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	-
Aluminum	0.001 mg/L	-	<0.001	-	-
Antimony	0.0005 mg/L	-	<0.0005	-	-
Arsenic	0.001 mg/L	-	<0.001	-	-
Barium	0.001 mg/L	-	0.109	-	-
Beryllium	0.0005 mg/L	-	<0.0005	-	-
Boron	0.01 mg/L	-	0.01	-	-
Cadmium	0.0001 mg/L	-	<0.0001	-	-
Calcium	0.1 mg/L	92.5	93.1	-	-
Chromium	0.001 mg/L	-	<0.001	-	-

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 23-Oct-2017
Order Date: 17-Oct-2017
Project Description: 61318.15

	Client ID:	NTW3-3hr	NTW3-6hr	-	-
	Sample Date:	17-Oct-17	17-Oct-17	-	-
	Sample ID:	1742284-01	1742284-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Chromium (VI)	0.010 mg/L	-	<0.010	-	-
Cobalt	0.0005 mg/L	-	<0.0005	-	-
Copper	0.0005 mg/L	-	<0.0005	-	-
Iron	0.1 mg/L	0.9	0.9	-	-
Lead	0.0001 mg/L	-	<0.0001	-	-
Magnesium	0.2 mg/L	22.0	22.2	-	-
Manganese	0.005 mg/L	0.191	0.191	-	-
Molybdenum	0.0005 mg/L	-	0.0023	-	-
Nickel	0.001 mg/L	-	<0.001	-	-
Potassium	0.1 mg/L	1.5	1.5	-	-
Selenium	0.001 mg/L	-	<0.001	-	-
Silicon	0.01 mg/L	-	8.00	-	-
Silver	0.0001 mg/L	-	<0.0001	-	-
Sodium	0.2 mg/L	31.7	32.1	-	-
Strontium	0.01 mg/L	-	0.24	-	-
Thallium	0.001 mg/L	-	<0.001	-	-
Tin	0.01 mg/L	-	<0.01	-	-
Titanium	0.005 mg/L	-	<0.005	-	-
Tungsten	0.01 mg/L	-	<0.01	-	-
Uranium	0.0001 mg/L	-	0.0009	-	-
Vanadium	0.0005 mg/L	-	<0.0005	-	-
Zinc	0.005 mg/L	-	<0.005	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
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 (VI)	ND	0.010	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						
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						
Silicon	ND	0.01	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						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	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/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
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
Anions									
Chloride	237	1	mg/L	237			0.1	10	
Fluoride	0.23	0.1	mg/L	0.23			0.3	10	
Nitrate as N	0.81	0.1	mg/L	0.81			0.0	20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Sulphate	99.4	1	mg/L	99.3			0.1	10	
General Inorganics									
Alkalinity, total	276	5	mg/L	278			0.8	14	
Ammonia as N	0.535	0.01	mg/L	0.545			1.8	17.7	
Dissolved Organic Carbon	1.1	0.5	mg/L	1.0			6.9	37	
Colour	ND	2	TCU	ND				12	
Conductivity	774	5	uS/cm	794			2.5	11	
pH	7.8	0.1	pH Units	7.7			0.6	10	
Phenolics	ND	0.004	mg/L	ND				10	GEN02
Total Dissolved Solids	436	10	mg/L	416			4.7	10	
Sulphide	ND	0.02	mg/L	ND				10	
Tannin & Lignin	ND	0.1	mg/L	ND			0.0	11	
Total Kjeldahl Nitrogen	0.33	0.1	mg/L	0.38			14.2	10	QR-01
Turbidity	3.2	0.1	NTU	3.3			0.6	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			0.0	20	
Aluminum	ND	0.001	mg/L	ND				20	
Antimony	0.0006	0.0005	mg/L	ND			0.0	20	
Arsenic	ND	0.001	mg/L	ND			0.0	20	
Barium	0.054	0.001	mg/L	0.057			4.1	20	
Beryllium	ND	0.0005	mg/L	ND			0.0	20	
Boron	0.08	0.01	mg/L	0.08			6.1	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Calcium	110	0.1	mg/L	108			2.6	20	
Chromium (VI)	ND	0.010	mg/L	ND				20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	0.0008	0.0005	mg/L	0.0007			4.5	20	
Iron	ND	0.1	mg/L	ND			0.0	20	
Lead	0.0001	0.0001	mg/L	ND			0.0	20	
Magnesium	89.0	0.2	mg/L	88.5			0.6	20	
Manganese	ND	0.005	mg/L	ND			0.0	20	
Molybdenum	0.0014	0.0005	mg/L	0.0012			15.7	20	
Nickel	ND	0.001	mg/L	ND			0.0	20	
Potassium	4.2	0.1	mg/L	4.3			1.3	20	
Selenium	0.001	0.001	mg/L	0.001			1.0	20	
Silicon	6.52	0.01	mg/L	5.86			10.6	20	
Silver	ND	0.0001	mg/L	ND			0.0	20	
Sodium	56.4	0.2	mg/L	56.2			0.4	20	
Thallium	ND	0.001	mg/L	ND			0.0	20	
Tin	ND	0.01	mg/L	ND			0.0	20	
Titanium	ND	0.005	mg/L	ND			0.0	50	
Tungsten	ND	0.01	mg/L	ND			0.0	20	
Uranium	0.0055	0.0001	mg/L	0.0051			7.0	20	
Vanadium	ND	0.0005	mg/L	ND			0.0	20	
Zinc	0.012	0.005	mg/L	0.013			3.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	ND	1	CFU/100 mL	ND				30	
Heterotrophic Plate Count	10	10	CFU/mL	10			0.0	30	

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 23-Oct-2017
Order Date: 17-Oct-2017
Project Description: 61318.15

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	9.84	1	mg/L		98.4	78-112			
Fluoride	1.25	0.1	mg/L	0.23	102	73-113			
Nitrate as N	1.81	0.1	mg/L	0.81	101	81-112			
Nitrite as N	0.964	0.05	mg/L	ND	96.4	76-107			
Sulphate	108	1	mg/L	99.3	89.9	75-111			
General Inorganics									
Ammonia as N	0.804	0.01	mg/L	0.545	104	81-124			
Dissolved Organic Carbon	11.7	0.5	mg/L	1.0	107	60-133			
Phenolics	0.024	0.001	mg/L		97.0	69-132			
Total Dissolved Solids	92.0	10	mg/L		92.0	75-125			
Sulphide	0.53	0.02	mg/L	ND	106	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	97.8	71-113			
Total Kjeldahl Nitrogen	2.32	0.1	mg/L	0.38	97.2	81-126			
Metals									
Mercury	0.0030	0.0001	mg/L	ND	99.0	70-130			
Aluminum	65.9		ug/L	ND	132	80-120			QM-07
Antimony	58.9		ug/L	0.0294	118	80-120			
Arsenic	68.1		ug/L	0.278	136	80-120			QM-07
Barium	102		ug/L	56.6	90.3	80-120			
Beryllium	52.5		ug/L	0.0022	105	80-120			
Boron	122		ug/L	80.7	83.2	80-120			
Cadmium	53.2		ug/L		106	80-120			
Calcium	924		ug/L		92.4	80-120			
Chromium (VI)	0.185	0.010	mg/L	ND	92.5	70-130			
Chromium	52.6		ug/L		105	80-120			
Cobalt	57.4		ug/L	0.0186	115	80-120			
Copper	56.6		ug/L	0.738	112	80-120			
Iron	1100		ug/L		110	80-120			
Lead	50.2		ug/L	0.0376	100	80-120			
Magnesium	1010		ug/L		101	80-120			
Manganese	53.3		ug/L		107	80-120			
Molybdenum	60.8		ug/L	1.22	119	80-120			
Nickel	56.0		ug/L	0.109	112	80-120			
Potassium	5160		ug/L	4250	90.8	80-120			
Selenium	52.6		ug/L		105	80-120			
Silicon	45.1		ug/L		90.2	80-120			
Silver	48.0		ug/L	ND	96.0	80-120			
Sodium	1040		ug/L		104	80-120			
Thallium	51.9		ug/L	0.011	104	80-120			
Tin	53.3		ug/L		107	80-120			
Titanium	52.5		ug/L		105	70-130			
Tungsten	58.7		ug/L	0.20	117	80-120			
Uranium	50.8		ug/L		102	80-120			
Vanadium	52.8		ug/L		106	80-120			
Zinc	69.5		ug/L	12.6	114	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

GEN02 : Elevated Reporting Limit due to matrix interference.

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

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

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.

PARACE LABORATORIES L

Paracel ID: 1742284

Paracel Order Number	Chain Of Custody
1742284	Ontario Drinking Water Samples № 6676

Client Name:	Hale Chevrier	Project Ref:	6131&15	Waterworks Name:	Samples Taken By:
Contact Name:	A. Parmekas	Quote #:		Waterworks Number:	Name: A Parmekas
Address:	32 steacie	PO #:		Address:	Signature:
After Hours Contact:		E-mail:	aparmekas@hlcengka		Page ____ of ____
Telephone:	613-836-1422	Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other: Reg 169/03 (ODWS)

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Total Coliform/E. Coli	HPC	Lead	THM	Sub. Package (Metals)	Heavy metals		
1	–	NTW3-3hr	R	G	N	–	Oct 17/17	11:30 am	8	0.0						X			
2	–	NTW3-6hr	R	G	N	–	Oct 17/17	2:30 pm	11	0.0						X	X		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: will email stephanie list of subpackage and heavy metals parameters
↳ Include Hg/CrVI & SC.

