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Hydrogeological Investigation & Terrain Analysis
Proposed Residential Subdivision
Cedar Lakes Subdivision, Phase 3 and 4
Greely, Ontario

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Submitted to:

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Cedar Lakes Subdivision, Phase 3 and 4
Greely, Ontario

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES (FOLLOWING THE TEXT OF THE REPORT)

LIST OF APPENDICES

1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists (GEMTEC) was retained by ARK Engineering and Development to conduct a hydrogeological investigation and terrain analysis for a proposed 40-hectare residential subdivision (hereafter referred to as 'the Site') in Greely, Ontario. The location of the Site is shown in the attached Figure 1.

The Site is about 40 hectares (400,900 m^2) in size and is located at 1600 Stagecoach Road, Geographic Township of Osgoode, in the City of Ottawa. The Site is bounded by residential properties utilizing private services to the north and west, Stagecoach Road to the east, and undeveloped woodlands to the south.

The proposed development at the Site will consist of 71 residential 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 a minimum lot size of 0.4 hectares. The proposed layout of the development is shown on the Lot Development Plan (Appendix K). A copy of the proposed Storm Drainage and Macro Grading Plan Cedar Lakes – Phases 3 to 4 prepared by ARK Engineering and Development is provided in Appendix A.

This report is Revision 2 of the initial report dated December 7, 2023. It incorporates additional field work and historical report reviews that were conducted to address comments received by the technical reviewer from the City of Ottawa.

1.1 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 Site and develop a hydrogeological conceptual model;
- To identify and characterize the shallow subsurface conditions on the Site as they relate to the suitability of on-site septic sewage disposal systems;
- 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 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 Site.

A pre-consultation with the City of Ottawa reviewer Dillon Consulting was held on September 12, 2023. Key points regarding the hydrogeological investigation, terrain and septic impact assessment, and other discussion points were addressed during the pre-consultation meeting. A detailed summary of the pre-consultation provided by Dillon Consulting is included in Appendix J.

This investigation did not include a water balance assessment, which is being completed as part of the stormwater management investigations.

2.0 REVIEW OF BACKGROUND INFORMATION

2.1 Land Use and Land Cover

Site land cover is cleared land, unevaluated wetlands and woodlands. Land uses within 500 metres of the Site include vacant undeveloped land, residential properties on private services, agricultural land, and a single commercial property, which is located approximately 400 m from the Site. Specific land use and land cover with respect to the Site boundaries are documented in Table 2.1.

Table 2.1 – Summary of Land Use and Land Cover in Study Area

Site Boundary	Existing Land Use and Land Cover
North	• Residential dwellings
East	• Residential dwellings • Pond
West	• Residential dwellings
South	• Commercial property • Agricultural land • Woodlands

2.1.1 Permit to Take Water Records

A review of the MECP's Permit to Take Water records (https://www.ontario.ca/page/map-permits-take-water) indicates a large-scale water taking permit registered for the Site. PTTW number 7184-BZ5SAE is listed as dewatering construction with allowable surface and groundwater takings of up to 1,500,000 litres per day. Based on information received from ARK Engineering and Development, the PTTW is associated with construction of the stormwater management ponds for Cedar Lakes Phase 1 and 2, which have been constructed at the time of preparing this report.

2.2 Topography and Drainage

Surface elevation across the Site generally slopes down towards the south (Figure 2), with topography ranging from 101 to 99 metres above mean sea level (m a.s.l.). The existing surficial drainage of the Site is expected to follow topography and is anticipated to be towards the south (Figure 2). Post-development surficial drainage is proposed to be largely directed to the new

stormwater management ponds to the south of the Site, with some being directed north to existing ponds constructed to support the existing Phases 1 and 2 of the development (Appendix A).

2.3 Raisin-South Nation Source Protection

GEMTEC has reviewed the Raisin-South Nation Source Protection Plan (RRSN, 2016). The relevant information is noted:

- The Site is located within an area of highly vulnerable aquifer (HVA) with a vulnerability score of 6. Vulnerability scores range from 0 (least sensitive) to 10 (most sensitive).
    - Most of the Ottawa Region's aquifer system is classified as highly vulnerable.
    - No policy restrictions for the proposed development were identified for HVA zones, based on the source protection plan.
- The Site is within a significant groundwater recharge area.
- The Site is not within an intake protection zone or a wellhead protection area.

2.4 Regional Surficial and Bedrock Geology

Surficial geology maps (Ontario Geologic Survey (OGS), 2010) indicate that the Site is underlain by organic soils (i.e., peat, muck, and/or marl), glacial till (i.e., sandy silt to silty sand), and coarse-textured glaciomarine deposits (i.e., sand and gravel, with minor silt and clay); the OGS mapping of these soils is presented in Figure 3. Soil thickness / bedrock depth mapping (OGS, 2010) indicates the Site is underlain by 1 to 10 metres of soil (Figure 4).

Paleozoic bedrock geology maps (Armstrong and Dodge, 2007) indicate that the bedrock underlying the Site consists of a dolostone unit of the Oxford Formation, which is part of the Beekmantown Group. The Oxford Formation is described as a dolostone with shale and sandstone interbeds that are up to 30 cm thick (Williams, 1991). The formation is characterized by light to medium brownish to greenish grey dolostone.

The Oxford Formation is underlain by the March Formation, which consists of interbedded grey quartz sandstone, dolomitic quartz sandstone, blue-grey sandy dolostone, and dolostone. The March Formation represents a transition zone between the Oxford Formation dolostones above and the Nepean Formation sandstone below. Dolostones of the March Formation are lithologically similar to the overlying Oxford Formation, making them difficult to distinguish using drill cuttings.

Available karst mapping (Brunton and Dodge, 2008) does not indicate any areas of any inferred or potential karstic features.

2.5 Previous Investigations

2.5.1 Paterson (2011a) Phase 1 Cedar Lakes

A previous hydrogeological investigation and terrain analysis was completed by Paterson Group Inc. (Paterson). The findings were provided in a report titled "Terrain Analysis and

Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3, Geographic Township of Osgoode, Ottawa (Greely), Ontario" and dated March 16, 2011, in support of the (now existing) Phase 1 of the residential subdivision (shown in Appendix A).

Field investigations were conducted from November 2009 to January 2011. These investigations involved excavating 20 test pits, digging 3 hand auger holes, installing 7 monitoring wells, drilling 5 test wells, background water quality sampling from neighbouring residential wells, test well groundwater pumping tests and water quality sampling, in-situ infiltration testing, soil sample collection and testing, a review of available background documents, and data analysis.

Key project findings from Paterson (2011a) are summarized as follows:

- Phase 1 of Cedar Lakes is underlain by four distinct terrain units established based on a test pit program: clayey silty sand, medium sand with trace silt, gravelly sand, and glacial till, with varying degrees of permeability.
- Water quantity and quality of the Oxford and March Formations (considered to be a combined water supply aquifer) are suitable for domestic use, based on residential well and site test well testing.
    - Test wells were constructed with casing lengths ranging from approximately 8.5 to 18 meters and drilled to depths ranging from 18 to 79 meters.
    - The upper Oxford formation may be vulnerable to surface impacts based on elevated concentrations of nitrate/bacterial indicator species, observed during sampling of residential wells.
- No negative impacts to the bedrock aquifer were anticipated from the residential subdivision based on the septic impact assessment. Patterson inferred that a protective bedrock aquitard overlays the water supply aquifer.
- Elevated concentrations of nitrates were noted in the overburden within the northeast section of Phase 1 - Cedar Lakes. The elevated nitrate levels were attributed to areas with relatively flat and slow-moving overburden groundwater with poor drainage. After restoring the drainage pattern within the local area, the overburden groundwater was resampled, and nitrate levels had decreased. The rapid decrease in nitrates were stated to be directly related to the improvement in drainage.
- Well interference between neighbouring wells were expected to be minimal, based on the anticipated water demand being within safe yields of the water supply aquifer.

2.5.2 Paterson (2011b) Phases 2 - 6 Cedar Lakes

A previous hydrogeological investigation and terrain analysis investigation was completed by Paterson. The findings were provided in a report titled "Terrain Analysis and Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3, Geographic Township of Osgoode, Ottawa (Greely), Ontario" and dated April 1, 2011, in support of Phases 1-6 of a proposed residential subdivision on a 59.04-hectare parcel of land (note that Phases 3-6 are referred to as Phases 3-4 in the GEMTEC report). The previous investigations completed by Paterson (2011a) pertaining to Phase 1 of this development were accounted for in the overall calculations of their investigation.

Field investigations were conducted from November 2009 to January 2011. These investigations involved excavating 28 test pits, digging 3 hand auger holes, installing 8 monitoring wells, drilling five test wells, background water quality sampling from neighbouring residential wells, test well groundwater pumping tests and water quality sampling, in-situ infiltration testing, soil sample collection and testing, review of available background documents, and data analysis.

Key project findings from Paterson (2011b) are summarized as follows:

- Cedar Lakes Phases 2-6 are underlain by overburden more than 4 meters thick, generally consisting of silty sand to sandy silt, which is underlain by lower permeability silty clay, silt or glacial till deposits across the majority of the site. The overburden is underlain by bedrock.
- Water quantity and quality of the Oxford and March Formations (considered to be a combined water supply aquifer) underlying the Site are suitable for domestic use, based on residential well and site test well testing.
    - Test wells were constructed with casing lengths ranging from approximately 8.5 to 18 meters and drilled to depths ranging from 18 to 79 meters.
- No negative impacts to the bedrock aquifer were anticipated from the residential subdivision based on the septic impact assessment. Patterson inferred that a protective bedrock aquitard overlays the water supply aquifer.
- Well interference between neighbouring wells were expected to be minimal, based on the anticipated water demand being within safe yields of the water supply aquifer.

2.5.3 Paterson (2015) Supplemental Study

Paterson prepared a report evaluating the performance of the well and septic services for Phase 1 of the Cedar Lakes Subdivision titled “Hydrogeological Study Performance Report: Servicing Review Study, Proposed Phase 2 Development, Cedar Lakes Subdivision, Ottawa (Greely), Ontario” dated December 8, 2015. Therein, the groundwater quality at two reference locations were compared against baseline conditions before Phase 1 of the development was constructed. In addition, four homeowner wells with casing lengths of approximately 40 metres were sampled and reviewed in the context of the Ontario Drinking Water Quality Standards, Objectives and Guidelines.

2.5.4 Paterson (2023) Phase 3 - 4 Cedar Lakes

The subsurface conditions at the Site were characterized as part of the geotechnical investigation completed by Paterson Group. The findings were provided in a report titled “Geotechnical Investigation, Proposed Residential Development, Cedar Lake Subdivision - Part of Lot 8, Concession 3, Phase 3 & 4, Greely, Ontario” dated October 27, 2023.

The field investigation for the geotechnical investigation included the advancement of seven test pits (TP 1-23 to 7-23, inclusive). The Paterson (2023) report includes the results of previous site investigations completed as part of hydrogeological and geotechnical investigation for Cedar

Lakes Phases 1 through 6. This includes 12 test pits (TP1 to TP12, inclusive) advanced in 2009; eight test pits (MW1 to MW8, inclusive) and four hand auger holes (AH1 to AH4) advanced in 2010, and 17 test pits (TP 13 to TP 29, inclusive) and two hand auger holes (AH5 and AH6) advanced in 2011. A grain size analyses was performed on a sample of glacial till collected from TP 11. The locations of all the test holes referenced in Paterson (2023) are shown on Figure 1.

The subsurface conditions reported by Paterson (2023) for Cedar Lakes Phase 3 and 4 indicate that the site is generally underlain by native deposits of silty sand to sandy silt, overlying glacial till. Occasionally, a layer of clayey silt was identified between the silty sand and glacial till layers.

2.6 MECP Water Well Records

2.6.1 Cedar Lakes Phases 1 and 2 Well Records (North)

A search for the Ministry of Environment, Conservation and Parks (MECP) Water Well Records for existing private wells located in Cedar Lakes Phase 1 and 2 Subdivision, north of the Site was completed.

The well construction details for the Cedar Lakes wells were reviewed and compared to the construction recommendations from the hydrogeological investigation report for the Phase 1 and 2 subdivision application (Paterson, 2011a, 2011b). A total of 52 well records were reviewed from the MECP online water well record database (Appendix B). Based on the well record search, 51 of the 52 available well records indicate casing lengths of at least 40 m, while 1 well record indicated a casing length of 37 m. The hydrogeological investigation report for Phase 1 and 2 (Paterson, 2011a, 2011b) indicates that wells should be constructed with minimum casing lengths of 12 metres below ground surface.

2.6.2 Well Records Within Vicinity of Site (East and West)

A search for the Ministry of Environment, Conservation and Parks (MECP) Water Well Records for existing private wells was completed for private wells within 500 metres of the eastern and west site boundaries (refer to Figure 6).

A total of 38 well records were reviewed from the MECP online water well record mapping resource (Appendix B). Of the 38-drinking water well records reviewed, 21 were completed in limestone bedrock and 17 were completed in limestone and/or sandstone (limestone layers are likely actually dolostone). Table 2.2 provides a summary of the well characteristics for the 38 water well records.

Table 2.2 – Summary of Water Well Records Search Results (500-m Radius)

Parameter	10th Percentile	90th Percentile	Geometric Mean
Casing Lengths (m)	6.7	18.7	11.7

Parameter	10th Percentile	90th Percentile	Geometric Mean
Depth to Bedrock (m)	4.8	17.3	10.6
Total Well Depth (m)	14.6	79.3	39.0
Depth Water Found[1] (ft)	11.0	63.4	32.5
Recommended Pump Rate (l/min)	18.9	132.5	43.2

Notes:
1. Depth water found as reported on MECP water well records, representing water bearing fractures encountered at the time of drilling.

3.0 TERRAIN EVALUATION

3.1 Summary of Existing Subsurface Data Paterson (2011-2023)

The following subsections provide a summary of the available subsurface data from the Paterson (2011, 2023) reports.

3.1.1 Soil Conditions and Groundwater Observations

Paterson (2011, 2023) observed the depth of exfiltration or groundwater level in test pits and hand auger hole locations at the time of excavation. Their observations are included on the test hole logs included in Appendix C and summarised in Table 3.1.