Method of Delivery: Walk-in

Relinquished By (Sign): A Parmekas	Received By Driver/Depot: Karen Cull	Received at Lab: Rachel Sybert	Verified By:
Relinquished By (Print): A. Parmekas	Date/Time: Oct 17/17 4:50	Date/Time: oct 17/17	Date/Time: OCT/17 11:43a
Date/Time: Oct 17/17 4:50pm	Temperature: 9.8 °C	Temperature: ~~10.4~~ 6.3 °C 11.15	pH Verified: ☑ By: KJ

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Certificate of Analysis

Houle Chevrier

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 61318.15
Custody: 6677

Report Date: 24-Oct-2017
Order Date: 18-Oct-2017

Order #: 1742435

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

Paracel ID	Client ID
1742435-01	NTW2- 3hr
1742435-02	NTW2- 6hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 24-Oct-2017
Order Date: 18-Oct-2017
Project Description: 61318.15

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	20-Oct-17	20-Oct-17
Ammonia, as N	EPA 351.2 - Auto Colour	24-Oct-17	24-Oct-17
Anions	EPA 300.1 - IC	23-Oct-17	23-Oct-17
Chromium, hexavalent - water	MOE E3056 - colourimetric	20-Oct-17	20-Oct-17
Colour	SM2120 - Spectrophotometric	20-Oct-17	20-Oct-17
Conductivity	EPA 9050A- probe @25 °C	20-Oct-17	20-Oct-17
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	23-Oct-17	24-Oct-17
E. coli	MOE E3407	19-Oct-17	19-Oct-17
Fecal Coliform	SM 9222D	19-Oct-17	19-Oct-17
Heterotrophic Plate Count	SM 9215C	20-Oct-17	20-Oct-17
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	23-Oct-17	23-Oct-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	19-Oct-17	19-Oct-17
pH	EPA 150.1 - pH probe @25 °C	20-Oct-17	20-Oct-17
Phenolics	EPA 420.2 - Auto Colour, 4AAP	20-Oct-17	23-Oct-17
Subdivision Package	Hardness as CaCO3	19-Oct-17	19-Oct-17
Sulphide	SM 4500SE - Colourimetric	24-Oct-17	24-Oct-17
Tannin/Lignin	SM 5550B - Colourimetric	20-Oct-17	23-Oct-17
Total Coliform	MOE E3407	19-Oct-17	19-Oct-17
Total Dissolved Solids	SM 2540C - gravimetric, filtration	21-Oct-17	24-Oct-17
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Oct-17	23-Oct-17
Turbidity	SM 2130B - Turbidity meter	19-Oct-17	19-Oct-17

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 24-Oct-2017
Order Date: 18-Oct-2017
Project Description: 61318.15

	Client ID:	NTW2- 3hr	NTW2- 6hr	-	-
	Sample Date:	18-Oct-17	18-Oct-17	-	-
	Sample ID:	1742435-01	1742435-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	293	294	-	-
Ammonia as N	0.01 mg/L	0.42	0.42	-	-
Dissolved Organic Carbon	0.5 mg/L	2.0	2.1	-	-
Colour	2 TCU	4	3	-	-
Conductivity	5 uS/cm	722	724	-	-
Hardness	mg/L	228	233	-	-
pH	0.1 pH Units	7.9	8.0	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	434	426	-	-
Sulphide	0.02 mg/L	7.00	0.30	-	-
Tannin & Lignin	0.1 mg/L	0.8	0.2	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.5	0.5	-	-
Turbidity	0.1 NTU	4.1	12.9	-	-
Anions					
Chloride	1 mg/L	65	69	-	-
Fluoride	0.1 mg/L	0.7	0.7	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	21	20	-	-
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	-
Aluminum	0.001 mg/L	-	0.036	-	-
Antimony	0.0005 mg/L	-	<0.0005	-	-
Arsenic	0.001 mg/L	-	<0.001	-	-
Barium	0.001 mg/L	-	0.136	-	-
Beryllium	0.0005 mg/L	-	<0.0005	-	-
Boron	0.01 mg/L	-	0.14	-	-
Cadmium	0.0001 mg/L	-	<0.0001	-	-
Calcium	0.1 mg/L	46.1	48.7	-	-
Chromium	0.001 mg/L	-	<0.001	-	-

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 24-Oct-2017
Order Date: 18-Oct-2017
Project Description: 61318.15

	Client ID:	NTW2- 3hr	NTW2- 6hr	-	-
	Sample Date:	18-Oct-17	18-Oct-17	-	-
	Sample ID:	1742435-01	1742435-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Chromium (VI)	0.010 mg/L	-	<0.010	-	-
Cobalt	0.0005 mg/L	-	<0.0005	-	-
Copper	0.0005 mg/L	-	0.0007	-	-
Iron	0.1 mg/L	<0.1	<0.1	-	-
Lead	0.0001 mg/L	-	<0.0001	-	-
Magnesium	0.2 mg/L	27.4	27.0	-	-
Manganese	0.005 mg/L	0.006	0.006	-	-
Molybdenum	0.0005 mg/L	-	<0.0005	-	-
Nickel	0.001 mg/L	-	<0.001	-	-
Potassium	0.1 mg/L	8.5	8.0	-	-
Selenium	0.001 mg/L	-	0.006	-	-
Silicon	0.01 mg/L	-	6.87	-	-
Silver	0.0001 mg/L	-	<0.0001	-	-
Sodium	0.2 mg/L	57.0	54.0	-	-
Strontium	0.01 mg/L	-	2.59	-	-
Thallium	0.001 mg/L	-	<0.001	-	-
Tin	0.01 mg/L	-	<0.01	-	-
Titanium	0.005 mg/L	-	<0.005	-	-
Tungsten	0.01 mg/L	-	<0.01	-	-
Uranium	0.0001 mg/L	-	<0.0001	-	-
Vanadium	0.0005 mg/L	-	<0.0005	-	-
Zinc	0.005 mg/L	-	0.006	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
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 (VI)	ND	0.010	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						
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						
Silicon	ND	0.01	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						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	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/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
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
Anions									
Chloride	50.8	1	mg/L	50.7			0.2	10	
Fluoride	3.50	0.1	mg/L	3.54			1.1	10	
Nitrate as N	ND	0.1	mg/L	ND			0.0	20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Sulphate	50.5	1	mg/L	50.5			0.0	10	
General Inorganics									
Alkalinity, total	287	5	mg/L	293			2.2	14	
Ammonia as N	0.078	0.01	mg/L	0.072			7.5	17.7	
Dissolved Organic Carbon	2.9	0.5	mg/L	3.1			4.8	37	
Colour	4	2	TCU	4			0.0	12	
Conductivity	709	5	uS/cm	722			1.9	11	
pH	7.9	0.1	pH Units	7.9			0.1	10	
Phenolics	ND	0.001	mg/L	ND				10	
Total Dissolved Solids	104	10	mg/L	100			3.9	10	
Sulphide	0.29	0.02	mg/L	0.30			2.7	10	
Tannin & Lignin	ND	0.1	mg/L	ND			0.0	11	
Total Kjeldahl Nitrogen	0.51	0.1	mg/L	0.54			4.3	10	
Turbidity	4.1	0.1	NTU	4.1			0.5	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			0.0	20	
Aluminum	ND	0.001	mg/L	ND			0.0	20	
Antimony	0.0007	0.0005	mg/L	ND			0.0	20	
Arsenic	ND	0.001	mg/L	ND			0.0	20	
Barium	0.083	0.001	mg/L	0.084			0.7	20	
Beryllium	ND	0.0005	mg/L	ND			0.0	20	
Boron	0.05	0.01	mg/L	0.05			1.2	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Calcium	84.3	0.1	mg/L	84.6			0.3	20	
Chromium (VI)	ND	0.010	mg/L	ND				20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	0.0363	0.0005	mg/L	0.0362			0.1	20	
Iron	0.2	0.1	mg/L	0.2			1.0	20	
Lead	0.0001	0.0001	mg/L	ND			0.0	20	
Magnesium	11.3	0.2	mg/L	11.3			0.1	20	
Manganese	0.068	0.005	mg/L	0.068			0.2	20	
Molybdenum	0.0014	0.0005	mg/L	0.0013			9.0	20	
Nickel	ND	0.001	mg/L	ND			0.0	20	
Potassium	9.0	0.1	mg/L	9.1			0.5	20	
Selenium	0.002	0.001	mg/L	0.002			4.3	20	
Silicon	3.37	1.00	mg/L	3.23			4.5	20	
Silver	ND	0.0001	mg/L	ND				20	
Sodium	10.8	0.2	mg/L	10.7			0.4	20	
Thallium	ND	0.001	mg/L	ND			0.0	20	
Tin	ND	0.01	mg/L	ND			0.0	20	
Titanium	ND	0.005	mg/L	ND			0.0	50	
Tungsten	ND	0.01	mg/L	ND			0.0	20	
Uranium	0.0051	0.0001	mg/L	0.0048			6.1	20	
Vanadium	ND	0.0005	mg/L	ND			0.0	20	
Zinc	0.014	0.005	mg/L	0.015			9.3	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	ND	1	CFU/100 mL	ND				30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND				30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	60.2	1	mg/L	50.7	94.9	78-112			
Fluoride	4.52	0.1	mg/L	3.54	97.3	73-113			
Nitrate as N	1.03	0.1	mg/L	ND	103	81-112			
Nitrite as N	0.975	0.05	mg/L	ND	97.5	76-107			
Sulphate	59.6	1	mg/L	50.5	91.8	75-111			
General Inorganics									
Ammonia as N	0.348	0.01	mg/L	0.072	110	81-124			
Dissolved Organic Carbon	13.5	0.5	mg/L	2.9	106	60-133			
Phenolics	0.024	0.001	mg/L	ND	97.3	69-132			
Total Dissolved Solids	106	10	mg/L		106	75-125			
Sulphide	0.73	0.02	mg/L	0.30	85.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	97.8	71-113			
Total Kjeldahl Nitrogen	2.57	0.1	mg/L	0.54	102	81-126			
Metals									
Mercury	0.0030	0.0001	mg/L	ND	99.0	70-130			
Aluminum	61.2		ug/L	0.042	122	80-120			QM-07
Antimony	56.0		ug/L	0.491	111	80-120			
Arsenic	65.8		ug/L	0.665	130	80-120			QM-07
Barium	134		ug/L	83.6	102	80-120			
Beryllium	57.3		ug/L	0.0167	115	80-120			
Boron	105		ug/L	54.5	101	80-120			
Cadmium	58.9		ug/L	0.0024	118	80-120			
Calcium	942		ug/L		94.2	80-120			
Chromium (VI)	0.175	0.010	mg/L	ND	87.5	70-130			
Chromium	60.2		ug/L	0.294	120	80-120			
Cobalt	57.1		ug/L	0.0967	114	80-120			
Copper	90.4		ug/L	36.2	108	80-120			
Iron	1450		ug/L	223	122	80-120			QM-07
Lead	54.3		ug/L	0.0871	108	80-120			
Magnesium	964		ug/L		96.4	80-120			
Manganese	124		ug/L	68.0	111	80-120			
Molybdenum	57.6		ug/L	1.28	113	80-120			
Nickel	57.1		ug/L	0.664	113	80-120			
Potassium	9730		ug/L	9060	67.0	80-120			QM-07
Selenium	47.9		ug/L		95.7	80-120			
Silicon	47.1		ug/L		94.1	80-120			
Silver	56.3		ug/L	ND	113	80-120			
Sodium	942		ug/L		94.2	80-120			
Thallium	57.2		ug/L	0.009	114	80-120			
Tin	58.4		ug/L	ND	117	80-120			
Titanium	48.5		ug/L		97.0	70-130			
Tungsten	57.3		ug/L	0.03	115	80-120			
Uranium	48.4		ug/L		96.8	80-120			
Vanadium	61.4		ug/L	0.324	122	80-120			QM-07
Zinc	73.7		ug/L	15.3	117	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers :

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

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.

PARACE LABORATORIES LT

Paracel ID: 1742435

Paracel Order Number	Chain Of Custody
1742435	Ontario Drinking Water Samples
	№ 6677

Client Name:	Hoyle Chevrier	Project Ref:	6/3 18.15	Waterworks Name:	Samples Taken By:
Contact Name:	H. Pazmekas	Quote #:		Waterworks Number:	Name: Ben Stevenson
Address:	32 Stacie Dr.	PO #:		Address:	Signature:
After Hours Contact:		E-mail:	apazmekas@hceng.ca		Page ____ of ____
Telephone:		Fax:		Public Health Unit:	Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other: O.Reg 169/03 (ODWS)

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G/S	Reportable: Y/N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing/Flushed: S/F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Sub. Package (Bacteria)	Heavy Metals		
1	—	NTW2-3hr	R	G	N	-	Oct 18/17	11:15	3							X			✓
2	—	NTW2-6hr	R	G	N	-	Oct 18/17	2:15	11							X	X		✓
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Will email parameter list.

Method of Delivery: Walk-in

Relinquished By (Sign):	Received By Driver/Depot: Karen Cull	Received at Lab:	Verified By:
Relinquished By (Print): Ben Stevenson	Date/Time: Oct 18/17 4:45	Date/Time: 10/19/17 11:26a	Date/Time: 10/19/17 11:40a
Date/Time: Oct. 18, 2017 4:45pm	Temperature: 9.6 °C	Temperature: 8.7 °C	pH Verified: ☐ By: KV

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Certificate of Analysis

Houle Chevrier

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Andrius Paznekas

Client PO:
Project: 61318.15
Custody: 6678

Report Date: 26-Oct-2017
Order Date: 19-Oct-2017

Order #: 1742503

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

Paracel ID	Client ID
1742503-01	NTW1-3 hr
1742503-02	NTW1-6 hr

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Oct-2017
Order Date: 19-Oct-2017
Project Description: 61318.15

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	20-Oct-17	20-Oct-17
Ammonia, as N	EPA 351.2 - Auto Colour	24-Oct-17	24-Oct-17
Anions	EPA 300.1 - IC	23-Oct-17	23-Oct-17
Chromium, hexavalent - water	MOE E3056 - colourimetric	20-Oct-17	20-Oct-17
Colour	SM2120 - Spectrophotometric	20-Oct-17	20-Oct-17
Conductivity	EPA 9050A- probe @25 °C	20-Oct-17	20-Oct-17
Dissolved Organic Carbon	MOE E3247B - Combustion IR, filtration	23-Oct-17	24-Oct-17
E. coli	MOE E3407	19-Oct-17	19-Oct-17
Fecal Coliform	SM 9222D	19-Oct-17	19-Oct-17
Heterotrophic Plate Count	SM 9215C	20-Oct-17	20-Oct-17
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	23-Oct-17	23-Oct-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	24-Oct-17	24-Oct-17
pH	EPA 150.1 - pH probe @25 °C	20-Oct-17	20-Oct-17
Phenolics	EPA 420.2 - Auto Colour, 4AAP	20-Oct-17	23-Oct-17
Subdivision Package	Hardness as CaCO3	24-Oct-17	24-Oct-17
Sulphide	SM 4500SE - Colourimetric	24-Oct-17	24-Oct-17
Tannin/Lignin	SM 5550B - Colourimetric	20-Oct-17	23-Oct-17
Total Coliform	MOE E3407	19-Oct-17	19-Oct-17
Total Dissolved Solids	SM 2540C - gravimetric, filtration	21-Oct-17	24-Oct-17
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	19-Oct-17	23-Oct-17
Turbidity	SM 2130B - Turbidity meter	19-Oct-17	19-Oct-17

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Oct-2017
Order Date: 19-Oct-2017
Project Description: 61318.15

	Client ID:	NTW1-3 hr	NTW1-6 hr	-	-
	Sample Date:	19-Oct-17	19-Oct-17	-	-
	Sample ID:	1742503-01	1742503-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	ND	-	-
Fecal Coliforms	1 CFU/100 mL	ND	ND	-	-
Total Coliforms	1 CFU/100 mL	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	10	-	-
General Inorganics					
Alkalinity, total	5 mg/L	294	292	-	-
Ammonia as N	0.01 mg/L	0.11	0.10	-	-
Dissolved Organic Carbon	0.5 mg/L	2.8	2.4	-	-
Colour	2 TCU	9	5	-	-
Conductivity	5 uS/cm	733	710	-	-
Hardness	mg/L	332	332	-	-
pH	0.1 pH Units	8.0	8.0	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	480	502	-	-
Sulphide	0.02 mg/L	0.25	0.39	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	0.2	-	-
Turbidity	0.1 NTU	14.2	3.9	-	-
Anions					
Chloride	1 mg/L	56	57	-	-
Fluoride	0.1 mg/L	0.5	0.5	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-
Sulphate	1 mg/L	44	44	-	-
Metals					
Mercury	0.0001 mg/L	-	<0.0001	-	-
Aluminum	0.001 mg/L	-	0.030	-	-
Antimony	0.0005 mg/L	-	<0.0005	-	-
Arsenic	0.001 mg/L	-	<0.001	-	-
Barium	0.001 mg/L	-	0.332	-	-
Beryllium	0.0005 mg/L	-	<0.0005	-	-
Boron	0.01 mg/L	-	0.03	-	-
Cadmium	0.0001 mg/L	-	<0.0001	-	-
Calcium	0.1 mg/L	93.8	93.6	-	-
Chromium	0.001 mg/L	-	<0.001	-	-

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Oct-2017
Order Date: 19-Oct-2017
Project Description: 61318.15

	Client ID:	NTW1-3 hr	NTW1-6 hr	-	-
	Sample Date:	19-Oct-17	19-Oct-17	-	-
	Sample ID:	1742503-01	1742503-02	-	-
	MDL/Units	Drinking Water	Drinking Water	-	-
Chromium (VI)	0.010 mg/L	-	<0.010	-	-
Cobalt	0.0005 mg/L	-	<0.0005	-	-
Copper	0.0005 mg/L	-	<0.0005	-	-
Iron	0.1 mg/L	1	0.3	-	-
Lead	0.0001 mg/L	-	<0.0001	-	-
Magnesium	0.2 mg/L	23.7	23.8	-	-
Manganese	0.005 mg/L	0.057	0.057	-	-
Molybdenum	0.0005 mg/L	-	<0.0005	-	-
Nickel	0.001 mg/L	-	<0.001	-	-
Potassium	0.1 mg/L	3.0	3.0	-	-
Selenium	0.001 mg/L	-	<0.001	-	-
Silicon	0.01 mg/L	-	10.0	-	-
Silver	0.0001 mg/L	-	<0.0001	-	-
Sodium	0.2 mg/L	19.2	19.9	-	-
Strontium	0.01 mg/L	-	0.73	-	-
Thallium	0.001 mg/L	-	<0.001	-	-
Tin	0.01 mg/L	-	<0.01	-	-
Titanium	0.005 mg/L	-	<0.005	-	-
Tungsten	0.01 mg/L	-	<0.01	-	-
Uranium	0.0001 mg/L	-	0.0001	-	-
Vanadium	0.0005 mg/L	-	<0.0005	-	-
Zinc	0.005 mg/L	-	<0.005	-	-

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Oct-2017
Order Date: 19-Oct-2017
Project Description: 61318.15

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
General Inorganics									
Alkalinity, total	ND	5	mg/L						
Ammonia as N	ND	0.01	mg/L						
Dissolved Organic Carbon	ND	0.5	mg/L						
Colour	ND	2	TCU						
Conductivity	ND	5	uS/cm						
Phenolics	ND	0.001	mg/L						
Total Dissolved Solids	ND	10	mg/L						
Sulphide	ND	0.02	mg/L						
Tannin & Lignin	ND	0.1	mg/L						
Total Kjeldahl Nitrogen	ND	0.1	mg/L						
Turbidity	ND	0.1	NTU						
Metals									
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 (VI)	ND	0.010	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						
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						
Silicon	ND	0.01	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						
Tin	ND	0.01	mg/L						
Titanium	ND	0.005	mg/L						
Tungsten	ND	0.01	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/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
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
Anions									
Chloride	50.8	1	mg/L	50.7			0.2	10	
Fluoride	3.50	0.1	mg/L	3.54			1.1	10	
Nitrate as N	ND	0.1	mg/L	ND			0.0	20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Sulphate	50.5	1	mg/L	50.5			0.0	10	
General Inorganics									
Alkalinity, total	287	5	mg/L	293			2.2	14	
Ammonia as N	0.078	0.01	mg/L	0.072			7.5	17.7	
Dissolved Organic Carbon	2.9	0.5	mg/L	3.1			4.8	37	
Colour	4	2	TCU	4			0.0	12	
Conductivity	709	5	uS/cm	722			1.9	11	
pH	7.9	0.1	pH Units	7.9			0.1	10	
Phenolics	ND	0.001	mg/L	ND				10	
Total Dissolved Solids	104	10	mg/L	100			3.9	10	
Sulphide	0.29	0.02	mg/L	0.30			2.7	10	
Tannin & Lignin	ND	0.1	mg/L	ND			0.0	11	
Total Kjeldahl Nitrogen	0.51	0.1	mg/L	0.54			4.3	10	
Turbidity	0.3	0.1	NTU	0.3			3.8	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			0.0	20	
Aluminum	0.023	0.001	mg/L	0.024			2.1	20	
Antimony	ND	0.0005	mg/L	ND			0.0	20	
Arsenic	ND	0.001	mg/L	ND			0.0	20	
Barium	0.015	0.001	mg/L	0.015			1.7	20	
Beryllium	ND	0.0005	mg/L	ND			0.0	20	
Boron	ND	0.01	mg/L	ND			0.0	20	
Cadmium	ND	0.0001	mg/L	ND			0.0	20	
Calcium	9.0	0.1	mg/L	9.4			4.1	20	
Chromium (VI)	ND	0.010	mg/L	ND				20	
Chromium	ND	0.001	mg/L	ND			0.0	20	
Cobalt	ND	0.0005	mg/L	ND			0.0	20	
Copper	0.0429	0.0005	mg/L	0.0425			0.8	20	
Iron	ND	0.1	mg/L	ND			0.0	20	
Lead	0.0100	0.0001	mg/L	0.0104			3.4	20	
Magnesium	2.2	0.2	mg/L	2.1			1.3	20	
Manganese	ND	0.005	mg/L	ND			0.0	20	
Molybdenum	0.0007	0.0005	mg/L	0.0011			48.7	20	QR-01
Nickel	ND	0.001	mg/L	ND			0.0	20	
Potassium	0.7	0.1	mg/L	0.7			0.5	20	
Selenium	ND	0.001	mg/L	ND			0.0	20	
Silicon	2.11	0.01	mg/L	2.28			7.8	20	
Silver	0.0001	0.0001	mg/L	ND			0.0	20	
Sodium	10.4	0.2	mg/L	10.3			1.6	20	
Thallium	ND	0.001	mg/L	ND			0.0	20	
Tin	ND	0.01	mg/L	ND			0.0	20	
Titanium	ND	0.005	mg/L	ND			0.0	50	
Tungsten	ND	0.01	mg/L	ND			0.0	20	
Uranium	ND	0.0001	mg/L	ND			0.0	20	
Vanadium	ND	0.0005	mg/L	ND			0.0	20	
Zinc	0.022	0.005	mg/L	0.023			1.0	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	ND	1	CFU/100 mL	ND				30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND				30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	60.2	1	mg/L	50.7	94.9	78-112			
Fluoride	4.52	0.1	mg/L	3.54	97.3	73-113			
Nitrate as N	1.03	0.1	mg/L	ND	103	81-112			
Nitrite as N	0.975	0.05	mg/L	ND	97.5	76-107			
Sulphate	59.6	1	mg/L	50.5	91.8	75-111			
General Inorganics									
Ammonia as N	0.348	0.01	mg/L	0.072	110	81-124			
Dissolved Organic Carbon	13.5	0.5	mg/L	2.9	106	60-133			
Phenolics	0.024	0.001	mg/L	ND	97.3	69-132			
Total Dissolved Solids	106	10	mg/L		106	75-125			
Sulphide	0.73	0.02	mg/L	0.30	85.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	97.8	71-113			
Total Kjeldahl Nitrogen	2.57	0.1	mg/L	0.54	102	81-126			
Metals									
Mercury	0.0030	0.0001	mg/L	ND	99.0	70-130			
Aluminum	80.4		ug/L	23.9	113	80-120			
Antimony	56.7		ug/L	0.119	113	80-120			
Arsenic	58.3		ug/L	0.269	116	80-120			
Barium	67.4		ug/L	15.0	105	80-120			
Beryllium	57.0		ug/L	0.0455	114	80-120			
Boron	61.7		ug/L	5.27	113	80-120			
Cadmium	53.8		ug/L	0.0281	108	80-120			
Calcium	1820		ug/L	663	116	80-120			
Chromium (VI)	0.175	0.010	mg/L	ND	87.5	70-130			
Chromium	55.0		ug/L	0.241	110	80-120			
Cobalt	53.3		ug/L	0.0433	106	80-120			
Copper	92.2		ug/L	42.5	99.4	80-120			
Iron	1100		ug/L	34	107	80-120			
Lead	62.5		ug/L	10.4	104	80-120			
Magnesium	3130		ug/L	2150	97.8	80-120			
Manganese	58.9		ug/L	3.12	112	80-120			
Molybdenum	50.0		ug/L	1.10	97.7	80-120			
Nickel	52.5		ug/L	0.247	105	80-120			
Potassium	1800		ug/L	747	105	80-120			
Selenium	58.0		ug/L	0.235	116	80-120			
Silicon	47.2		ug/L		94.4	80-120			
Silver	51.1		ug/L	0.0499	102	80-120			
Sodium	11100		ug/L	10300	88.2	80-120			
Thallium	53.7		ug/L	0.063	107	80-120			
Tin	52.6		ug/L	0.74	104	80-120			
Titanium	45.5		ug/L		91.0	70-130			
Tungsten	52.8		ug/L	0.49	105	80-120			
Uranium	55.4		ug/L	ND	111	80-120			
Vanadium	55.8		ug/L	0.105	111	80-120			
Zinc	77.7		ug/L	22.7	110	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Bottle and COC sample ID don't match - Bottle reads as NTW1- 6 hr instead of NTW2- 6 hr.
Applies to samples: NTW1-6 hr

Sample Qualifiers :

QC Qualifiers :

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

QR-01 : Duplicate RPD is high, however, the sample result is less than 10x the MDL.

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.

PARACEL LABORATORIES LTD

Paracel ID: 1742503

Paracel Order Number	Chain Of Custody
1742503	Ontario Drinking Water Samples № 6678

Client Name:	Houle Chevrier	Project Ref:	6318.15	Waterworks Name:		Samples Taken By:	
Contact Name:	A. Paznekas	Quote #:		Waterworks Number:		Name:	A. Paznekas
Address:	32 Steacie Dr.	PO #:		Address:		Signature:	
After Hours Contact:		E-mail:	apaznekas@chcreng.ca			Page ____ of ____	
Telephone:		Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☐ 2 day ☐ 3 day ☒ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other: O Reg 169/03

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Sub Package (Bacteria)	Heavy mtls		
1		NTW1-3hr	R	G	N	-	Oct 19,17	11:00	8							X			
2		NTW2-6hr	R	G	N	-	Oct 19,17	2:00	11							X	X		
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

→ Should read 1 per Andrius. SC

Comments: Same as WO 1742435 X: Sample ID the All Sets read = NTW-1-6hr.

Method of Delivery: walk in

Relinquished By (Sign):	Received By Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Ben Stevenson	Date/Time:	Date/Time: Oct 19/17 3:33p	Date/Time: Oct 19/17 4:03p
Date/Time: Oct. 19, 2017 2:00 pm	Temperature: °C	Temperature: 9.4 °C	pH Verified: ☑ By: KW

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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: 61318.15
Custody: 7612

Report Date: 10-Nov-2017
Order Date: 8-Nov-2017

Order #: 1745366

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

Paracel ID	Client ID
1745366-01	TW1-R1

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: GEMTEC Consulting Engineers and Scientists Limited
Client PO:

Report Date: 10-Nov-2017
Order Date: 8-Nov-2017
Project Description: 61318.15

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
E. coli	MOE E3407	9-Nov-17	9-Nov-17
Fecal Coliform	SM 9222D	9-Nov-17	9-Nov-17
Heterotrophic Plate Count	SM 9215C	8-Nov-17	8-Nov-17
Total Coliform	MOE E3407	9-Nov-17	9-Nov-17

Certificate of Analysis

Client: GEMTEC Consulting Engineers and Scientists Limited

Client PO:

Report Date: 10-Nov-2017

Order Date: 8-Nov-2017

Project Description: 61318.15

	Client ID:	TW1-R1	-	-	-
	Sample Date:	08-Nov-17	-	-	-
	Sample ID:	1745366-01	-	-	-
	MDL/Units	Drinking Water	-	-	-
Microbiological Parameters					
E. coli	1 CFU/100 mL	ND	-	-	-
Fecal Coliforms	1 CFU/100 mL	ND	-	-	-
Total Coliforms	1 CFU/100 mL	ND	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-

Certificate of Analysis
Client: GEMTEC Consulting Engineers and Scientists Limited
Client PO:

Report Date: 10-Nov-2017
Order Date: 8-Nov-2017
Project Description: 61318.15

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL						
Fecal Coliforms	ND	1	CFU/100 mL						
Total Coliforms	ND	1	CFU/100 mL						
Heterotrophic Plate Count	ND	10	CFU/mL						

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Microbiological Parameters									
E. coli	ND	1	CFU/100 mL	ND				30	
Fecal Coliforms	ND	1	CFU/100 mL	ND				30	
Total Coliforms	ND	1	CFU/100 mL	ND				30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND				30	

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.