Table 3.1 –Groundwater Depth and Elevation (Paterson, 2011, 2023)

Test Hole ID	Date	Groundwater Level[1] (m BGS[2])	Groundwater Elevation (m, CGVD28)
TP 1-23	Oct 4, 2023	1.5	96.9
TP 2-23	Oct 4, 2023	1.0	96.5
TP 3-23	Oct 4, 2023	0.7	97.4
TP 4-23	Oct 4, 2023	Dry to 5.2	Dry to 98.2
TP 5-23	Oct 4, 2023	1.0	97.7

Test Hole ID	Date	Groundwater Level[1] (m BGS[2])	Groundwater Elevation (m, CGVD28)
TP 6-23	Oct 4, 2023	1.0	97.6
TP 6A-23	Oct 4, 2023	1.0	97.7
TP 7-23	Oct 4, 2023	1.0	97.9
TP 7	Nov 24, 2009	1.1	100.3
TP 9	Nov 24, 2009	2.2	98.0
TP 10	Nov 24, 2009	Dry to 2.8	Dry to 100.8
TP 11	Nov 24, 2009	0.35	101.5
TP 12	Nov 24, 2009	1.0	99.5
TP 18	Dec 7, 2010	Dry to 3.1	Dry to 98.9
TP 19	Dec 7, 2010	Dry to 2.6	Dry to 97.4
TP 20	Dec 7, 2010	0.7	97.8
TP 21	Dec 7, 2010	1.6	97.6
TP 22	Dec 7, 2010	1.0	98.4
TP 23	Dec 7, 2010	0.2	98.8
TP 24	Dec 7, 2010	0.7	99.0

Test Hole ID	Date	Groundwater Level[1] (m BGS[2])	Groundwater Elevation (m, CGVD28)
TP 25	Dec 7, 2010	0.5	100.7
TP 26	Dec 17, 2010	1.8	97.1
TP 27	Dec 17, 2010	1.5	101.3
AH 1	Oct 4, 2010	2.12	97.0
AH 4	Dec 7, 2010	0.8	97.7
AH 5	Dec 7, 2010	0.8	97.2
MW 1	Sept 22, 2010	1.4	97.6
MW 3	Sept 22, 2010	1.2	98.0
MW 7	Sept 22, 2010	1.4	99.5
MW 8	Nov 24, 2009	0.6	103.1

Notes:
1. Includes both observations of exfiltration depth in pits following excavation and stable water levels. Exfiltration depths would be inclined to, if anything, overestimate the depth of the water table.
2. m BGS - Metres Below Ground Surface

Groundwater level varied from 0.2 to more than 3.1 metres below ground surface. Reported elevations of the water table ranged from 103.1 to 97.0 metres above mean sea level, CGVD28. The most concurrent measurements of groundwater levels occurred on December 7, 2010; the water levels at this time suggested that shallow groundwater flow was south.

3.2 Hydrogeological Investigation – GEMTEC

The following subsections provide a summary of the subsurface collected over the course of the current GEMTEC investigation.

3.2.1.1 Field Procedure

The field work for the terrain evaluation was conducted on September 21, 2023. On that date, 3 boreholes (numbered 23-1, 23-2 and 23-3) were advanced on the Site by Limitless Drilling and supervised by GEMTEC. The boreholes were advanced to depths of about 5.5 to 5.9 metres below the existing ground surface. A licensed well technician (from Limitless Drilling) installed well screens at all boreholes locations (i.e., MW23-1, MW23-2, and MW23-3) to allow for groundwater level monitoring and facilitate groundwater quality sampling. The well screens were installed with a surround of filter sand and the annular space was sealed back to surface using bentonite and soil.

Descriptions of the subsurface conditions encountered in the boreholes and well constructions are provided on the borehole logs in Appendix C. The locations of the monitoring wells installed within each borehole are shown on Figure 1. Supplemental permeameter testing and soil characterisation work, as discussed in the technical pre-consultation for the project, were not considered necessary to complete this scope of work and were differed to future field programs.

3.2.1.2 Soil Conditions

The following subsections present an overview of the subsurface conditions encountered in the boreholes advanced as part of the hydrogeological investigation. These findings are reasonably consistent with Paterson, (2023) and the conditions identified on the geological mapping, with the exception of mapped organic soils, which were not encountered.

Silty Sand to Sand

Native deposits of silty sand to sand with some silt, some to trace gravel was encountered below the topsoil in all test hole locations, were encountered at BH23-1 and 23-3. The silty sand to sand deposit extended to depths ranging from about 0 to 3.91 metres below ground surface.

Sandy Silt

A deposit of sandy silt was encountered between the silty sand layer in the BH23-3. The sandy silt layer has a thickness of about 1.53 metres and extends to about 2.9 metres below ground surface.

Clayey Silt

A native deposit of clayey silt was encountered below the sand layers in boreholes 23-1 and 23-2. The clayey silt layer has a thickness ranging from about 0.5 to 2.9 metres and extends to depths ranging from about 2.3 to 5.2 metres below ground surface.

Glacial Till

Glacial till was encountered in all of the boreholes. Glacial till is a heterogeneous mixture of all grain sizes, which at this site, can be described as silty sand to sandy silt, with trace to some gravel and trace silt. Cobbles and boulders are frequently encountered within glacial till. The

glacial till was not fully penetrated in all the test holes but was proven to at least a depth of about 5.9 metres below ground surface.

3.2.1.3 Groundwater Observations

The groundwater levels in the monitoring wells were measured between September and October 2023. The groundwater levels are summarized in Table 3.2 and were all within the overburden.

The groundwater levels may be higher during wet periods of the year such as the early spring or following periods of precipitation. The measured groundwater levels suggest that the overburden groundwater flow is towards the east-southeast, which is generally consistent with topography which slopes to the southeast. Due to the potential divide (high point) in the centre of the site, local flow "catchments" may be more nuanced than the three well assessment has the resolution to conclude. Nonetheless, given the historical data (Paterson, 2011, 2023) and topography, it is reasonable to expect flow to generally travel south and/or southeast.

Table 3.2 –Groundwater Depth and Elevation (GEMTEC)

Well ID	Date of Reading	Groundwater Depth Below Ground Surface (metres)	Groundwater Elevation (metres, CGVD28)
MW23-1	21-09-2023	1.43	98.9
	19-10-2023	1.44	98.9
	20-06-2024	2.18	98.1
	14-11-2024	2.38	97.9
MW23-2	21-09-2023	-0.3[1]	98.6
	19-10-2023	-0.3	98.6
	20-06-2024	1.90	
	14-11-2024	2.27	96.1
MW23-3	21-09-2023	0.61	98.1
	19-10-2023	0.65	97.7
	20-06-2024	1.30	97.4
	14-11-2024	2.15	96.5

Note: 1. Artesian conditions

4.0 GROUNDWATER SUPPLY

A groundwater supply investigation was carried out in accordance with the MECP August 1996 document “Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment” and the Ottawa “Hydrogeological and Terrain Analysis Guidelines” dated March 2021 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.

4.1 Test Well Construction

MECP Procedure D-5-5 and the Ottawa “Hydrogeological and Terrain Analysis Guidelines” dated March 2021 indicate that a minimum of five test wells is required for sites more than 25 hectares and up to 40 hectares in area. The total area of the proposed Cedar Lakes Phase 3 – 4 is approximately 40 hectares (40.09 hectares). A total of five test wells (namely TW A (previously TW 1), B, C, D, and E) were utilized to support the groundwater supply investigations.

TW A and C were drilled on the Site as part of previous investigations by others – refer to Paterson (2011b). Conversely, TW B was drilled in 2017 by D&R Well Drilling Inc. and is located off of the Site in a City of Ottawa Park (see Figure 1). The well casings of TW A and TW C were extended with a 4-inch liner during the current groundwater investigation by GEMTEC to meet the recommended 40-metre casing length.TW D and TW E were drilled by Air Rock Drilling Co. Ltd. (Well Contractor License No. 1119) in October 2023. The locations of TW-D and TW-E were chosen to provide representative coverage of the Site and with the intent for future use as water supply wells on individual lots (Figure 1). Copies of the MECP Water Well Records for these wells are provided in Appendix B.

The construction details of TW-A to TW-E inclusive, are summarized in Table 4.1.

Table 4.1 – Summary of Test Well Construction Details

Test Well ID	Depth to Bedrock (m BGS[1])	Depth of Well Casing (m BGS)	Depth Water Found[2] (m BGS)	Total Well Depth (m BGS)	Lithology Description (open interval)
TW A (A089354)	11.58	41.1[3]	47.5, 52.4	54.9	Grey and white sandstone
TW B (A209552)	14.48	41.1	59.7	60.6	Grey dolostone
TW C (A093609)	10.67	41.1[3]	49.4, 52.1	54.9	Grey and brown dolostone

Test Well ID	Depth to Bedrock (m BGS[1])	Depth of Well Casing (m BGS)	Depth Water Found[2] (m BGS)	Total Well Depth (m BGS)	Lithology Description (open interval)
TW D (A378947)	6.10	39.9	56.7, 59.1	61.0	Grey and black dolostone with layers of grey sandstone
TW E (A378948)	11.58	41.1	56.1, 59.1	61.0	Grey and black dolostone

Notes:
1. m BGS - Metres Below Ground Surface
2. Depth water found as reported by well driller on the MECP water well record.
3. Test well lined with 4" casing.

4.2 Off-Site Private Well Construction (Wells sampled)

The well construction details of the private wells sampled as part of the hydrogeological investigation are summarized in Table 4.2. The well record for PW-6266 was not found.

Table 4.2 – Offsite Private Domestic Well Construction Details

Well ID	Well Tag #	Depth to Bedrock (m)	Depth of Well Casing (m)	Depth of Water Found (m)	Total Well Depth (m)	Lithology Description (open interval)
PW-1794	A229133	5.8	39.9	56.7	58.5	Sandstone
PW-1826	A305055	4.9	39.9	52.1, 71.3	73.2	Sandstone
PW-1850	A144728	7.9	39.9	57.3, 77.7, 89.3	91.4	Sandstone
PW-1858	A144727	8.8	39.9	54.9, 75.6, 89.6	91.4	Sandstone
PW-1922	A135456	8.8	39.9	55.2, 77.4	85.3	Sandstone
PW-6266	unknown	unknown	unknown	unknown	unknown	unknown
PW-6342	A014478	9.1	10.7	15.2, 21.0, 22.2	24.4	Limestone (Dolostone)

4.3 Pumping Test Field Procedure

The pumping tests for the onsite test wells were conducted between October 25 and November 7, 2023. In each test well a six-hour duration constant discharge rate pumping test was conducted.

The pump discharge was directed to the ground surface at a distance of at least 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.

4.3.1 Water Level Measurements and Bedrock Groundwater Flow

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 to ensure a minimum of 95 percent of the drawdown in water level had recovered in the test wells. The water level measurements for the drawdown and recovery data for the pumping tests are provided in Appendix F.

Water level measurements were also taken from other onsite test wells and monitoring wells (observation wells) prior to, during and after the pumping of each of the test wells to determine potential interference effects, water level fluctuations and influence from precipitation. Continuous water level measurements were recorded at 10-minute intervals in all observation wells from October 17, 2023, to November 22, 2023. Water level measurements taken in the observation wells are provided in Appendix G.

Minimal daily water level fluctuations of less than 0.3 metres were observed in all five test wells. Precipitation data from a nearby weather station (Ottawa Int. Airport, approximately 15 km from site) was compared to the test well water levels during the monitoring period. The major rainfall events did not appear to have direct impacts on the test well water levels (Appendix G). A gradual increase in water levels, up to approximately 0.5 metres was observed in all test wells during the four-week water level monitoring period.

4.3.2 Flow Rate Measurements

The wells were pumped using an electric submersible pump and portable generator supplied by Air Rock Drilling Ltd. The flow rate of the pump discharge hose was constantly monitored using a timed-volume method. Multiple flow measurements were taken within the first hour of the pumping test and then at 60-minute intervals throughout the remainder of the pumping test to ensure that the discharge rate maintained a constant flow rate (i.e., within 5%). The test wells were pumped at a rate of approximately 58 litres per minute, which is three times greater than that required to support a 4-bedroom dwelling with flows of 18.8 litres per minute.

4.3.3 Groundwater Sampling

Total chlorine tests were conducted in the field to ensure that chlorine levels were at non-detectable concentrations prior to bacteriological testing. The temperature, conductivity, total dissolved solids, pH, turbidity, colour, and total chlorine levels of the groundwater were measured at periodic intervals during the pumping tests and are summarized in Appendix D. The field

equipment used during the pumping test is calibrated before use and the details of field equipment are provided in Table 4.3.

Table 4.3 – Field Equipment Overview

Field Parameters	Manufacturer	Model No.
Total and Free Chlorine	Hach	DR 900
pH, temperature, Conductivity	Hanna / Horiba[1]	HI 98129 / Horiba U-52[1]
Turbidity	Hanna	HI 98703
Colour	Hach	DR 900

Notes: 1. Rental equipment from Maxim Environmental and Safety Inc.

The groundwater samples were collected after three and six hours of pumping 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 groundwater samples were subsequently submitted to Paracel laboratories in Ottawa, Ontario for analysis of 'subdivision package' and 'trace metals' parameters, as outlined in the City of Ottawa Hydrogeological Guidelines dated March 2021. No other parameters of concern, e.g. volatile organic compounds, were identified based on a review of surrounding land use.

The pre-consultation notes (Appendix J) indicate that radon has been an identified issue in the area and testing of radon is recommended. A technical discussion to discuss radon testing was held on September 20, 2023, between GEMTEC (Andrius Paznekas, M.Sc., P.Geo) and City of Ottawa (Tessa Di Iorio, M.Sc., P.Geo.). It is understood that radon testing has been completed by the OGS and includes 15 samples in the Greely area. The data collected by OGS is not yet publicly available. There are no Ontario Drinking Water Quality Standards or Canadian Guideline limits for radon in groundwater. In Nova Scotia, where radon is more prevalent, Nova Scotia's Environment and Climate change indicates that "*the amount of radon that goes into the air when you use water is so small that it is generally not thought to cause for worry. It usually makes up only 1 to 2% of radon that can collect in indoor air*" (Government of Nova Scotia, N.D). It is understood that one property located south of the Site and outside of Greely is utilizing a radon system; however, the source of radon is unknown. Given the available information, radon in groundwater is not considered to be a parameter of concern that would require testing as part of the Site investigations.