Paracel ID: 1745366

PARACEL LABORATORIES LTD.

Paracel Order Number	Chain Of Custody Ontario Drinking Water Samples № 7612
1745366	

Client Name:	Gentec	Project Ref:	61318.15	Waterworks Name:		Samples Taken By:	
Contact Name:	A. Parnekas	Quote #:		Waterworks Number:		Name:	A. Parnekas
Address:	32 Steacie Dr.	PO #:		Address:		Signature:	A Parnekas
After Hours Contact:		E-mail:	Alfandras.parnekas@gentec.ca			Page 1 of 1	
Telephone:	613-836-1422	Fax:		Public Health Unit:		Turn Around Time Required: ☐ 1 day ☒ 2 day ☐ 3 day ☐ 4 day	

Samples Submitted Under: (Indicate **ONLY one**)
☐ ON REG 170/03 ☐ ON REG 318/08 ☐ Private Well
☐ ON REG 243/07 ☐ ON REG 319/08 ☒ Other: Reg 169/03

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

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

All information must be completed before samples will be processed.

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

	LOCATION NAME	SAMPLE ID	Sample Type: R/T/D/P	Source Type: G / S	Reportable: Y / N	Resample	SAMPLE COLLECTED DATE	SAMPLE COLLECTED TIME	# of Containers	Free/Combined Chlorine Residual mg/L	Standing / Flushed: S / F (REG 243)	Required Analyses: Total Coliform/E. Coli	HPC	Lead	THM	Fecal Coliform			
1	—	TW1-R1	R	G	N	-	Nov 8/17	1pm	8	0.0		X	X			X			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

Comments: Extra bottles on hold

Method of Delivery: Walk-in

Relinquished By (Sign): A Parnekas	Received By Driver/Depot: Lauren Cull	Received at Lab: SUNRISE DORMAN	Verified By: Rachel Sobczak
Relinquished By (Print): A. Parnekas	Date/Time: Nov 8/17 1:31	Date/Time: NOV 08 2017 04:07	Date/Time: Nov 8 17.
Date/Time: Nov 8/17 1:30pm	Temperature: 6.9 °C	Temperature: 10.2 °C	pH Verified: ☒ By: N/A 4:22

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

			350540					GUIDELINE		
			2004-10-23							
			TW #3							
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
Picloram	ug/L	5	<5							
CARBAMATES										
Aldicarb	ug/L	9	<9							
Bendiocarb	ug/L	2	<2							
Carbaryl	ug/L	5	<5							
Carbofuran	ug/L	5	<5							
TRIAZINE & RELATED HERBICIDES										
Alachlor	ug/L	0.5	<0.5							
Atrazine	ug/L	0.2	<0.2							
De-ethylated atrazine	ug/L	0.5	<0.5							
Atrazine + *N*-dealkylated metabolites	ug/L	0.2	<0.2							
Cyanazine	ug/L	1	<1							
Metolachlor	ug/L	0.5	<0.5							
Metribuzin	ug/L	5	<5							
Prometryne	ug/L	0.25	<0.25							
Simazine	ug/L	1	<1							
ORGANOPHOSPHOROUS PESTICIDES										
Azinphos-methyl	ug/L	2	<2							
Chlorpyrifos	ug/L	1	<1							
Diazinon	ug/L	1	<1							
Diclofop-methyl	ug/L	0.9	<0.9							
Dimethoate	ug/L	2.5	<2.5							
Malathion	ug/L	5	<5							
Parathion	ug/L	1	<1							
Phorate	ug/L	0.5	<0.5							
Temephos	ug/L	10	<10							
Terbufos	ug/L	0.4	<0.4							
Triallate	ug/L	1	<1							
Trifluralin	ug/L	1	<1							

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Mina Nasrat

LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350540					GUIDELINE		
	Sample Date:	2004-10-23							
	Sample ID:	TW #3							
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
Organochlorine Pesticides (OCPs) & PCBs									
Aldrin	ug/L	0.006	<0.006						
Dieldrin	ug/L	0.006	<0.006						
Aldrin + Dieldrin	ug/L	0.012	<0.012						
a-chlordane	ug/L	0.006	<0.006						
g-chlordane	ug/L	0.006	<0.006						
Oxychlordane	ug/L	0.006	<0.006						
Chlordane (Total)	ug/L	0.018	<0.018						
op-DDT	ug/L	0.006	<0.006						
pp-DDD	ug/L	0.006	<0.006						
pp-DDE	ug/L	0.006	<0.006						
pp-DDT	ug/L	0.006	<0.006						
(DDT) + Metabolites	ug/L	0.024	<0.024						
Heptachlor	ug/L	0.006	<0.006						
Heptachlor epoxide	ug/L	0.006	<0.006						
Heptachlor + Heptachlor Epoxide	ug/L	0.012	<0.012						
Lindane	ug/L	0.006	<0.006						
Methoxychlor	ug/L	0.024	<0.024						
Polychlorinated Biphenyls (PCBs)	ug/L	0.1	<0.1						
CHLOROPHENOLS									
2,3,4,6-tetrachlorophenol	ug/L	0.5	<0.5						
2,4,6-trichlorophenol	ug/L	0.5	<0.5						
2,4-dichlorophenol	ug/L	0.5	<0.5						
Pentachlorophenol	ug/L	0.5	<0.5						
PHENOXYACID HERBICIDES									
2,4,5-trichlorophenoxyacetic acid (2,4,5-T)	ug/L	1	<1						
2,4-dichlorophenoxyacetic acid (2,4-D)	ug/L	1	<1						
Bromoxynil	ug/L	0.5	<0.5						
Dicamba	ug/L	1	<1						
Dinoseb	ug/L	1	<1						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL

Mina Nasrat

...LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350540					GUIDELINE		
	Sample Date:	2004-10-23							
	Sample ID:	TW #3							
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
DIURON & GLYPHOSATE									
Diuron	ug/L	10	<10						
Glyphosate	ug/L	10	<10						
DIQUAT & PARAQUAT									
Diquat	ug/L	7	<7						
Paraquat	ug/L	1	<1						
BENZO (a) PYRENE									
Benzo(a)pyrene	ug/L	0.01	<0.01						

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

lient: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
ttention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

	LAB ID:	350534	350535	350536	350537	350538	GUIDELINE		
	Sample Date:	2004-10-23	2004-10-23	2004-10-23	2004-10-23	2004-10-23			
	Sample ID:	TW #1 Deep	TW #1 Shallow	TW#2 Deep	TW #2 Shallow	TW #3 Deep			
PARAMETER	UNITS	MDL					TYPE	LIMIT	UNITS
NO3 (Nitrate)	mg/L	0.10	9.47	4.12	<0.10	<0.10	<0.10		

L = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
mment:

APPROVAL

Ewan McPherson

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2420554
Date: 2004-11-11
Date Submitted: 2004-10-26

Project: 031-040

P.O. Number:
Matrix: Water

			350539	350541	350542	350543		GUIDELINE		
			2004-10-23	2004-10-23	2004-10-23	2004-10-23				
			TW #3 Shallow	TW #4 Deep	TW #4 Shallow	TW #5 Shallow				
PARAMETER	UNITS	MDL						TYPE	LIMIT	UNITS
N-NO3 (Nitrate)	mg/L	0.10	<0.10	5.76	12.5	<0.10				

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: HOULE CHEVRIER
32 STEACIE DRIVE
OTTAWA, ON K2K2A9
(613) 836-1422

ATTENTION TO: James Mcewen

PROJECT: 61318.13

AGAT WORK ORDER: 16Z104077

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: Jun 15, 2016

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z104077

PROJECT: 61318.13

CLIENT NAME: HOULE CHEVRIER

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2016-06-10

DATE REPORTED: 2016-06-15

		SAMPLE DESCRIPTION:		MW1S	MW1D	MW2S	MW2D	MW3S	MW3D	MW4S	MW4D
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		6/9/2016	6/9/2016	6/9/2016	6/9/2016	6/9/2016	6/9/2016	6/9/2016	6/9/2016
Parameter	Unit	G / S	RDL	7622716	7622747	7622759	7622761	7622763	7622765	7622766	7622767
Nitrate as N	mg/L		0.05	2.56	7.86	<0.05	<0.05	<0.05	<0.05	5.75	3.02
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.02	<0.02	<0.02	0.07	0.04	<0.02	0.07	<0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	0.14	0.18	0.16	0.18	0.46	0.16	0.23	<0.10

		SAMPLE DESCRIPTION:		MW5S	MW6D	MW6S
		SAMPLE TYPE:		Water	Water	Water
		DATE SAMPLED:		6/9/2016	6/9/2016	6/9/2016
Parameter	Unit	G / S	RDL	7622769	7622770	7622771
Nitrate as N	mg/L		0.05	<0.05	2.17	1.32
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.02	<0.02	<0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	<0.10	0.18	0.18

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Amanjot Bhela

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z104077

PROJECT: 61318.13

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 15, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	7624586		<0.5	<0.5	NA	< 0.05	95%	90%	110%	102%	90%	110%	109%	80%	120%
Nitrite as N	7624586		<0.5	<0.5	NA	< 0.05	NA	90%	110%	98%	90%	110%	96%	80%	120%
Ammonia as N	7622761	7622761	0.04	0.03	NA	< 0.02	97%	90%	110%	97%	90%	110%	98%	80%	120%
Total Kjeldahl Nitrogen	7618516		2.86	3.04	6.1%	< 0.10	100%	80%	120%	104%	80%	120%	99%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z104077

PROJECT: 61318.13

ATTENTION TO: James Mcewen

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
www.agatlabs.com webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only

Work Order #: 16T104077

Cooler Quantity: 1

Arrival Temperatures: 4.0 | 3.5 | 3.1

on ice · LT -2.4 | 3.7 | 3.3

Custody Seal Intact: ☐ Yes ☐ No ☒ N/A

Notes:

Report Information:

Company: Houle Chevrier Eng Ltd

Contact: Shaun Pelkey

Address: 32 Steacie Drive
Ottawa, ON K2K 2A9

Phone: 6138361427 Fax:

Reports to be sent to:

1. Email: spelkey@hceng.ca
2. Email: jmcewen@hceng.ca

Regulatory Requirements:

(Please check all applicable boxes)

☒ No Regulatory Requirement

☐ Regulation 153/04
Table ___ (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture

Soil Texture (Check One)
☐ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm

Region ___ (Indicate One)

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other ___ (Indicate One)

Is this submission for a **Record of Site Condition**? ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☒ No

Turnaround Time (TAT) Required:

Regular TAT ☐ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☒ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT

**TAT is exclusive of weekends and statutory holidays*

Project Information:

Project: 61318.13

Site Location: Ottawa

Sampled By: A.P.

AGAT Quote #: 131617 PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company:

Contact:

Address:

Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_3/NO_2 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☒ NH_3 ☒ TKN ☐ NO_3 ☒ NO_3/NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
MW1S	9/6/2016	10-3pm	2	GW							X									
MW1D											X									
MW2S											X									
MW2D											X									
MW3S											X									
MW3D											X									
MW4S											X									
MW4D											X									
MW5S											X									
MW6D											X									
MW6S											X									

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
S. McEwen	June 9/16	11 am	C Barthelet	10-Jun-16	12h00
C Barthelet to Purolator	10-June-16	16h30	Shannon June 11/16	10:00a	

Page 1 of 1

№: T011359

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Document ID: DW-72-1811-009

Date Issued: Jan 9, 2015

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: HOULE CHEVRIER
32 STEACIE DRIVE
OTTAWA, ON K2K2A9
(613) 836-1422

ATTENTION TO: Shaun Pelkey

PROJECT: 63978.96

AGAT WORK ORDER: 16Z111851

WATER ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Jul 07, 2016

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16Z111851

PROJECT: 63978.96

CLIENT NAME: HOULE CHEVRIER

ATTENTION TO: Shaun Pelkey

SAMPLING SITE:

SAMPLED BY:Andrius Paznekas

Inorganic Chemistry (Water)

DATE RECEIVED: 2016-07-04

DATE REPORTED: 2016-07-07

		SAMPLE DESCRIPTION:		SW-1	SW-2
		SAMPLE TYPE:		Water	Water
		DATE SAMPLED:		6/30/2016	6/30/2016
Parameter	Unit	G / S	RDL	7679403	7679416
Nitrate as N	mg/L		0.05	<0.05	0.34
Nitrite as N	mg/L		0.05	<0.05	<0.05
(Nitrate + Nitrite) as N	mg/L		0.07	<0.07	0.34
Ammonia as N	mg/L		0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	1.23	0.38

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Sofiya Pehlyova

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z111851

PROJECT: 63978.96

ATTENTION TO: Shaun Pelkey

SAMPLING SITE:

SAMPLED BY:Andrius Paznekas

Water Analysis

RPT Date: Jul 07, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	7674259		<0.25	<0.25	NA	< 0.05	101%	90%	110%	108%	90%	110%	103%	80%	120%
Nitrite as N	7674259		<0.25	<0.25	NA	< 0.05	NA	90%	110%	96%	90%	110%	97%	80%	120%
Ammonia as N	7681819		18.1	19.0	4.9%	< 0.02	103%	90%	110%	105%	90%	110%	99%	80%	120%
Total Kjeldahl Nitrogen	7679403	7679403	1.23	1.15	6.7%	< 0.10	101%	80%	120%	94%	80%	120%	95%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Sofiya Pehlyova

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: HOULE CHEVRIER

AGAT WORK ORDER: 16Z111851

PROJECT: 63978.96

ATTENTION TO: Shaun Pelkey

SAMPLING SITE:

SAMPLED BY:Andrius Paznekas

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
(Nitrate + Nitrite) as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Laboratory Use Only
Work Order #: 16Z111851
Cooler Quantity: 1
Arrival Temperatures: 7.5 | 7.3 | 7.2
Custody Seal Intact: ☐Yes ☐No ☐N/A
Notes:

Report Information:
Company: Houle Chevrier Engineering Ltd.
Contact: Andrius Paznekas
Address: 32 Steacie Drive
Ottawa, ON K2K 2A9
Phone: 613-836-1472 Fax:
Reports to be sent to:
1. Email: apaznekas@hceng.ca
2. Email: spelkey@hceng.ca

Regulatory Requirements: ☒ No Regulatory Requirement
(Please check all applicable boxes)

☐ Regulation 153/04
Table (indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (indicate One)

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(indicate One)

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on Certificate of Analysis ☐ Yes ☒ No

Turnaround Time (TAT) Required:

Regular TAT ☐ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)
☒ 3 Business Days ☐ 2 Business Days ☐ 1 Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

Project Information:
Project: ~~613815~~ 63978.96
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: if quotation number is not provided, client will be billed full price for analysis.

Invoice Information: Bill To Same: Yes ☑ No ☐
Company:
Contact:
Address:
Email:

Sample Matrix Legend
B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Please Circle) Y / N	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	(Check Applicable) ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ NO_2/NO_3 ☐ Total N ☐ Hg ☐ pH ☐ SAR	Nutrients: ☐ TP ☒ NH_3 ☒ THN ☐ NO_2 ☒ NO_3 ☒ NO_2/NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use
SW-1	June 30/16	PM	2	GW								X									
SW-2	June 30/16	PM	2	GW								X									

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Andrius Paznekas A Paznekas	July 4/16	10am	CBeaudette	July 4/16	13h10
Samples Relinquished By (Print Name and Sign): 1200	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1
N°: T 025681

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

Document ID: DIV-79-1511.011

Date Issued: Feb 18, 2016

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www.paracellabs.com

Certificate of Analysis

Houle Chevrier

32 Steacie Drive
Kanata, ON K2K 2A9
Attn: Nicole Soucy

Client PO:
Project: 61318.15
Custody: 37861

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017

Order #: 1729552

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

Paracel ID	Client ID
1729552-01	MW1-S
1729552-02	MW1-D
1729552-03	MW2-S
1729552-04	MW2-D
1729552-05	MW3-S
1729552-06	MW3-D
1729552-07	MW5-S
1729552-08	MW6-S
1729552-09	MW6-D

Note: MW 3S and 3D MISLABELLED! Switch

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017
Project Description: 61318.15

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	24-Jul-17	24-Jul-17
Metals, ICP-MS	EPA 200.8 - ICP-MS	25-Jul-17	25-Jul-17

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017
Project Description: 61318.15

	Client ID:	MW1-S	MW1-D	MW2-S	MW2-D
	Sample Date:	21-Jul-17	21-Jul-17	21-Jul-17	21-Jul-17
	Sample ID:	1729552-01	1729552-02	1729552-03	1729552-04
	MDL/Units	Water	Water	Water	Water
Anions					
Chloride	1 mg/L	<1	36	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-
Nitrate as N	0.1 mg/L	2.1	7.3	<0.1	<0.1
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05
Sulphate	1 mg/L	4	38	-	-
Metals					
Calcium	100 ug/L	40600	93600	-	-
Magnesium	200 ug/L	6980	17800	-	-
Sodium	200 ug/L	11400	28800	-	-

	Client ID:	MW3-S	MW3-D	MW5-S	MW6-S
	Sample Date:	21-Jul-17	21-Jul-17	21-Jul-17	21-Jul-17
	Sample ID:	1729552-05	1729552-06	1729552-07	1729552-08
	MDL/Units	Water	Water	Water	Water
Anions					
Nitrate as N	0.1 mg/L	<0.1	<0.1	<0.1	<0.1
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	<0.05

	Client ID:	MW6-D	-	-	-
	Sample Date:	21-Jul-17	-	-	-
	Sample ID:	1729552-09	-	-	-
	MDL/Units	Water	-	-	-
Anions					
Nitrate as N	0.1 mg/L	0.5	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017
Project Description: 61318.15

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	ND	1	mg/L						
Fluoride	ND	0.1	mg/L						
Nitrate as N	ND	0.1	mg/L						
Nitrite as N	ND	0.05	mg/L						
Sulphate	ND	1	mg/L						
Metals									
Calcium	ND	100	ug/L						
Magnesium	ND	200	ug/L						
Sodium	ND	200	ug/L						

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017
Project Description: 61318.15

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	328	5	mg/L	323			1.7	10	
Fluoride	ND	0.1	mg/L	ND				10	
Nitrate as N	ND	0.1	mg/L	ND				20	
Nitrite as N	ND	0.05	mg/L	ND				20	
Sulphate	62.3	1	mg/L	64.1			2.9	10	
Metals									
Calcium	ND	100	ug/L	ND				20	
Magnesium	ND	200	ug/L	ND				20	
Sodium	ND	200	ug/L	203			0.0	20	

Certificate of Analysis
Client: Houle Chevrier
Client PO:

Report Date: 26-Jul-2017
Order Date: 21-Jul-2017
Project Description: 61318.15

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	8.78	1	mg/L		87.8	78-112			
Fluoride	0.96	0.1	mg/L	ND	96.1	73-113			
Nitrate as N	0.92	0.1	mg/L	ND	91.8	81-112			
Nitrite as N	1.03	0.05	mg/L		103	76-117			
Sulphate	73.6	1	mg/L	64.1	94.4	75-111			
Metals									
Calcium	925		ug/L	ND	92.5	80-120			
Magnesium	1050		ug/L	ND	105	80-120			
Sodium	1290		ug/L	203	109	80-120			

Qualifier Notes:

None

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.