4.4 Water Quality

4.4.1 Test Well Water Quality

A summary of the results from the chemical, physical and bacteriological analyses performed on the water samples obtained from the five test wells and the laboratory results from Paracel are summarized in Appendix D. Table 4.4 summarises how sample identifiers on the certificates of analysis correspond with report test hole identifiers used in this report to clarify variable naming conventions for the test wells.

Table 4.4 – Summary of Test Well Certificates of Analysis and Naming Conventions

Paracel Order #	Sample Date	Sample IDs	Report IDs
2344227	Oct 31, 2023	TW1	TWA
2344440	Oct 31, 2023	TW2	TWB
2344186	Oct 30, 2023	TW3	TWC
2343287	Oct 25, 2023	TW4	TWD
2345203	Nov 7, 2023	TW5	TWE

4.4.1.1 Bacteriological Parameters

Total and free chlorine measurements confirmed that total and free chlorine concentrations in the well water was non-detectable (<0.02 mg/L) at the time of bacteriological sampling during the pumping tests (refer to Appendix D).

Based on water samples collected from the on-site test wells, total coliform counts exceeded the Ontario Drinking Water Quality Standards (ODWQS) maximum acceptable concentration of 0 CFU/100mL in three of the five on-site test wells (TW B, TW C and TW E). Low levels of total coliform were detected in the initial 3-hr samples from TW B, with reported total coliform counts of 1 CFU/100mL, but the 6-hr samples indicated non-detectable total coliform. The total coliform levels detected in the initial 3-hr samples were 14 and 3 CFU/100mL, while the 6-hr samples had concentrations of 8 and 10 CFU/100mL, at TW C and TW E, respectively.

Bacteria indicator species such as *E. coli* and fecal coliform were not detected in any of the water samples.

Test Wells TW C and TW E were shock chlorinated on November 11, 2024, by a licensed well technician (Air Rock Drilling Ltd.). The test wells were allowed for sit for a period of 24-48 hours prior to purging, where the wells were pumped at a rate of approximately 75 litres per minute for about six hours prior to sampling. Test well TW E was pumped on November 12, 2024, and sampled for bacteriological parameters (TC, EC, FC and HPC) following confirmation that the field measured chlorine was non-detectable. All bacteriological parameters analyzed were non-detectable (Laboratory Certificates of Analysis provided in Appendix D).

Test well TW C was pumped on November 13, 2024, and sampled for bacteriological parameters (TC, EC, FC and HPC) following confirmation that the field measured chlorine was non-detectable. The total coliform was reported to be 8 CFU/100mL with non-detectable *E. coli*, fecal coliform and HPC. The pumping equipment / pump trailer was moved from TW E to TW C on November 13, 2024, and is likely the source of total coliform. This is supported by additional well sampling completed on March 25, 2025, where the bacteriological parameters (TC, EC, FC, HPC; duplicate sample) were reported to be non-detectable following purging (Laboratory Certificates of Analysis provided in Appendix D). Test well TW C was not chlorinated between November 11, 2024, and March 25, 2025, when the well was pumped at a rate of approximately 75 litres per minute for six hours prior to sampling.

In GEMTECs professional opinion the detectable total coliform at TW C and TW E was attributable to insufficient well chlorination and/or introduced via pumping equipment.

4.4.1.2 Other Health Related Parameters

With the exception of total coliforms noted above, no maximum acceptable concentration limits of the ODWQS were exceeded in the three and six-hour water samples collected from the onsite test wells.

Sodium concentrations exceeded the warning level for persons on sodium-restricted diets. This exceedance calls for a recommendation that the local Medical Officer of Health be notified in order to alert persons with relevant medical conditions.

4.4.1.3 Operational Guideline Exceedances

Operational related exceedances of the ODWQS were noted for hardness (all test well samples), aluminum (TW A), organic nitrogen (TW B), and are discussed in the following section:

Hardness

The concentration of hardness in water samples obtained from all five test wells ranged from 300 to 469 mg/L, which exceeds the operational guideline of 80 to 100 mg/L of $CaCO_3$ as specified in the ODWQS.

Water having a hardness level above 80 to 100 mg/L as $CaCO_3$ is often softened for domestic use. The MECP 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 MECP Procedure D-5-5.

The concentrations of hardness in all the test wells are below the threshold of 500 mg/L as CaCO3 as specified in the Technical Support Document for the ODWQS. The concentration of hardness observed in the test wells is reasonably treatable using a conventional water softener. Based on our experience, 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 (e.g., a bypass of the softener to the cold-water kitchen tap).

Organic Nitrogen

The organic nitrogen concentration (calculated as total Kjeldahl nitrogen – ammonia) slightly exceeded the operational guideline of 0.15 mg/L for ODWQS in the 3-hr and 6-hr samples from test well TW B with concentrations of 0.2 mg/L.

The ODWQS indicates that levels of organic nitrogen more than 0.15 mg/L may be caused by septic tank or sewage effluent contamination and is typically associated with dissolved organic carbon (DOC) contribution, which was reported to be 1.4 mg/L in the 3-hr and 6-hr samples.

Organic nitrogen can react with chlorine and severely reduce its disinfectant power; in addition, taste and odour problems may also occur. It is not expected that ongoing 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.

Aluminum

Total aluminum concentrations of 0.135 mg/L identified in the 6-hr samples for TW A slightly exceeds the ODWQS operational guideline of 0.1 mg/L. Aluminum in untreated water is found in the form of fine particles of alumino-silicate clay, which can be effectively removed in coagulation/filtration. The dissolved aluminum concentrations are below the maximum acceptable

concentration of 2.9 mg/L (Health Canada, 2021). The total aluminum exceedances are attributed to the turbidity levels, which was 2.3 mg/L at the time of sampling. This is supported by the dissolved aluminum concentration of 0.019 mg/L which was field filtered through 0.45-micron filter.

The operational guideline exceedance for aluminum was only exceeded in one test well (TW A), which is expected to be within the operational guidelines following additional well development, as the turbidity levels decrease. High levels of aluminum can cause coating of pipes within the distribution system and result in interferences (flocculation, increased pumping energy and interference). Although treatment for aluminum is not anticipated, it can be treated using coagulation/filtration.

4.4.1.4 Aesthetic Objective Exceedances

Aesthetic objective exceedances of the ODWQS included total dissolved solids in TW B and TW D, iron in TW D and TW E, and turbidity in TW E. These exceedances are discussed in the following sections:

Iron

The iron concentrations from all on-site test wells ranged from 0.1 to 0.4 mg/L. The 3-hr samples obtained from TW D, and both the 3-hr and 6-hr samples obtained from TW E exceed the ODWQS aesthetic objective for iron of 0.3 mg/L, with reported iron concentrations of 0.4 mg/L.

Elevated levels of iron may cause staining to plumbing fixtures and laundry. However, the iron level is within the maximum reasonably treatable limits of 5.0 mg/L provided in Table 3 of the Appendix in the MECP Guideline D-5-5. Iron is typically removed using water softeners or manganese greensand filters.

Turbidity

Turbidity levels at TW E slightly exceed the ODWQS aesthetic objective of 5 NTU, with concentrations 5.2 and 5.5 NTU for the 3-hr and 6-hr samples, respectively. It is noted that the 6-hr field measurement for turbidity indicated a concentration of 4.28 NTU, which is within the aesthetic objective.

Discrepancies between lab and field measurements of turbidity can be caused by the change of conditions the water is subjected to during the period between the time of sampling and time of analysis (I.e., change in temperature, oxidation). Precipitation of substances such as iron and manganese can occur, leading to an increase in turbidity. As such, field measured turbidity is considered more representative of in-situ water conditions, which was measured to be 4.28 NTU, satisfying the ODWQS aesthetic objective of 5 NTU.

Total Dissolved Solids (TDS)

TDS levels in samples obtained from TW B and TW D exceed the ODWQS aesthetic objective of 500 mg/L, with concentrations of 916 mg/L and 900 mg/L at TW B, and 562 mg/L and 520 mg/L at TW D, at the 3-hr and 6-hr, respectively. 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 laboratory measured TDS, pH, alkalinity, and calcium following 6-hours of pumping. The LSI was calculated for TW B and TW D to be 0.25 and 0.10 respectively, using an estimated groundwater temperature of 10°C (refer to Appendix I). The test wells have LSI values between 0.0 and 0.5, which indicates the groundwater is slightly scale forming and corrosive.

As per the “Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines”, TDS levels in excess of 500 mg/L may result in excessive hardness, taste, mineral deposition or corrosion. According to the “Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Total Dissolved Solids (TDS)”, published by Health Canada (1991), TDS levels between 600 and 900 mg/L are considered to be ‘fair’. At levels above 1,200 mg/L, the palatability of drinking water is ‘unacceptable’. The palatability of the drinking water is expected to be acceptable, although some taste problems may occur as the palatability is classified as ‘fair’. Optional water treatment by reverse osmosis, distillation, or deionization can reduce TDS concentrations.

4.4.2 Offsite Water Quality Sampling Program

To characterize the background water quality homeowner water quality sampling in the vicinity of the Site was completed. A total of seven private wells were sampled, five of which are located within Cedar Lakes Phases 1 and 2. The remaining two samples were chosen based on their shallower depths and shorter casing lengths to help characterize bedrock aquifer susceptibility to surface contamination. Refer to Figure 1 for the locations of the sampled private wells.

4.4.2.1 Resident Interviews

The participants of the water quality sampling program conducted on November 8, 2023, within Cedar Lakes 1 and 2 were respondents of a general email sent out to homeowners via the Cedar Lakes Homeowners Association. This method gave all homeowners within the subdivision the opportunity to participate in the sampling program. The email yielded five participants.

Further off-site sampling was performed for homes within the adjacent subdivision west of the Site. Following a review of available MECP well records, a door-to-door survey was conducted on November 28, 2023. Two further homeowners agreed to participate in the sampling program, giving a total of seven participants.

A summary of the interviews with the residents is provided in the Table 4.5. Homeowners were requested to rate water quality on a scale of 1 (poor), 2 (fair), 3 (good), 4 (very good), and 5 (excellent).

The private wells owners surveyed had variable water quality ratings, from poor to excellent. Specific water quality comments were for sulfur odours, high iron and colour. Private well owners reported the use of conventional water softeners (7 of 7), UV units (2 of 7), iron filtration (2 of 7) and reverse osmosis (3 of 7). No groundwater quantity issues were reported.

Table 4.5 – Summary of Homeowner Interview

Test Well ID	Homeowner Water Quality Rating[1]	Water Quantity Comments	Water Quality / Septic Comments
PW-1922	Excellent	No reported groundwater quantity issues	• No reported groundwater quality issues. • UV, Water softener and reverse osmosis (RO) (at sink taps) systems in place.
PW-1826	Good	No reported groundwater quantity issues	• Occasional sulfur smell. • Water softener system in place.
PW-1858	Fair	No reported groundwater quantity issues	• High iron and sulfur • UV, Water softener, iron filter and reverse osmosis (at kitchen tap) systems in place.
PW-1850	Poor	No reported groundwater quantity issues	• Respondent noted no groundwater quality issues. • Water softener and iron filtration systems in place.
PW-1794	Poor	No reported groundwater quantity issues	• High iron, hardness, and colour. • Reverse osmosis treatment system in place.
PW-6342	Fair	No reported groundwater quantity issues	• High iron and sulfur • Water softener system in place.

Test Well ID	Homeowner Water Quality Rating[1]	Water Quantity Comments	Water Quality / Septic Comments
PW-6266	Good	No reported groundwater quantity issues	• High iron, and presence of sulfur • Water softener system in place.

Colour issues can be the product of metals (e.g., iron and/or manganese) and/or organic materials. Removal of these constituents (e.g., by using softeners and/or reverse osmosis) may improve the colour of the water. Organic materials can result in disinfection bi-products – but regular chlorination of drinking water is not anticipated.

Sulfur smell was reported two homeowners, which may be associated with hydrogen sulphide, which was non-detect in all of the test wells. Sulfide may produce an unpleasant odour/flavour, black stains on laundered items, and black deposits on pipes and fixtures in association with iron. Aeration is an effective treatment option for low levels of hydrogen sulphide.

4.4.2.2 Private Well Water Quality Results

The seven private well water quality results are provided in Appendix D and the ODWQS exceedances are summarized in Table 4.6.

The groundwater encountered in the on-site test wells is similar to the water quality in off-site test wells and private domestic wells, with operational guideline exceedances of hardness and organic nitrogen and aesthetic objective exceedances of iron and total dissolved solids. With the exception of one test well (TW B) which reported a nitrate concentration of 1.6 mg/L, all other wells sampled reported non-detectable (<0.1 mg/L) nitrate concentrations.

Table 4.6 – Summary of ODWQS Exceedances in Private Off-site Wells

ODWQS Exceedance Type	Parameter	Cedar Lakes Phase 1-2	Subdivision West of Site
Health-Related	Total Coliform	-	-
Aesthetic	Iron, total dissolved solids	Iron, total dissolved solids	Colour, iron, total dissolved solids
Operation Guideline	Hardness, organic nitrogen, aluminum	Hardness	Hardness, organic nitrogen

4.4.3 Historical Water Quality Data Summary

Water quality data was collected from test wells located in Phase 1 and 2 of the development named TW4 (Phase 1) and TW2A (Phase 2). Samples were collected in 2010 and 2015 and intercompared. To note, TW2A was screened in the (inferred) Oxford Formation in 2010 and extended to the underlying March Formation by the 2015 sample. No exceedances of ODWQS health-related parameters were reported for either well sample. Nitrate (0.32 mg/L) and ammonia (0.05 mg/L) were detected in the Oxford Formation in 2010 in TW2A and some level of organic nitrogen (i.e., the difference between TKN and ammonia) was reported in both wells in 2015. Apart from the noted nitrogen species, the remainder measurements were reported as non-detect.

Water softeners at all private wells tested and some iron filter units in use

4.4.4 Supplemental Sampling Program Results (2024-2025)

Additional sampling was completed to address comments provided from the technical reviewer of the City of Ottawa. The purpose and relevant results of the field and lab water quality sampling is summarised in the following subsections, and the Certificates of Analysis are included in Appendix D following the water quality data reported in previous revisions of the report. Lab analyses were performed by Parcel Laboratories Limited of Ottawa and field parameters were collected using the device summarised in Section 4.3.3.

4.4.4.1 Test Well B (TW B; Off-Site City of Ottawa Park Well)

TWB had detectable nitrate concentrations, despite being cased to 40 metres below ground surface. Accordingly, additional sampling was undertaken to explore this nitrate detection. TWB was re-sampled on November 14, 2024, then again on November 15, 2024, following 1 day of pumping, and a final time on November 28, 2024, following 1 more day of pumping. The first two samples were submitted for chloride and nitrate, as field turbidity readings exceeded 5 NTU at the time of sampling. The third water quality sample was collected after confirmation that turbidity had declined below 5 NTU and was submitted for hardness, total dissolved solids, turbidity, chloride, nitrate, nitrite, calcium, and magnesium. Select water quality results for TWB are summarised in Table 4.7 for consideration.

Table 4.7 – Select Water Quality Results for TW B Supplemental Sampling

Date	Nitrate (mg/L)	Nitrite (mg/L)	Chloride (mg/L)	Turbidity (NTU)
14 Nov, 2024	1.2	<0.05	215	-
15 Nov, 2024	1.3	<0.05	214	-

Date	Nitrate (mg/L)	Nitrite (mg/L)	Chloride (mg/L)	Turbidity (NTU)
28 Nov, 2024	1.1	<0.05	212	0.6

4.4.4.2 Test Well C (TW C)

TWC had a total coliform exceedance in a sample taken following the pumping test, believed to be associated with drilling and pumping activities. Confirmatory sampling was performed on November 14, 2024, following chlorination, circulation, and purging of the well. Another low exceedance of total coliform was noted (8 CFU/100 ml of sample). Follow up sampling was performed in duplicate on March 25, 2025. All health-related bacterial indicators were non-detect in both samples. Chlorine was measured at the detection limit (0.02 mg/L), which is inferred to be anomalous given the duration between sampling events, and turbidity in the well (4.4 NTU) was measured below 5 NTU at the time of sampling.

4.4.4.3 Test Well E (TW E)

The initial water quality results for TWE indicated a total coliform exceedance and turbidity in excess of 5 NTU. Accordingly, the well was chlorinated, circulated, and purged. Water samples were collected from TWE on November 12, 2024. The lab reported that the bacterial indicator species were all non-detect and the turbidity was reported as 2.4 NTU. Field turbidity at the time of sampling was measured as 1.9 NTU and chlorine was reported as non-detect (<0.02 mg/L).

4.4.4.4 Monitoring Wells

The on-site monitoring wells (i.e., MW23-01, MW23-02, and MW23-03) were re-sampled on June 20, 2024, and November 14, 2024. Water samples were submitted for nitrogen species, including ammonia, total Kjeldahl nitrogen, nitrate, and nitrite. The water quality results are presented along with previously reported results in Table 4.8.

Table 4.8 – Water Quality Results for On-Site Monitoring Wells

Well ID	Date (dd/mm/yy)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Total Kjeldahl Nitrogen (mg/L)
MW23-01	25/09/23	3.4	<0.05	<0.01	0.2
	27/10/23	2.6	<0.05	-	-
	20/06/24	2.8	<0.05	0.02	0.7
	14/11/24	3.5	0.09	0.03	0.5-

Well ID	Date (dd/mm/yy)	Nitrate (mg/L)	Nitrite (mg/L)	Ammonia (mg/L)	Total Kjeldahl Nitrogen (mg/L)
MW23-02	25/09/23	<0.1	<0.05	0.12	1.6
	27/10/23	<0.1	<0.05	-	-
	20/06/24	<0.1	<0.05	0.16	3.0
	14/11/24	<0.1	<0.05	0.11	1.6
MW23-03	25/09/23	<0.1	<0.05	0.06	1.3
	27/10/23	<0.1	<0.05	-	-
	20/06/24	<0.1	<0.05	0.04	1.0
	14/11/24	<0.1	<0.05	0.01	0.5

4.4.4.5 Homeowner Private Wells

Homeowner wells northeast (PW-1700) and southwest (PW-1738) of TWB were sampled to support an assessment of the observed nitrate concentrations in the deeper aquifer. Samples were collected from both private wells on March 24, 2025, and were submitted for the analysis of chloride and nitrate. The results for both locations are presented in Table 4.9, and the well records for the wells are included at the end of Appendix B.

Table 4.9 – Water Quality Results for PW-1700 and PW-1738

Well ID	Nitrate (mg/L)	Chloride (mg/L)
PW-1700	1.9	235
PW-1738	<0.1	242

4.4.5 Chlorides Assessment

Chloride concentrations range from 6 to 242 mg/L in the 2010 and 2015 samples, which is in general agreement with present investigation (i.e., 61 to 246 mg/L). The large range of chloride concentrations may highlight the variability within the water supply aquifer(s), differences between aquifer units, and/or variable impacts from surface sources (e.g., road salts, softener discharge, septic systems, etc.). This is particularly evident in private wells PW-1850 and PW-1858, which are both completed at depths of 91.4 metres, reported similar water bearing depths of 57.3 / 77.7

/ 89.3 m and 54.9 / 75.6 / 89.6 m respectively, yet the chloride concentrations were 84 and 231 mg/L respectively.

Limited long-term water quality data is available from technically representative test wells to comment on chloride concentrations over time. Additional sampling was performed on the private water supply well at PW-1700, which is a former test well from previous investigation ('HW-TW6'; Paterson 2011b). The chloride concentration of HW-TW6 was reported to be 216 and 209 mg/L during the December 18, 2009, pumping test and 235 mg/L during the homeowner sampling event completed by GEMTEC on March 24, 2025 (Laboratory Certificates of Analysis provided in Appendix D). Recent chloride concentrations are slightly higher than those recorded 15 years ago but remain within the expected range of seasonal variability.

All concentrations remain below the ODWQS aesthetic limit of 250 mg/L.

4.4.6 Nitrogen Species Assessment

TW B presented with low levels of nitrates despite being cased to 40 metres below ground surface, whereas other test wells have non-detectable nitrates. Supplemental groundwater quality sampling was completed at TWB on November 14, 15 and 28, 2024. Test well TWB was pumped for a period of three days, as the field measured turbidity was greater than 5 NTU during the November 14 and 15, 2024 pumping, which is attributed to the well not being regularly pumped. The nitrate concentrations ranged from 1.1 to 1.3 mg/L and the turbidity on November 28, 2024, was 0.6 NTU.

Additional sampling was performed at PW-1700 (upgradient of TW B) and PW-1738 (downgradient of TW B) to investigate potential sources of the nitrate to the deeper groundwater system. PW-1700 was 61.0 m deep and cased down to 15.85 m below ground surface, whereas PW-1738 was 59.1 m deep and cased to 39.9 m below ground surface.

The sample taken from the upgradient location (PW-1700) presented with a higher nitrate concentration (1.9 mg/L) than the concentrations measured in TW B (1.1-1.8 mg/L), whereas the downgradient location was free of measurable concentrations of nitrates. This data suggests that the nitrate source to the deeper groundwater system is localised, rather than a distributed issue across the previous phases of development in the area, and is likely sourced upgradient of TW B. It is presently interpreted that PW-1700, TW B or another upgradient deep well with relatively shallow casing depth, is serving as a vertical connection between the shallow aquifer receiving septic effluent and the deep aquifer. Although a natural vertical fracture connection cannot be entirely ruled out, it is inferred to be less likely considering the conceptual understanding of the Site. Regardless of the transport pathway, this nitrate issue is inferred to be localised, and unlikely to be an issue requiring further investigation for the purpose of the groundwater supply investigation for the Phase 3 and 4 Cedar Lakes developments.

Organic nitrogen increased in both test wells (TW2A and TW4) from 2010 to 2015, but the 2015 concentrations appear to be generally consistent with 2025 water samples. The presence of organic nitrogen could be an indicator of septic influence, but not necessarily, and does not pose a health-related risk in the absence of nitrates and bacteria.

Monitoring wells MW23-1, MW23-2, and MW23-3 were sampled for nitrogen species on four occasions:

- Nitrates at MW23-1 ranged between 2.6 and 3.5 mg/L, likely owing to its proximity to upgradient septic systems and organic deposits previously identified in the area (Paterson, 2010), and nitrates were non-detect at the other two well locations.
- Nitrites were not measurable at any monitoring location.
- Organic nitrogen was present at all locations that are likely associated with surface water processes and/or septic systems in the case of MW23-1.

4.5 Test Well Water Quantity

4.5.1 Pump Test Analysis Overview

As per MECP Procedure D-5-5 and the Ottawa “Hydrogeological and Terrain Analysis Guidelines” dated March 2021, each test well was pumped at a flow rate greater than 18.9 litres per minute for 6 hours.

The maximum drawdown observed at the end of pumping was 5.4 metres in test well TW E which is equivalent to approximately 9.7 percent of the available drawdown in the test well. The drawdown utilized in the remaining test wells ranged from 0.5 to 8.5 percent. All wells recovered within 24 hours following pump turn off time.

Based on these results, all the on-site test wells are capable of supplying water at a rate significantly greater than 18.9 litres per minute for a period greater than six hours. This is considered more than sufficient for typical domestic use.

4.5.2 Transmissivity and Storativity Analysis

The transmissivity of the water supply aquifer was estimated from the pump test drawdown data using Aqtesolv version 4.5, a commercially available software program from HydroSOLVE Inc. Analysis of the pumping test data was carried out using the Cooper-Jacob and Theis recovery methods. The results of the Aqtesolv 4.5 analysis are provided in Appendix F. Storativity values are not generally representative of aquifer properties in single-well pumping tests due to the effects of wellbore storage and/or well construction, and drawdowns were insufficient for analyses of the pumping test using multi-well analyses; therefore, the calculated storativity values were excluded from the results.

4.5.2.1 Pumping Test TW A

Test well TW A was pumped at a constant rate of 57 L/min for 380 minutes. The initial drawdown in the pumped well was approximately 1.2 m within 10 seconds of pumping. It gradually increased to a maximum drawdown of 2.3 m after 380 minutes. The water level in the test well recovered 96 percent approximately 12 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 24.8 L/min/m. An aquifer transmissivity of 86 and 85 m^2/day was estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.5.2.2 Pumping Test TW B

Test well TW B was pumped at a constant rate of 57 L/min for 380 minutes. The initial drawdown in the pumped well was approximately 0.2 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 0.3 m after 380 minutes. The water level in the test well recovered 96 percent approximately 16 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 190 L/min/m. Aquifer transmissivities of 158 m^2/day and 126 m^2/day were estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.5.2.3 Pumping Test TW C

Test well TW C was pumped at a constant rate of 57 L/min for 381 minutes. The initial drawdown in the pumped well was approximately 1.6 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 3.1 m after 380 minutes. The water level in the test well recovered 95 percent approximately 24 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 18.4 L/min/m. An aquifer transmissivity of 26 m^2/day was estimated using both the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

4.5.2.4 Pumping Test TW D

Test well TW D was pumped at a constant rate of 57 L/min for 374 minutes. The initial drawdown in the pumped well was approximately 0.9 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 4.8 m after 374 minutes. The water level in the test well recovered 97 percent approximately 10 minutes after the pump was shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 10.6 L/min/m. Aquifer transmissivities

of 90 m^2/day, 41 m^2/day and 70 m^2/day was estimated using the Cooper-Jacob (drawdown), Papadopulos-Cooper method (drawdown) and Theis method (recovery), respectively. The Papadopulous-Copper method was also selected as it incorporates wellbore storage which provided a better estimate of transmissivity. The well response to pumping in TW D was similar to those observed in TW A and TW C. The estimated transmissivity of TW D is within the range of the other test wells and TW D is considered to be technically representative.

4.5.2.5 Pumping Test TW E

Test well TW E was pumped at a constant rate of 57 L/min for 360 minutes. The initial drawdown in the pumped well was approximately 0.9 m within 20 seconds of pumping. It gradually increased to a maximum drawdown of 5.4 m after 360 minutes. The water level in the test well recovered 98 percent approximately within 20 hours of pump shut off.

Aquifer parameters were evaluated using drawdown data from the pumping well. The specific capacity of the well at the time of maximum drawdown was 11.9 L/min/m. Aquifer transmissivities of 13 m^2/day and 15 m^2/day were estimated using the Cooper-Jacob method (drawdown) and Theis method (recovery), respectively.

The drawdown and recovery water level data from the five pumping tests conducted on the onsite test wells TW A to TW E, inclusive, are provided in Appendix F. The details of the pumping tests carried out on the test wells are provided in Table 4.10.

Table 4.10 – Pumping Tests Details

Parameter	TW A	TW B	TW C	TW D	TW E
Pumping Duration (minutes)	380	380	381	374	360
Flow Rate (litres per minute)	57	57	57	57	57
Static Water Level (m BGS)	5.4	7.0	9.2	4.3	5.3
Well Depth (m BGS)	54.9	60.6	54.9	61.0	61.0
Available Drawdown (m)	49.5	53.6	45.7	56.7	55.8
Water Level at End of Pumping (m BGS)	7.7	7.3	12.3	9.1	10.7
Observed Drawdown at End of Pumping (m)	2.3	0.3	3.1	4.8	5.4

Parameter	TW A	TW B	TW C	TW D	TW E
Percent Drawdown Utilized (%)	4.6	0.5	6.8	8.5	9.7
Recovery hours / % recovered	0.2 / 96%	0.3 / 96%	0.4 / 95%	0.2 / 97%	20 / 98%
Specific Capacity (L/min/m)	24.8	190	18.4	11.9	10.6
Estimated Transmissivity (m^2/day)	85	142	26	67	15

4.6 Hydraulic Interference Effects

During the pumping of the onsite test wells, water level measurements were recorded at the remaining four bedrock wells using electric data loggers, recording every 10 minutes. The water level measurements in the observation wells are reported in Appendix G and discussed below.

4.6.1 Bedrock Observation Wells

During the pumping tests for test wells TW A to TW E water levels were measured in bedrock observation wells. The maximum observed water level decrease in bedrock observations wells was 0.15 metres and was observed at TW A during the pumping of TW B. A similar drawdown of 0.12 m was experienced at TW B during pumping of TW A, 0.14 m at TW E during pumping of TW C, 0.12 m and 0.11 m at TW C during pumping of TW D and TW E, respectively. All other wells displayed drawdowns of less than 0.1 m at any given pumping time.

Based on the test well pumping rates (57 litres per minute), which are greater than typical domestic use, little to no hydraulic interference effects are anticipated at the Site. This is supported by long-term water level monitoring of the test wells between October 19 and November 17, 2023. The test wells located on proposed lots adjacent to the existing residential development (Figure 2) did not display any significant (less than 0.5 metres) daily water level fluctuations over the 30-day monitoring period.

4.6.2 Computer Model Simulations

A well interference simulation was developed using Aqtesolv Version 4.5. The well simulation output is provided in Appendix H for reference. Drawdowns were calculated using the Theis (1935) analytical solution for groundwater flow. This mathematical solution is based on the following assumptions:

- The aquifer is homogeneous and isotropic;
- The aquifer is of infinite extent;

- The pumping well is fully penetrating;
- The aquifer is fully confined; and
- The well diameter is negligible.

Like all methods of groundwater modelling, the Theis (1935) solution has several limitations with respect to emulating real-world conditions. Nonetheless, it is still regarded as one of the better tools for efficiently estimating subsurface hydraulic and storage properties using groundwater drawdown, or vise versa. Real aquifers are rarely perfectly confined, homogenous, or isotropic and cannot have a truly infinite extent (though it can be a fair assumption in many circumstances). Furthermore, wellbore storage or screen effects are not incorporated into the Theis (1935) solution.

Storativity in the simulation was not estimated from the pumping test data due to minimal water level drawdowns in the observation wells, as the analysis of single-well pumping tests generally produces inaccurate storativity estimates. Literature values of storativity for confined aquifers, typically range from 5×10^{-5} to 5×10^{-3} (Todd, 1980), were used in the model in place of values calculated from observational data.

4.6.2.1 Scenario 1

Scenario 1 is provided to illustrate the maximum drawdown using the geometric mean aquifer parameters identified in Table 4.7. The following parameter values were utilized in the model:

- Number of pumping wells = 71 wells (well locations approximated by taking the central point on each proposed land parcel).
- Individual well pumping rate = 18.75 litres per minute (minimum peak flow estimate as per MECP Procedure D-5-5).
- Duration of pumping = 120 minutes.
- Analysis model = Theis
- Aquifer thickness = 55 m (minimum aquifer thickness; refer to Table 4.7).
- Aquifer transmissivity, Theis = 39 m^2/day (geometric mean; refer to Table 4.7).
- Storativity coefficient = 5×10^{-5} (conservative estimate based of storativity based on literature values; Todd, 1980).

- Available drawdown = 52 m (geometric mean; refer to Table 4.7).

The results of Scenario 1 simulation indicate that the maximum drawdown within the Site is approximately 6 metres, representing 10% of available drawdown in on-site wells, and is localized to the pumping wells. To note, the long-term water level monitoring of on-site test wells located adjacent to Cedar Lakes Phases 1 and 2 had daily water level fluctuations less than 0.3 metres and therefore, Scenario 1 is considered to be conservative.

Interference between on-site test wells and private wells in Cedar Lakes Phases 1-2 are not anticipated given the wells are constructed with minimum casing depths of 40 metres and the calculated drawdown represents less than 10% of available drawdown.

Private wells located west of the Site are generally shallower, ranging from approximately 14 to 85 metres (10^{th} and 90^{th} percentile) with average well depths of 37 metres. The closest private wells located west of the Site would experience water level drawdown of less than 1.8 metres, assuming the water supply wells are completed in the same aquifer. Given the proposed water supply wells will be cased to 40 metres below ground surface and completed in the March and/or Nepean Formation, shallower wells with smaller available drawdown and completed in the Oxford and/or upper March Formations, would experience less drawdown.

Based on the results of the well interference simulation and on-site water level monitoring, future interference between drinking water wells is estimated to be minimal.

5.0 HYDROGEOLOGICAL CONCEPTUAL MODEL

The framework for the hydrogeological conceptual model for the Site is summarized in Table 5.1. The table shows the hydrogeological model based on thickness of overburden and bedrock layer identified on utilized private wells and on-site test well records. Ground surface elevations for each of the test wells were measured by GEMTEC staff using a Trimble R10 global positioning system, while ground surface elevations for the private wells were estimated from Google Earth.

The hydrogeological model was developed based on well record information for private and test wells, previous site investigations (Paterson, 2011a, 2011b, 2023), GEMTEC monitoring well and test well drilling, and OGS surficial and bedrock geological mapping.

An east-west hydrogeological cross-section (Figure 1A) across the Site was prepared based information from onsite test wells, while a north-south cross section (Figure 1B) was prepared from private wells within approximately 100 m (Figure 1). The boundaries between zones indicated on the cross-section have been interpreted based on available information as have conditions between the investigation points and are illustrative only. The actual conditions may

differ somewhat from that indicated. The elevations are referenced to the Canadian Geodetic Datum of 1928 (CGVD28).

Table 5.1 – Framework of Hydrogeological Conceptual Model

Stratigraphic Unit	Generalized Composition[1]	Thickness (m)
Overburden	• Topsoil. • Sand • Silty Clay • Glacial Till	• 6.1 to 14.5 metres
Bedrock	• Dolostone and Sandstone (Lower March Formation) • Sandstone	• 30 to 55 metres • 11 to > 50 metres

Notes:
1. Dolostones may be misidentified as limestone on well records due to similarities.

The overburden water levels measured in three on-site monitoring wells (MW23-1, 23-2 and 23-3) fluctuated up to about 2.5 metres, with slightly artesian conditions observed at MW23-2. Large seasonal fluctuations (i.e., in the order of a few metres) in overburden water levels are anticipated. The highest groundwater levels are expected to occur following the spring freshet and periods of significant rainfall.

The test well bedrock surface elevation ranges from about 89.1 to 94.4 m a.s.l. and the ground elevation at test well locations range from 99.7 to 104.6 m a.s.l. The water found elevations ranged from 42.8 to 55.21 metres below ground surface, and the elevation of the bottom of wells ranged from 38.8 to 49.7 metres below ground surface. The cross-section, based on the on-site test well water well records, indicates that the total thickness of the overburden ranges from approximately 6.1 to 14.5 metres.

The test wells are completed in dolostone and/or sandstone of the lower Oxford, March and/or Nepean Formations. The water well records do not provide sufficient geologic descriptions to delineate between aquifer units. The bedrock supply aquifers are primarily horizontally bedded with primary groundwater flow along the more permeable horizontal layers and bedding planes. Vertical fractures are less connected or cemented and vertical flow is typically orders of magnitude lower than horizontal flow, although vertical flow can locally be higher through faults / fractures and in significant recharge areas. Given the high aquifer transmissivity of the proposed water supply aquifer and relatively low pumping demands for individual private wells, the proposed wells are not likely to induce significant downward gradients.

6.0 IMPACT ASSESSMENT

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

6.1 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 Site for 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 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.

6.1.1 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 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.

A septic system envelope of 800 m^2 was adopted for the conceptual lot development plan (Appendix K) to comply with the City of Ottawa official plan. An 800 m^2 septic envelope corresponds to 20% area cover based on a 4,000 m^2 (0.4 hectare) lot. The septic system envelope should be readily accommodated on the lot sizes that are proposed. 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.

For comparison, Cedar Lakes Phases 1 and 2 has a total of 61 developed lots which have a minimum lot area of 2,000 m^2 (0.2 hectares) and accommodated well and septic systems.

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 groundwater levels measured in test pits and boreholes, it is expected that most of the septic leaching beds at this site will be partially or fully raised.

6.2 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 and the Ottawa “Hydrogeological and Terrain Analysis Guidelines” dated March 2021. To evaluate the groundwater impacts, the Three-Step Assessment Process outlining in MECP D-5-4 was followed. These are described below.

6.2.1 Hydrogeological Sensitivity

Areas of thin soil cover, highly permeable soils, and/or fractured bedrock may contribute to hydrogeological sensitivity of a site; these conditions may limit the natural attenuation of constituents entrained in the discharge of on-site septic systems. Areas of thin soil cover, generally taken to be less than 2 m, are not anticipated to be present on site, and permeable sands and topsoil near surface are generally underlain by lower conductivity glacial till or clayey silts. The area is not mapped as an inferred or potential area of karst activity (Brunton & Dodge, 2008). Consequently, the Site is not considered to be hydrogeologically sensitive based on the absence of significant areas of thin soils, highly permeable soils, or karst features.

6.2.2 Step 1 of 3 - 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) do not meet this consideration. Where proposed lot sizes are less than 1.0 hectares the risk of sewage effluent contamination must be assessed for the proposed subdivision, see Step 2.

6.2.3 Step 2 of 3 – Isolation

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 MECP Procedure D-5-4, the groundwater receiver for the septic effluent is the overburden sands and the glacial till layers.

The result of the hydrogeological conceptual model indicates that the overburden sands and till deposits across the Site generally do not meet the above requirements for isolation. 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, see Step 3.

6.2.4 Step 3 of 3 - Nitrate Dilution Calculations

The maximum allowable concentration of nitrate in the groundwater at the boundaries of a subject property is 10 mg/L as per the Ministry of the Environment and Climate Change's guideline D-5-4, dated August 1996. The nitrate concentration at the boundaries was calculated using the information in Table 6.1.

Table 6.1 – Nitrate Dilution Assumptions

Parameters	Site Descriptions
Infiltration Area for 71 lots	270,885 m^2
Water Holding Capacity	75 mm *Sandy Loam (representative of fine sand, silty sand and silty sand glacial till encountered on-site)*
Annual Water Surplus(1)	Sandy Loam = 380 mm/year *Representative of fine sand, silty sand glacial till encountered on-site*
Topography Factor (TF)	0.20 *'Rolling lands' with slope between 2.8m to 3.8m/km considered to be representative of post-development topography.*
Soil Factor (SF)	0.4 *Open Sandy Loam*
Cover Factor (CF)	0.165 *Rural Lawns 0.15 (70%) and Woodland 0.2 (30%). Weighted average cover factor of 0.165.*
Site Average Infiltration Factor(2) (TF + SF + CF)	0.765

1. Annual water surplus based on Environment Canada Water Surplus Datasheets (Appendix E) for Ottawa International Airport (1939-2020) weather station.
2. Infiltration factors based on information provided in MOEE, 1995.

As presented in Table 6.1 above, assumptions for the nitrate dilution calculations include:

- Water surplus of 380 mm/year and water holding capacity of 75 mm
  - The geotechnical investigation completed by Paterson (2011a, 2011b, 2023) characterized the surficial soils primarily as native deposits of silty sand to sandy silt underneath the topsoil and/or peat at ground surface. The native sand deposits are consistent with OGS (2010) mapping indicating the site is underlain by coarse-textured glaciomarine deposits (i.e., sand and gravel, with minor silt and clay). Areas of lower permeability soils (i.e. silt, clay and/or glacial till) were encountered

in the southwestern portion of the site (Paterson, 2023); however, these soils were overlain by sandy deposits at least 1 metre thick. Therefore, the upper representative soil type can generally be characterized as a sandy loam, for which a water holding capacity of 75mm and water surplus of 380 mm/year were incorporated into the nitrate impact assessment.

- Infiltration area of 270,885 m^2
  - Removal lands previously used in nitrate dilution assessment for Cedar Lakes Phases 1-2 (Paterson, 2011b). Remaining area equal to 308,180 m^2 based on information provided by the client.
  - Internal roadway area of 15,995 m^2 (7m wide x 2,285 m length)
  - House and driveway footprint of 300m^2 per lot. The hard surface area is representative of typical rural-residential house and driveway footprints. It is noted that some residential properties in Cedar Lakes Phases 1-2 have a larger footprint, and the size of future dwellings is unknown at this time. The selection of 300 m^2 per lot is considered to be appropriate and representative, as it does not consider water directed from roofs and driveways into buried roof leaders (subdivision specification). Following stormwater management guidelines, approximately 50% of water diverted to buried roof leaders can be infiltrated in sandy soils. Thereby, the 300 m^2 value is suitable, and it does not incorporate the diverted water which would further increase the amount of dilution.
- Stormwater management pond areas (two SWMPs located on southern end of the Site – refer to Appendix A) are included in the area available for infiltration. This assumption is based on unlined and naturalized stormwater management ponds. To note, the larger SWMP on the northern portion of the Site is on lands that have been removed from our calculations, as they have been used in previous dilution assessments for Cedar Lakes Phase 2 (Paterson, 2011b).
- Cover factor assumes post-development tree cover of 30% for the Site. The remaining post-development lands will consist of rural lawns (70%) which have a cover factor of 0.15.

The predictive assessment is conducted using a mass balance calculation to determine the sewage loading for nitrate at the property boundary (see equation below).

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

The nitrate dilution calculations are provided in Appendix D and summarized in Table 6.2 below.

Table 6.2 – Nitrate Dilution Calculations

Parameters	Site Descriptions
Number of Lots	71
Annual Nitrate Loading	1,036,600 grams/year *(71 lots x 40 grams/lot/day *365 days/year)*
Annual Dilution Volume	106,137 m^3/year *[(surplus 0.380 m/year * infiltration factor 0.765 * infiltration area 270,885 m^{2-})+ (septic flows of 1 m^3/lot/day * 71 lots * 365 days/year)*
Nitrate Concentration at Property Boundary	9.92 mg/L

Based on the above information, the nitrate concentration at the Site boundary was calculated to be 9.92 mg/L (refer to the calculation in Appendix E). The nitrate impact assessment meets the acceptable nitrate impact requirement of 10 mg/L established by the MECP.

6.2.5 Background Overburden Nitrate Concentrations

Groundwater samples were collected from three on-site monitoring wells completed in the overburden. Groundwater samples were submitted to an accredited laboratory for analysis of nitrate and nitrite. The results are summarized in Table 6.3. The Laboratory Certificates of Analyses are provided in Appendix D.

Table 6.3 – Overburden Nitrate Sampling

Monitoring Well ID	Monitoring Well Depth (m)	Sampling Date	Nitrate (mg/L)	Nitrite (mg/L)
MW23-1	5.4	Sep 25/23	3.4	<0.05
		Oct 27/23	2.6	0.09
		Jun 20/24	2.8	<0.05
		Nov 14/24	3.5	<0.05
MW23-2	5.9	Sep 25/23	<0.10	<0.05
		Oct 27/23	<0.10	<0.05
		Jun 20/24	<0.10	<0.05
		Nov 14/24	<0.10	<0.05

Monitoring Well ID	Monitoring Well Depth (m)	Sampling Date	Nitrate (mg/L)	Nitrite (mg/L)
MW23-3	5.9	Sep 25/23	<0.10	<0.05
		Oct 27/23	<0.10	<0.05
		Jun 20/24	<0.10	<0.05
		Nov 14/24	<0.10	<0.05

Nitrate concentrations were detected in MW23-1 at concentrations ranging from 2.6 to 3.5 mg/L between September 2023 and November 2024. Previous site investigations (Paterson 2011a, 2011b) also reported detectable nitrate concentrations in the eastern portion of Cedar Lakes Phase 2 at concentrations of up to 4.12 mg/L, which were attributed to septic systems and nitrification of peat layers combined with poor drainage. After the peat layers were removed and drainage improved, Paterson (2011b) reported significant decreases in nitrate concentrations to less than 0.53 mg/L (based on three samples from MW6, TP6 and TP7).

The concentrations and location of nitrates are generally consistent with previous investigations, with the highest concentrations localized to the northeastern portion of the site. Shallow overburden groundwater flows are generally to the south, with some local variability expected. Given the dense residential development located north of the site, the detectable nitrate concentration in MW23-1 and northeastern portion of Cedar Lakes Phases 1-2 (Paterson, 2011a, 2011b) are likely from residential septic systems combined with nitrification of peat deposits. The upgradient residential developments have been in place for an extended period of time and the concentrations measured in MW23-1 are lower than those originally reported in Cedar Lakes Phases 1-2 (Paterson, 2011b). Therefore, the nitrate concentrations are considered to be relatively stable and not extending over significant areas of the site.

6.3 Stormwater Management Ponds (SWMP)

The specific design details regarding the construction of the proposed stormwater managements ponds (SWMPs) are not known at this time. It is the intention to retain stormwater on site, and the ponds are expected to be constructed in a manner typical of the many SWMPs already constructed and previously approved by both the City and MECP in the Greely area. The designs will be required to meet the requirements of the Shields Creek Sub watershed study and treatment and volume detention criteria.

No negative impacts to the bedrock water supply aquifer are expected from SWMP constructed in accordance with MECP requirements. The proposed SWMP's are planned to be away from the arterial roadways and as such, there is minimal risk for contamination from agricultural fertilizers (e.g., nitrates), road salts or other sources (e.g., commercial or industrial properties).

7.0 CONCLUSIONS

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

- The Site is not considered to be hydrogeologically sensitive based on the absence of significant areas of thin soils, highly permeable soils (i.e. coarse sands or gravels), or karst features.
- The water supply aquifer encountered at the Site includes dolostone of the Oxford and/or March Formations as well as sandstones of the Nepean Formation.
    - The testing depth of on-site test wells ranges from 42 to 61 metres below ground surface.
- Water quality testing indicates that the water quality meets the ODWQS maximum acceptable concentrations and maximum concentrations considered to be reasonably treatable. Groundwater treatment for aesthetic and operational guideline parameters will be required.
    - Variability in groundwater quality was encountered in the five on-site test wells and aesthetic exceedances and treatment options may vary (all exceedances and treatment options discussed below).
    - Off-site private well users reported water quality issues with sulphur odours, hardness, colour and/or metals. Water quality treatment systems reported to include water softeners, iron-filtration, point of use reverse osmosis and/or ultraviolet disinfection.
    - To note, at the end of the six-hour pumping tests total coliform exceeded the ODWQS in TW C and E as well as following re-sampling in TW C; the total coliform is attributed to insufficient well chlorination and/or introduced via pumping equipment. Follow-up sampling confirmed bacteriological parameters were non-detectable. Low levels of total coliforms are not uncommon in newly constructed wells and no private wells sampled reported any bacteriological exceedances.
    - The levels of hardness, iron and manganese are considered to be reasonably treatable using a conventional water softener and/or manganese greensand filter.
    - The ODWQS operational guideline for aluminum was exceeded in one test well and is attributed to the turbidity levels at the time of sampling. The filtered sample collected reported lower aluminum levels within the operational guideline. Extended well development may be required for future wells. Treatment for aluminum is not anticipated; however, if required can be treated using flocculation/filtration.
    - Total Dissolved Solids levels are in excess of 500 mg/L in two of the five test wells, but are considered “fair”, according to the “Guidelines for Canadian Drinking Water Quality: Guideline Technical Document – Total Dissolved Solids (TDS)”, published by Health Canada (1991), and are well below levels of 1,200 mg/L, above which

the palatability of drinking water is considered ‘unacceptable’. LSI values indicate the water is considered is slightly scale forming and corrosive.

- The water quality from Cedar Lakes Phase 1 and 2 and private domestic wells sampled west of the Site are similar to the water quality found in the proposed subdivision. No significant impacts have been identified from the available background reports and water quality sampling.
- 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.
- Interference between drinking water wells is expected to be minimal under typical usage for residential developments.
    - Well interference modelling indicates well interference of up to 4 metres between on-site water supply wells and Cedar Lakes Phase 1-2 wells (10% of available drawdown) and less than 1.8 metres at shallower private wells located west of the Site.
    - Negligible well interference (<0.3 metres) observed in other technically representative test wells during test well pumping tests and long-term test well water level monitoring.
    - Given the high aquifer transmissivity of the proposed water supply aquifer and relatively low pumping demands for individual private wells, the proposed wells are not likely to induce significant downward gradients, which could greater impact existing private well users with shallower wells (particular in the older developments west of the site).
- No negative impacts to the bedrock aquifer are anticipated from the use of on-site septic systems based on nitrate dilution calculations which demonstrate that offsite nitrate impacts are less than 10 mg/L for 71 lots.
    - The development can support up to 71 lots with a calculated nitrate concentration of 9.92 mg/L at the Site boundary.
    - The nitrate dilution calculations assume the stormwater management ponds are unlined and naturalized, a tree planting covenant will be implemented for the proposed development requiring a minimum 30% tree cover.
- No negative impacts to the bedrock aquifer are anticipated from on-site stormwater management ponds constructed in accordance with MECP requirements.
- The observed chloride concentrations, ranging from 61 to 246 mg/L in the present investigation, are consistent with historical data and remain below the Ontario Drinking Water Quality Standards (ODWQS) aesthetic limit of 250 mg/L. The variability in concentrations likely reflects natural heterogeneity within the aquifer system and localized anthropogenic influences. While limited long-term data from test wells restricts definitive trend analysis, recent sampling results, including those from PW-1700, suggest that

chloride levels have remained relatively stable over time and within expected seasonal fluctuations.

- The presence of low-level nitrates in TW B, located off of the Site, contrasted with non-detectable concentrations in nearby test wells, suggests a localized nitrate source likely associated with upgradient influences. Detectable nitrate levels at PW-1700 support the interpretation of a vertical connection, possibly facilitated by shallow casing depths, allowing migration from a septic-impacted shallow aquifer to deeper groundwater. However, the downgradient well (PW-1738) showing no nitrate presence reinforces the localized nature of the issue. Monitoring well data further indicates nitrate influence in specific areas (e.g., MW23-1) consistent with historical septic and organic input, while the absence of nitrites and consistent organic nitrogen concentrations do not suggest a broader health concern. Overall, nitrate presence is considered localized and does not pose a significant risk to the deeper groundwater supply being evaluated for the Phase 3 and 4 Cedar Lakes developments.
- The Conceptual Lot Development Plan (Appendix K) demonstrates that the is sufficient space on the proposed lots to accommodate private well and septic systems along with a residence and driveway.

Based on the results of this hydrogeological investigation and terrain analysis, in GEMTEC's professional opinion that the proposed 71-lot residential development is suitable for development.

8.0 RECOMMENDATIONS

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

8.1 Well Construction Recommendations

- All wells that are drilled in the subdivision should be constructed in accordance with local and MECP regulations, including, but not limited to, Ontario Reg. 903.
- Well casings should be extended at least 40 metres (131 feet) 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.
- A well grouting certification inspection should be conducted during the installation and grouting of the well casing for all future wells installed on the Site. The well grouting certification inspection should be conducted under the supervision of a professional engineer or professional geoscientist.
- It should be noted that the water bearing fractures in the dolostone and sandstone bedrock were encountered at depths ranging from 47.5 to 59.7 metres below ground surface in test wells TW A to TW E, inclusive. Water quality below 59.7 metres has not been tested.
- 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. In addition, the well should be situated in a location that allows for future site access for cleaning, treatment, repair, testing or maintenance. Information regarding well access should be included in the subdivision agreement and/or purchase agreement.

  - Water supply wells should be located in rear yards as shown in the Lot Development Plan (Appendix K).
  - A minimum 3.5 metre side yard setback is recommended to accommodate accessibility for well service rigs.
  - A minimum of 15 metres separation (and up to 18 metres for fully raised septic beds) between water wells and septic systems and 15 metres between wells and on-site stormwater management ponds is recommended.

- To reduce the potential for insufficient setbacks between lots, drinking water wells should be in rear yards and septic systems in the front yards, consistent with Cedar Lakes Phase 1 and 2.
- It is recommended that newly drilled water wells be developed by the well driller for a minimum of one hour of pumping following completion of the well drilling. This well development can be carried in conjunction with the one-hour pumping test that is required for the MECP Water Well Record. Extended well development, up to six hours, may be required to reduce turbidity levels to within the ODWQS aesthetic objective.
- It is recommended that newly drilled water wells be chlorinated by the well driller following completion of the well drilling and pumping.
- It should be noted that this study does not address the construction of earth energy systems, which may require approval from the MECP.
- A dedicated monitoring well (one per subdivision phase) is recommended, to be constructed following the casing and total depth recommendation above. The City of Ottawa should be consulted prior to installation as per Official Plan Section 4.7.2 Policy 19.

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”.
- TW A and TW C were extended using a 4” liner. If those wells are utilised as residential supply wells, then it should be made clear to prospective owners that a well pump that is smaller than standard would be required.
- 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 Quality Standards (ODWQS) 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 some wells may exhibit elevated aesthetic parameters (hardness, iron, total dissolved solids, and organic nitrogen) and incrustation, taste, odour (hydrogen sulphide), and colour can be expected.
    - Several private well owner report using water softeners, UV units, iron filtration, and/or reverse osmosis to improve the quality of their groundwater (noting that UV units would not likely be suitable/necessary for wells cased 40+ m).
    - Organic nitrogen compounds frequently contain amine groups which can react with chlorine and severely reduce its disinfectant power.
    - Iron is typically removed using water softeners or manganese greensand filters.
- It is recommended that homeowners be informed that hardness levels may exceed the ODWQS operational guideline for hardness. Conventional water softeners may be desired by homeowners to treat minor aesthetic objective and operational guideline exceedances of the ODWQS 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.
- It is recommended that homeowners and the Local Medical Officer of Health be informed that sodium concentrations exceed 20 mg/L and exceed the warning level for persons on sodium restricted diets.
- 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.

8.3 Site Phasing and Performance Reviews

- Performance reviews (also referred to as Supplemental Studies) should be conducted in accordance with MECP Procedure D-5-5 Private Wells: Water Supply Assessment, section 4.7 Phased Developments and the Ottawa “Hydrogeological and Terrain Analysis Guidelines” dated March 2021.
- The results of the proposed performance evaluation would be reported prior to the registration of the subsequent phases. The report would include the MECP 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.
    - The proposed Site Phasing includes 40 residential lots in Phase 3 and the remaining 31 lots in Phase 4.

- In accordance with the MECP 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.

8.4 Septic System Construction Recommendations

- To reduce the potential for insufficient setbacks between lots, septic systems should be in front yards of each lot – refer to Lot Development Plan in Appendix K for proposed septic system locations.
- A maximum of 71 lots (septic systems) are recommended for the proposed subdivision based on the septic impact assessment (Section 6.2).
- 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.
    - Due to the presence of shallow groundwater, septic beds will likely be partially or fully raised.
- 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.

8.5 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 and best management practices (Ministry of Municipal Affairs and Housing, 2021). The owner shall consult the following guides available at: https://www.oowa.org/homeowner-resources/ .

9.0 CLOSURE

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.

Samuel Esenwa, G.I.T.
Environmental Scientist

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

SE/DC/JKA/AP

10.0 REFERENCES

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Consulting Engineers and Scientists

CONDITIONS AND LIMITATIONS OF THIS REPORT

1. **Standard of Care:** GEMTEC has prepared this report in a manner consistent with generally accepted engineering or environmental consulting practice in the jurisdiction in which the services are provided at the time of the report. No other warranty, expressed or implied is made.
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3. **Complete Report:** This report is of a summary nature and is not intended to stand alone without reference to the instructions given to GEMTEC by the Client, communications between GEMTEC and the Client and to any other reports prepared by GEMTEC for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. GEMTEC cannot be responsible for use of portions of the report without reference to the entire report.
4. **Basis of Report:** This Report has been prepared for the specific site, development, design objectives and purposes that were described to GEMTEC by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the document, subject to the limitations provided herein, are only valid to the extent that this report expressly addresses the proposed development, design objectives and purposes. Any change of site conditions, purpose or development plans may alter the validity of the report and GEMTEC cannot be responsible for use of this report, or portions thereof, unless GEMTEC is requested to review any changes and, if necessary, revise the report.
5. **Time Dependence:** If the proposed project is not undertaken by the Client within 18 months following the issuance of this report, or within the timeframe understood by GEMTEC to be contemplated by the Client, the guidance and recommendations within the report should not be considered valid unless reviewed and amended or validated by GEMTEC in writing.
6. **Use of This Report:** The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without GEMTEC's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, GEMTEC may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process.

   Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.
7. **No Legal Representations:** GEMTEC makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.
8. **Decrease in Property Value:** GEMTEC shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.
9. **Reliance on Provided Information:** The evaluation and conclusions contained in this report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to us. We have relied in good faith upon representations. information and instructions provided by the Client and others concerning the site. Accordingly, we cannot accept responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of misstatements, omissions,

misrepresentations. or fraudulent acts of the Client or other persons providing information relied on by us. We are entitled to rely on such representations, information and instructions and are not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.

10. **Investigation Limitations:** Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions but even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions.

    The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies. Accordingly, GEMTEC does not warrant or guarantee the exactness of of the subsurface descriptions.

    Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

    In addition, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

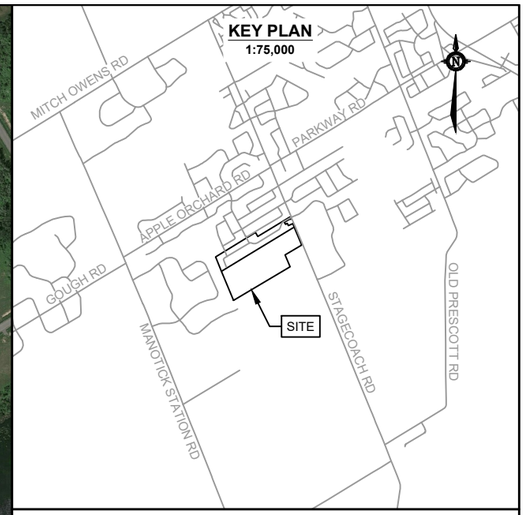
11. **Sample Disposal:** GEMTEC will dispose of all uncontaminated soil and/or rock samples 60 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fill materials or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

12. **Follow-Up and Construction Services:** All details of the design were not known at the time of submission of GEMTEC's report. GEMTEC should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of GEMTEC's report.

    During construction, GEMTEC should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of GEMTEC's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in GEMTEC's report. Adequate field review, observation and testing during construction are necessary for GEMTEC to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, GEMTEC's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

13. **Changed Conditions:** Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that GEMTEC be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that GEMTEC be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

14. **Drainage:** Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. GEMTEC takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



LEGEND

- TEST PIT (TP, PATERSON GROUP REPORT PG6871-1, 2023)
- TEST PIT (TP, PATERSON GROUP REPORT PH1276, 2011)
- BOREHOLE WITH MONITOING WELL (MW, PATERSON GROUP REPORT PH1276, 2011)
- HAND AUGER HOLE (AH, PATERSON GROUP REPORT PH1276, 2011)
- TEST WELL (TW, PATERSON GROUP REPORT PH1276, 2011)
- MONITORING WELL (MW)
- NEW TEST WELL (TW)
- PRIVATE WELL SAMPLE (PW)
- PROPERTY BOUNDARY
- A — A' CROSS SECTION LOCATION

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
2. Contains information licensed under the Open Government Licence - Ontario.
3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE

1:7500

0 150 300 450m

DRAWING

TEST HOLE, PRIVATE WELL, AND TEST WELL LOCATIONS

CLIENT

ARK ENGINEERING AND DEVELOPMENT

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

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100554.003	2
DATE	FIGURE NO.
MARCH 2025	FIGURE 1

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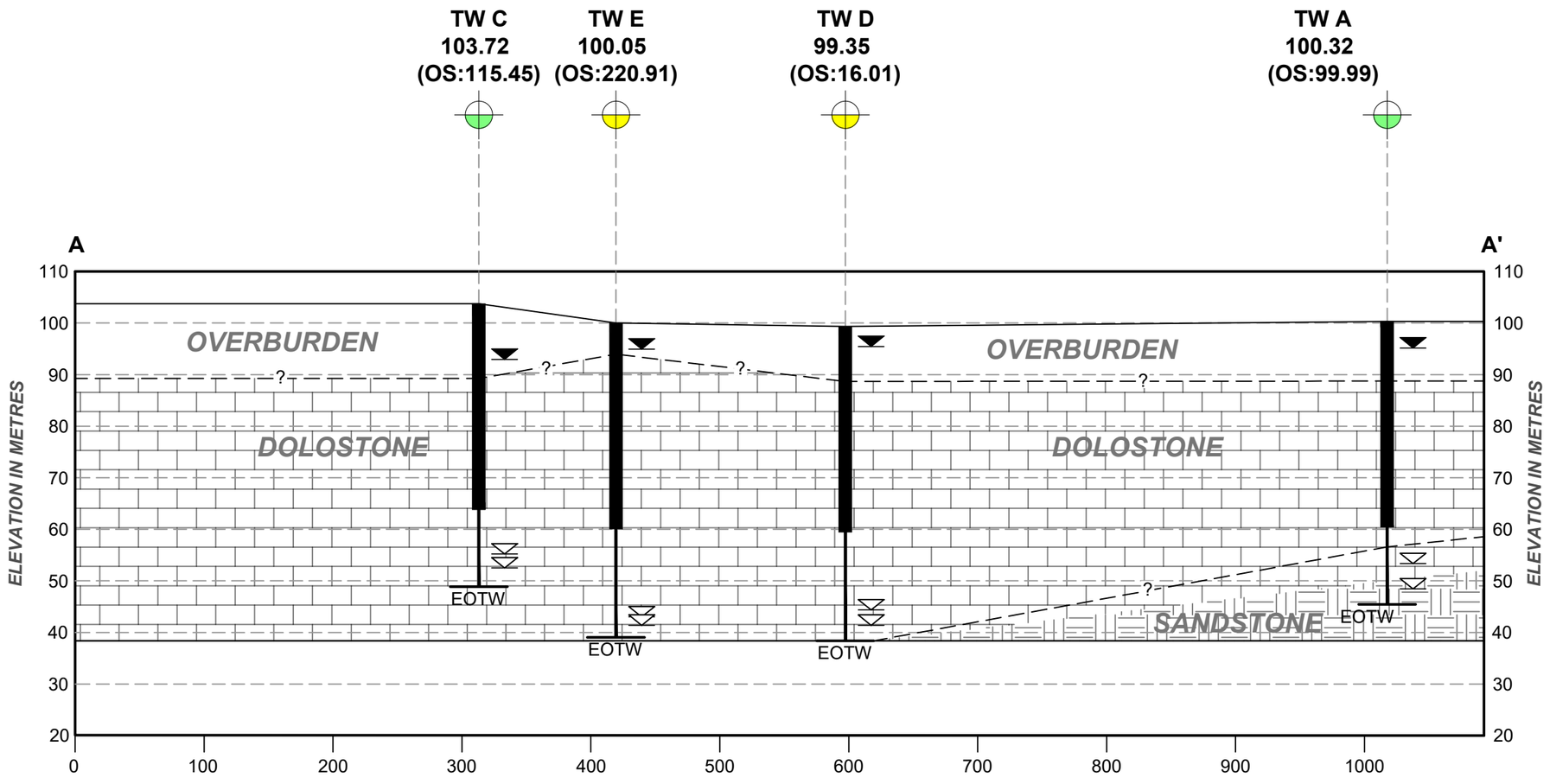
CROSS SECTION A - A'

HORIZTONAL 1:1000
VERTICAL 1:4000



DISTANCE IN METRES

LEGEND

- TW # — TEST WELL ID
- ##.## — GROUND SURFACE ELEVATION (M ASL)
- (OS:##.##) — OFFSET DISTANCE FROM CROSS SECTION LINE
- NEW PROPOSED TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- STATIC WATER LEVEL
- WATER FOUND ELEVATION
- DOLOSTONE
- SANDSTONE
- INFERRED GROUND SURFACE
- INFERRED CONTACT

GENERAL NOTE(S)

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4. Geographic dataset source: Ontario GeoHub.
5. M ASL: Metres above sea level
6. EOTW: End of Test Well

HORIZONTAL SCALE
1:4000
0 80 160 240m

VERTICAL SCALE
1:1000
0 20 40 60m

DRAWING
CROSS SECTION A-A'

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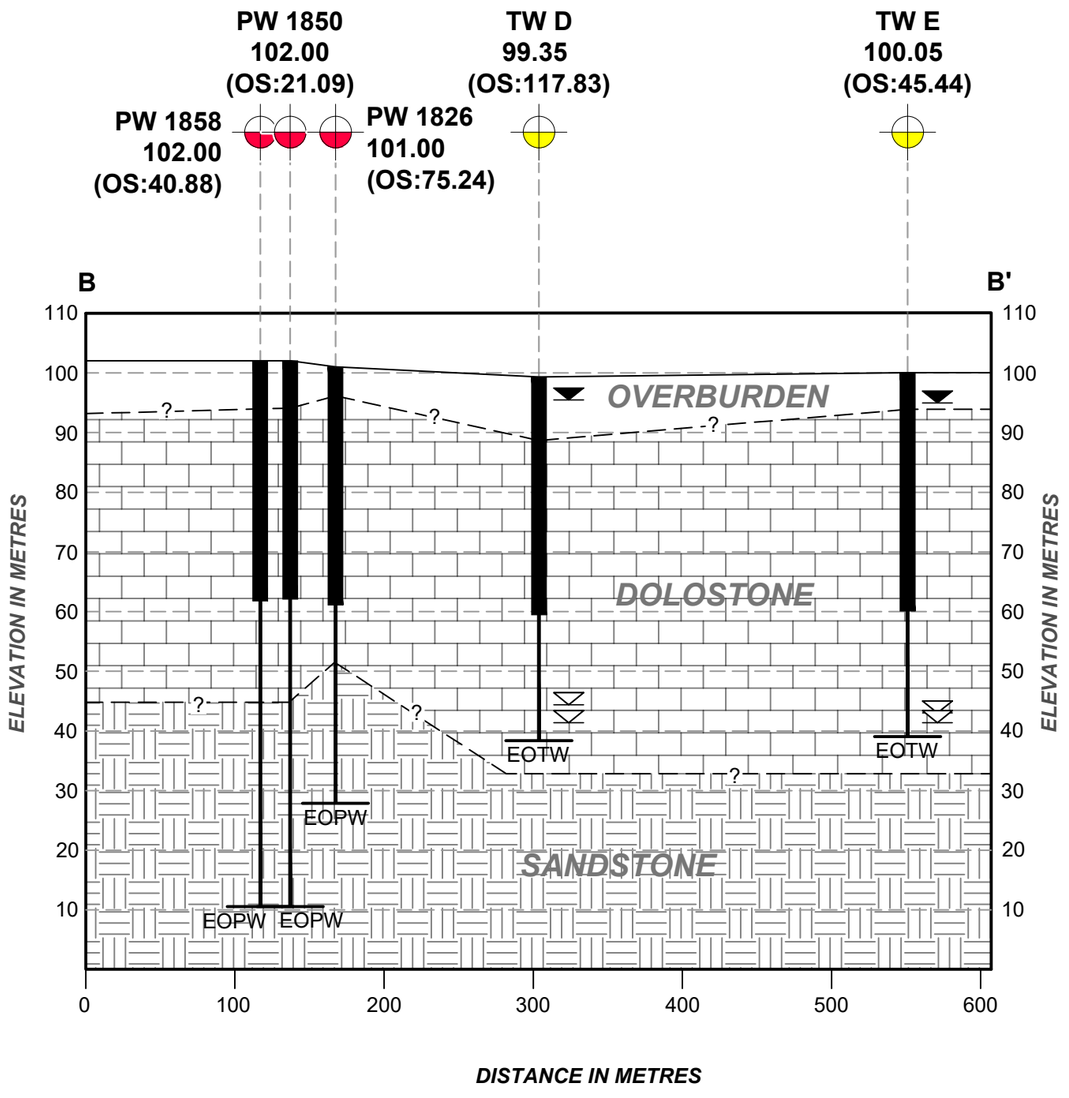
CROSS SECTION B - B'

HORIZTONAL 1:1000
VERTICAL 1:4000



LEGEND

- TW # ← TEST WELL ID
- ##.## ← GROUND SURFACE ELEVATION (M ASL)
- (OS:##.##) ← OFFSET DISTANCE FROM CROSS SECTION LINE
- NEW TEST WELL LOCATION
- EXISTING TEST WELL LOCATION
- PRIVATE WELL SAMPLE LOCATION
- STATIC WATER LEVEL
- WATER FOUND ELEVATION
- DOLOSTONE
- SANDSTONE
- INFERRED GROUND SURFACE
- INFERRED CONTACT

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.
5. M ASL: Metres above sea level
6. EOTW: End of Test Well
7. EOPW: End of Private Well
8. Private Well elevation data sourced from Google Earth.

HORIZONTAL SCALE
1:4000
0 80 160 240m

VERTICAL SCALE
1:1000
0 20 40 60m

DRAWING
CROSS SECTION B-B'

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MARCH 2025	FIGURE 1B

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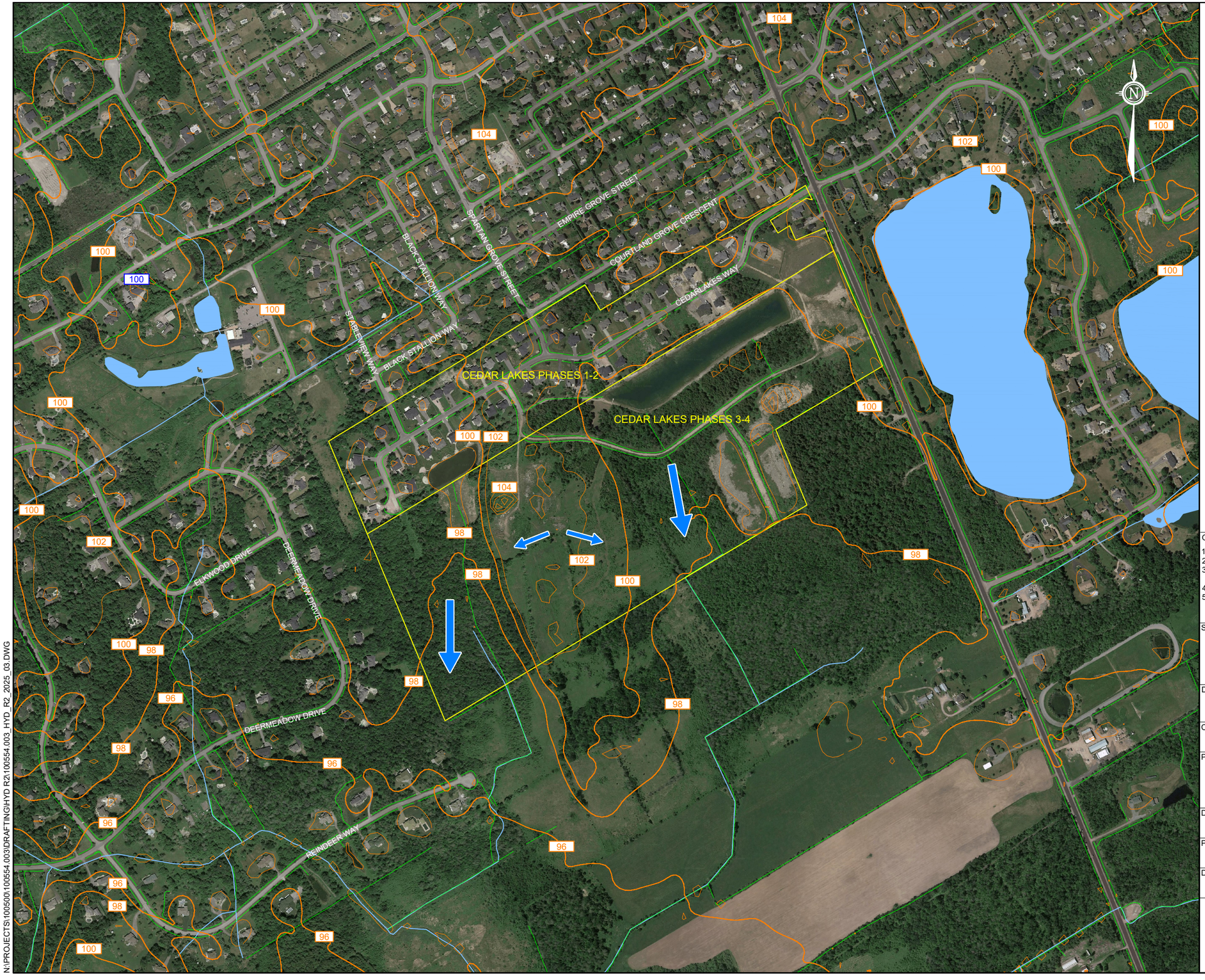

LEGEND

- PROPERTY BOUNDARY
- 100 GROUND SURFACE ELEVATION, METRES (CGVD2013)
- DITCHES
- WATERCOURSE
- WATERBODIES
- INFERRED SHALLOW GROUNDWATER FLOW

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies.
4. Geographic dataset source: Ontario GeoHub.
5. Contours derived from Lidar: High Resolution Digital Elevation Model - CanElevation Series. Contours are approximate, as they are downsampled and smoothed from 0.5-m resolution lidar data (2020) for visualisation purposes

SCALE

1:7500

0 150 300 450m

DRAWING

TOPOGRAPHY AND DRAINAGE

CLIENT

ARK ENGINEERING AND DEVELOPMENT

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LEGEND

PROPERTY BOUNDARY

SURFICIAL GEOLOGY

- **5b** TILL
- **7** GLACIOFLUVIAL DEPOSITS
- **11b** COARSE-TEXTURED GLACIOMARINE DEPOSITS
- **11c** COARSE-TEXTURED GLACIOMARINE DEPOSITS
- **20** ORGANIC DEPOSITS

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE

1:7500

0 150 300 450m

DRAWING

ONTARIO GEOLOGIC SURVEY
SURFICIAL GEOLOGY

CLIENT

ARK ENGINEERING AND DEVELOPMENT

PROJECT

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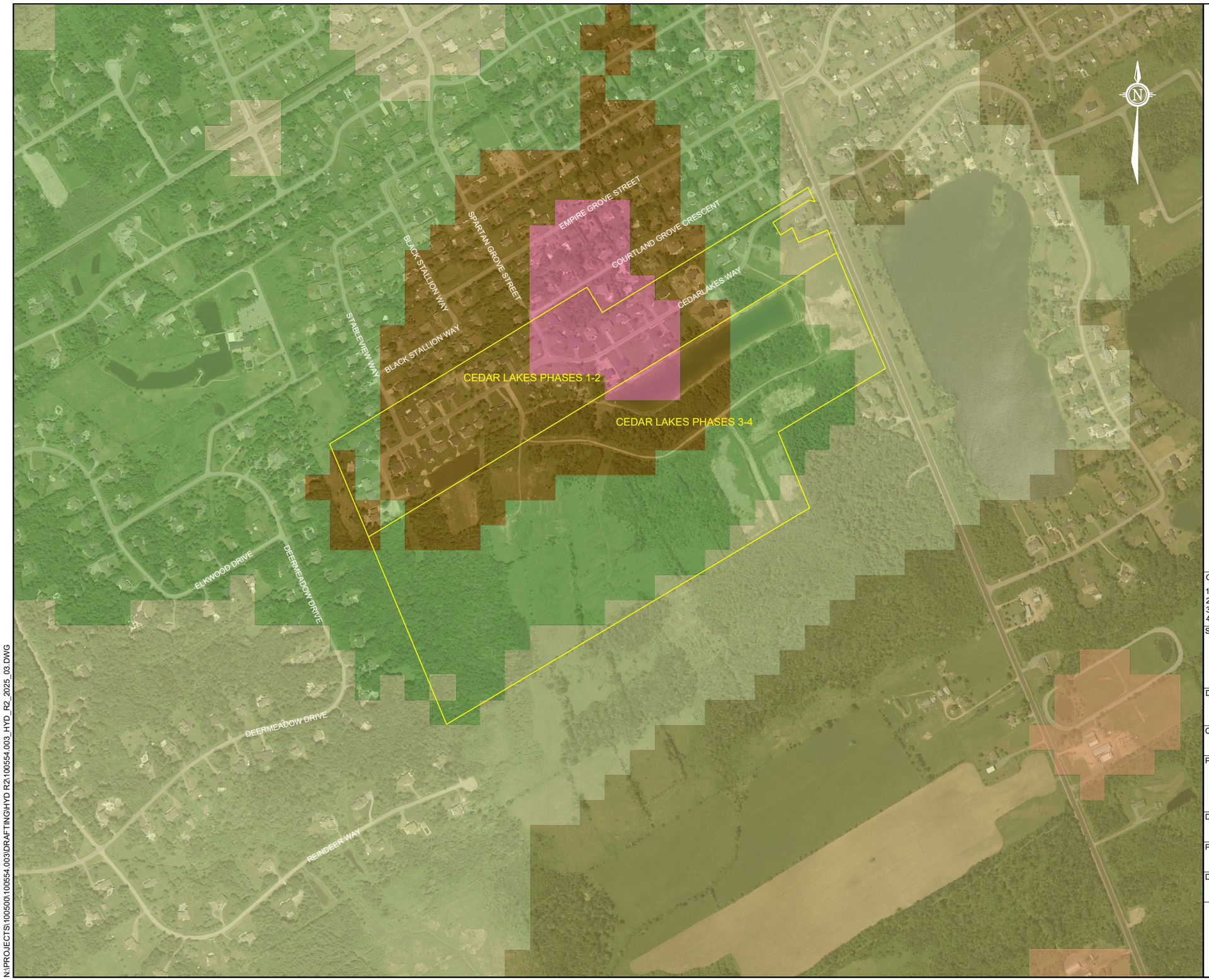

LEGEND

PROPERTY BOUNDARY

OVERBURDEN DRIFT THICKNESS, METRES

- 1 - 2
- 2 - 3
- 3 - 5
- 5 - 10
- 10 - 15
- 15 - 25

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE

1:7500

0 150 300 450m

DRAWING

ONTARIO GEOLOGIC SURVEY
OVERBURDEN THICKNESS MAP

CLIENT

ARK ENGINEERING AND DEVELOPMENT

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

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MARCH 2025	FIGURE 4

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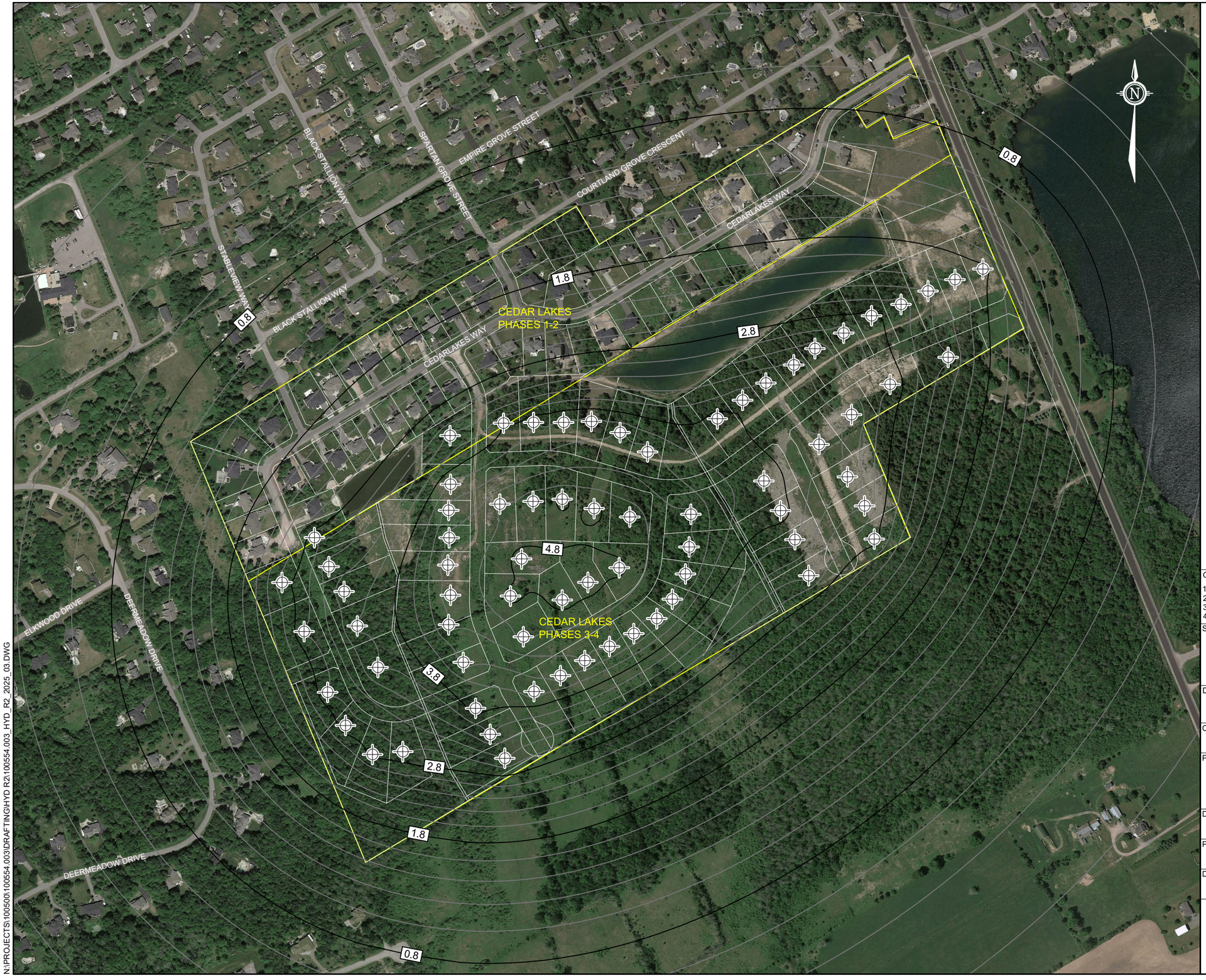

LEGEND

- PROPERTY BOUNDARY
- MINOR WATER TABLE DRAWDOWN CONTOUR, METRES
- 100 MAJOR WATER TABLE DRAWDOWN CONTOUR, METRES
- 71 WELLS IN SIMULATION

GENERAL NOTE(S)

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3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE

1:5000

0 100 200 300m

DRAWING

WELL INTERFERENCES SIMULATION

CLIENT

ARK ENGINEERING AND DEVELOPMENT

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PROPOSED RESIDENTIAL SUBDIVISION
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LEGEND

- TEST WELL (TW, PATERSON GROUP REPORT PH1276, 2011)
- NEW TEST WELL (TW)
- MECP PUBLIC WELL RECORD
- PROPERTY BOUNDARY

GENERAL NOTE(S)

1. Coordinate system: NAD83, UTM ZONE 18
2. Contains information licensed under the Open Government Licence - Ontario.
3. Maps Data: Google, @2023 CNES / Airbus, First Base Solutions, Maxar Technologies
4. Geographic dataset source: Ontario GeoHub.

SCALE 1:7500

DRAWING
DETAILED SITE PLAN

CLIENT
ARK ENGINEERING AND DEVELOPMENT

PROJECT
PROPOSED RESIDENTIAL SUBDIVISION
CEDAR LAKES PHASE 3 AND 4
OTTAWA, ONTARIO

DRAWN BY	CHECKED BY
CZ/SL	AP/JKA
PROJECT NO.	REVISION NO.
100554.003	2
DATE	FIGURE NO.
MARCH 2025	FIGURE 6

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