Paracel ID: 1729552

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Chain of Custody
(Lab Use Only)
№ 37861

Page 1 of 1

Client Name: HCEL	Project Reference: 6131815	**Turnaround Time:**
Contact Name: Nicole Soucy	Quote #	☐ 1 Day ☐ 3 Day
Address: 32 Steacie Dr. Kanata, ON	PO #	☐ 2 Day ☒ Regular
Telephone: 613-836-1422	Email Address: nsoucy@hcemg.ca	Date Required:

Criteria: ☒ O. Reg. 153/04 (As Amended) Table 3 ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: ☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Paracel Order Number: 1729552

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken Date	Sample Taken Time	Required Analyses: BTEX	Nitrate, Nitrite, [illegible]	Cations (Ca, Mg, Na)	Anions (Cl, F, SO4)
1	MW1-S	GW		2	07/21/17			x	x	x
2	MW1-D			2				x	x	x
3	MW2-S			4				x		
4	MW2-D							x		
5	MW3-S							x		
6	~~MW3-S~~ MW3-D							x		
7	MW5-S							x		
8	MW6-S							x		
9	MW6-D							x		
10										

Comments:

Method of Delivery: Walk-in

Relinquished By (Sign):	Received by Driver/Depot: Karen Cull	Received at Lab: SUMEPORN DOUMAI	Verified By:
Relinquished By (Print): Nicole Soucy	Date/Time: July 21/17 1:05	Date/Time: July 21 2017 09:55	Date/Time: 07/21/17 2:50p
Date/Time: July 21/17 1:04PM	Temperature: 9.1 °C	Temperature: 14.3 °C	pH Verified ☐ By:

APPENDIX M

Langelier Saturation Index (LSI) Calculations

Langelier Saturation Index Calculation

Test Well: TW6 - 6hr

Inputs

pH =	8	
Total Dissolved Solids =	502	
Calcium (as $CaCO_3$) =	332	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	294	
Temperature (^oC) =	11.2	

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 =	0.17
B =	2.36
C =	2.12
D =	2.47
pH_s =	7.24
LSI =	**0.76**

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

GEMTEC
Consulting Engineers and Scientists

Report to: 1384341 Ontario Ltd.
Project: 61318.15 (May 2018)

APPENDIX N

Laboratory Certificates of Analysis – Private Wells

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2505851
Date: 2005-04-12
Date Submitted: 2005-04-08

Project:

P.O. Number:
Matrix: Water

			LAB ID:	378025	378026				GUIDELINE		
			Sample Date:	2005-04-07	2005-04-07						
			Sample ID:	Turcotte	KOHL1				MOE REG. 170/03		
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Alkalinity as CaCO3	mg/L	5		282	235				OG	500	mg/L
Chloride	mg/L	1		70	7				AO	250	mg/L
Colour	TCU	2		6	<2				AO	5	TCU
Conductivity	uS/cm	5		839	500						TCU
Dissolved Organic Carbon	mg/L	0.5		2.9	1.3				AO	5	mg/L
Fluoride	mg/L	0.10		0.27	0.27				MAC	1.5	mg/L
Hydrogen Sulphide	mg/L	0.01		<0.01	<0.01				AO	0.05	mg/L
N-NH3 (Ammonia)	mg/L	0.02		0.05	0.04						mg/L
N-NO2 (Nitrite)	mg/L	0.10		<0.10	<0.10				MAC	1.0	mg/L
N-NO3 (Nitrate)	mg/L	0.10		<0.10	<0.10				MAC	10.0	mg/L
pH				7.64	7.82				AO	6.5-8.5	
Phenols	mg/L	0.001		<0.001	<0.001						
Sulphate	mg/L	1		65	30				AO	500	mg/L
Tannin & Lignin	mg/L	0.1		0.1	<0.1						mg/L
TDS (COND - CALC)	mg/L	5		545	325				AO	500	mg/L
Total Kjeldahl Nitrogen	mg/L	0.05		0.30	<0.05						mg/L
Turbidity	NTU	0.1		17.8	4.1				AO	1.0	NTU
Hardness as CaCO3	mg/L	1		398	264				OG	100	mg/L
Ion Balance		0.01		0.98	1.00						mg/L
Calcium	mg/L	1		115	76						mg/L
Magnesium	mg/L	1		27	18						mg/L
Potassium	mg/L	1		2	1						mg/L
Sodium	mg/L	2		17	6				AO	20	mg/L
Iron	mg/L	0.01		1.00	0.40				AO	0.3	mg/L
Manganese	mg/L	0.01		0.09	0.02				AO	0.05	mg/L

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration
Comment:

APPROVAL:
Ewan McRobbie
Inorganic Lab Supervisor

ACCUTEST LABORATORIES LTD

REPORT OF ANALYSIS

Client: Morey Houle Chevrier Engineering
28 Clothier St E., Unit B, Box 910
Kemptville, ON
K0G 1J0
Attention: Mr. Randy Morey

Report Number: 2505841
Date: 2005-04-11
Date Submitted: 2005-04-08

Project:

P.O. Number:
Matrix: Water

			LAB ID:	377993	377994				GUIDELINE		
			Sample Date:	2005-04-07	2005-04-07				MOE REG. 170/03		
			Sample ID:	Turcotte	KOHL1						
PARAMETER	UNITS	MDL							TYPE	LIMIT	UNITS
Total Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Escherichia Coli	ct/100mL			0	0				MAC	0	ct/100mL
Heterotrophic Plate Count	ct/1mL			0	0				MAC	500	ct/1mL
Faecal Coliforms	ct/100mL			0	0				MAC	0	ct/100mL
Faecal Streptococcus	ct/100mL			2	0						ct/100mL

MDL = Method Detection Limit INC = Incomplete AO = Aesthetic Objective OG = Operational Guideline MAC = Maximum Allowable Concentration IMAC = Interim Maximum Allowable Concentration

Comment:

APPROVAL:

Tim McCooeye
QC Manager

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.

116 HUNTLEY MANOR DRIVE

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Ottawa Carleton	West Carleton - Huntley	3				7

Owner's surname	First Name	Address	Date completed
Butler;	Scott	115 Huntley Manor Dr. Carp,Ontario K0A 1L0	13 day 6 month 00 year

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Sandy Clay	Stones		0	15
Gray	Limestone		Medium Hard	15	320

WATER RECORD

Water found at - feet	Kind of water		
21- 60	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
275-320	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
NOT TESTED	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
6 1/4	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	.188	0	22.5
6 1/16	☐ Steel ☐ Galvanized ☐ Concrete ☒ Open hole ☐ Plastic		22.5	275
5 7/8	☐ Steel ☐ Galvanized ☐ Concrete ☒ Open hole ☐ Plastic		275	320

SCREEN

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

PLUGGING & SEALING RECORD

☒ Annular space ☐ Abandonment

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

PUMPING TEST

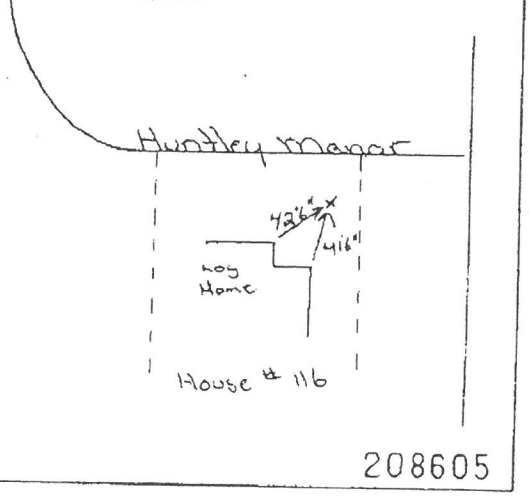
Pumping test method: ☐ Pump ☒ Bailer
Pumping rate: 3 GPM
Duration of pumping: 1 Hours Mins

Static level	Water level end of pumping	Water levels during ☒ Pumping ☐ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
41'2" feet	185 feet	100 feet	150 feet	165 feet	185 feet

If flowing give rate: GPM
Pump intake set at: feet
Water at end of test: ☐ Clear ☒ Cloudy
Recommended pump type: ☐ Shallow ☒ Deep
Recommended pump setting: 250 feet
Recommended pump rate: 3 GPM

LOCATION OF WELL

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



208605

FINAL STATUS OF WELL

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

WATER USE

☒ Domestic ☐ Stock ☐ Irrigation ☐ Industrial
☐ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning
☐ Not use ☐ Other

METHOD OF CONSTRUCTION

☒ Cable tool 275-320 ☐ Rotary (conventional) ☐ Rotary (reverse) ☒ Rotary (air) 0-275
☒ Air percussion ☐ Boring ☐ Diamond ☐ Jetting
☐ Driving ☐ Digging ☐ Other

Name of Well Contractor	Well Contractor's Licence No
Capital Water Supply Ltd.	1558
Address: P.O. Box 490 Stittsville,Ontario K2S 1A6	
Name of Well Technician: S. Miller	Well Technician's Licence No. T0097
Signature of Technician/Contractor	Submission date: day 19 mo 6 yr 00

MINISTRY USE ONLY

CONTRACTOR'S COPY

0506 (11/98) Front Form 9

Ministry of Environment and Energy
Ontario

The Ontario Water Resources Act
WATER WELL RECORD

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

112 HUNTLEY MANOR DRIVE

County or District	Township/Borough/City/Town/Village	Con.	block	tract, survey, etc.	Lot
Ottawa-Carleton	West Carleton (Huntley)	3			7

Owner's surname	First name	Address	Date completed
Turcotte	Bill	Woodlawn, Ont	20 08 96 (day month year)

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
	clay			0	8
	Sand	gravel		8	14
grey	Limestone			14	110

WATER RECORD

Water found at - feet	Kind of water	
72	X Fresh / Salty	Sulphur / Minerals / Gas
90	X Fresh / Salty	Sulphur / Minerals / Gas
	Fresh / Salty	Sulphur / Minerals / Gas
	Fresh / Salty	Sulphur / Minerals / Gas
	Fresh / Salty	Sulphur / Minerals / Gas

CASING & OPEN HOLE RECORD

Inside diam. - inches	Material	Wall thickness - inches	Depth - feet From	Depth - feet To
6 1/4	X Steel / Galvanized / Concrete / Open hole / Plastic	188	0	22
6 1/4	Steel / Galvanized / Concrete / X Open hole / Plastic		0	20
6	Steel / Galvanized / Concrete / X Open hole / Plastic		20	110

SCREEN

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

PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
2	22	cement grout

PUMPING TEST

Pumping test method: X Pump ☐ Bailer
Pumping rate: 7 GPM
Duration of pumping: ..... hours ..... Min.

Static level	Water level end of pumping	Water level during: X Pumping ☐ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
40 feet	110 feet	110 feet	110 feet	110 feet	110 feet

Flowing give rate: ..... GPM
Pump intake set at: ..... feet
Water at end of test: ☐ Clear X Cloudy

Recommended pump type	Recommended pump setting	Recommended pump rate
☐ Shallow X Deep	110 feet	7 GPM

FINAL STATUS OF WELL

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

WATER USE

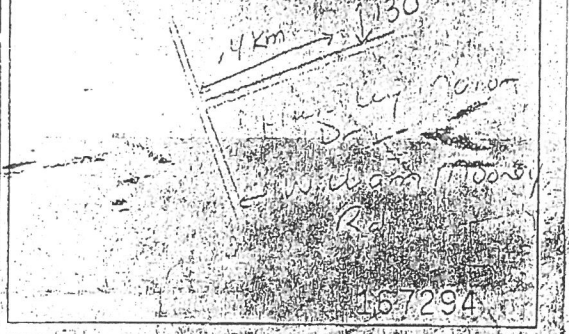
X Domestic ☐ Commercial ☐ Not used
☐ Stock ☐ Municipal ☐ Other .....
☐ Irrigation ☐ Public supply
☐ Industrial ☐ Cooling & air conditioning

METHOD OF CONSTRUCTION

☐ Cable tool X Air percussion ☐ Driving
☐ Rotary (conventional) ☐ Boring ☐ Digging
☐ Rotary (reverse) ☐ Diamond ☐ Other .....
☐ Rotary (air) ☐ Jetting

LOCATION OF WELL

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



Name of Well Contractor	Well Contractor's Licence No.
Arkdale Drilling Ltd	1119
Address: R.R. #2 Jasper, Ont	
Name of Well Technician	Well Technician's Licence No.
Shannon Sewell	1222
Signature of Technician/Contractor	Submission date: day month year

MINISTRY USE ONLY

OWNER'S COPY

0506 (07/94) P

Ministry of the Environment
Ontario

The Ontario Water Resources Act

WATER WELL RECORD

101 HUNTLEY MANOR

1 PRINT ONLY IN SPACES PROVIDED
2 CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON.	BLOCK	TRACT	SURVEY, ETC.	LOT
Ottawa Carleton	West Carleton			3		7

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
Lumsden; Cathy	101 Huntley Manor Drive Carp, Ontario K0A 1L0	DAY 18 MO 12 YR 91

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	TO
Brown	Loom			0	8
Gray	Clay		Sticky	8	20
Gray	Limestone		Broken	20	35

WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
23	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS
	☐ FRESH ☐ SALTY ☐ SULPHUR ☐ MINERALS ☐ GAS

CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	TO
6 1/4	☒ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC	.188	0	22
6 1/8	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☒ OPEN HOLE ☐ PLASTIC		22	35
	☐ STEEL ☐ GALVANIZED ☐ CONCRETE ☐ OPEN HOLE ☐ PLASTIC			

SCREEN

SCREEN OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET

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

PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, CLAY, PACKER, ETC.)
Grouted		Cement (2)

PUMPING TEST

PUMPING TEST METHOD: ☒ PUMP ☐ BAILER
PUMPING RATE: 15-20 GPM
DURATION OF PUMPING: 1 HOURS ____ MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING ☒ PUMPING ☐ RECOVERY: 10 MINUTES	20 MINUTES	30 MINUTES	40 MINUTES
4 FEET	10 FEET	10 FEET	10 FEET	10 FEET	10 FEET

IF FLOWING, GIVE RATE: ____ GPM
PUMP INTAKE SET AT: 10 FEET
WATER AT END OF TEST: ☒ CLEAR ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 15 FEET
RECOMMENDED PUMPING RATE: 5 GPM

FINAL STATUS OF WELL

☒ WATER SUPPLY ☐ OBSERVATION WELL ☐ TEST HOLE ☐ RECHARGE WELL ☐ ABANDONED, INSUFFICIENT SUPPLY ☐ ABANDONED, POOR QUALITY ☐ UNFINISHED ☐ REVATERING

WATER USE

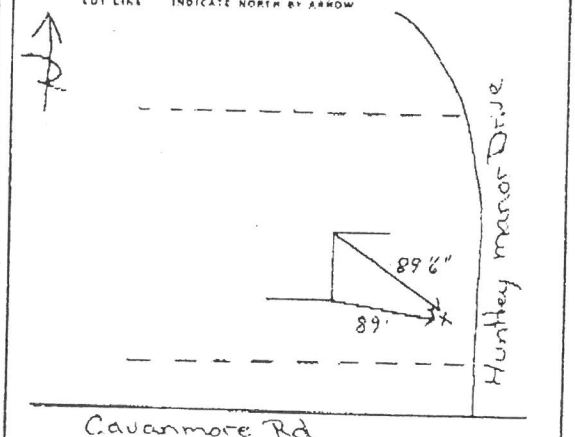
☒ DOMESTIC ☐ STOCK ☐ IRRIGATION ☐ INDUSTRIAL ☐ COMMERCIAL ☐ MUNICIPAL ☐ PUBLIC SUPPLY ☐ COOLING OR AIR CONDITIONING ☐ OTHER ☐ NOT USED

METHOD OF CONSTRUCTION

☐ CABLE TOOL ☐ ROTARY (CONVENTIONAL) ☐ ROTARY (REVERSE) ☐ ROTARY (AIR) ☒ AIR PERCUSSION ☐ BORING ☐ DIAMOND ☐ JETTING ☐ DRIVING ☐ DIGGING ☐ OTHER

LOCATION OF WELL

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



OR CLERK'S REMARKS: 113322

CONTRACTOR

NAME OF WELL CONTRACTOR	WELL CONTRACTOR'S LICENCE NUMBER
Capital Water Supply Ltd.	1558

ADDRESS: Box 490 Stittsville, Ontario K2S 1A6

NAME OF WELL TECHNICIAN	WELL TECHNICIAN'S LICENCE NUMBER
S. Miller	T0097

SIGNATURE OF TECHNICIAN/CONTRACTOR: W. Kanon
SUBMISSION DATE: DAY 20 MO 12 YR 91

OFFICE USE ONLY

APPENDIX O

Well Interference Modelling

LEGEND

SUBJECT SITE

CONTOUR INTERVAL, 0.5m

Scale 1:5000

0 100 200 300m

GEMTEC
Consulting Engineers and Scientists

32 Steacie Drive
Ottawa, ON
Tel: (613) 836-1422
www.gemtec.ca
ottawa@gemtec.ca

Drawing: INTERFERENCE MODELLING SCENARIO 1

Client: 1384341 ONTARIO LTD.

Project: 61318.15

HYDROGEOLOGICAL INVESTIGATION
2727 CARP ROAD
OTTAWA, ONTARIO

Drwn by: S.L.

Chkd by: A.P.

Date: DECEMBER 2017

Rev.: 0

FIGURE O1

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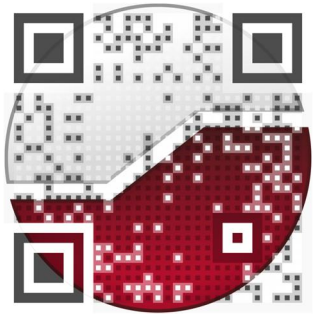
experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité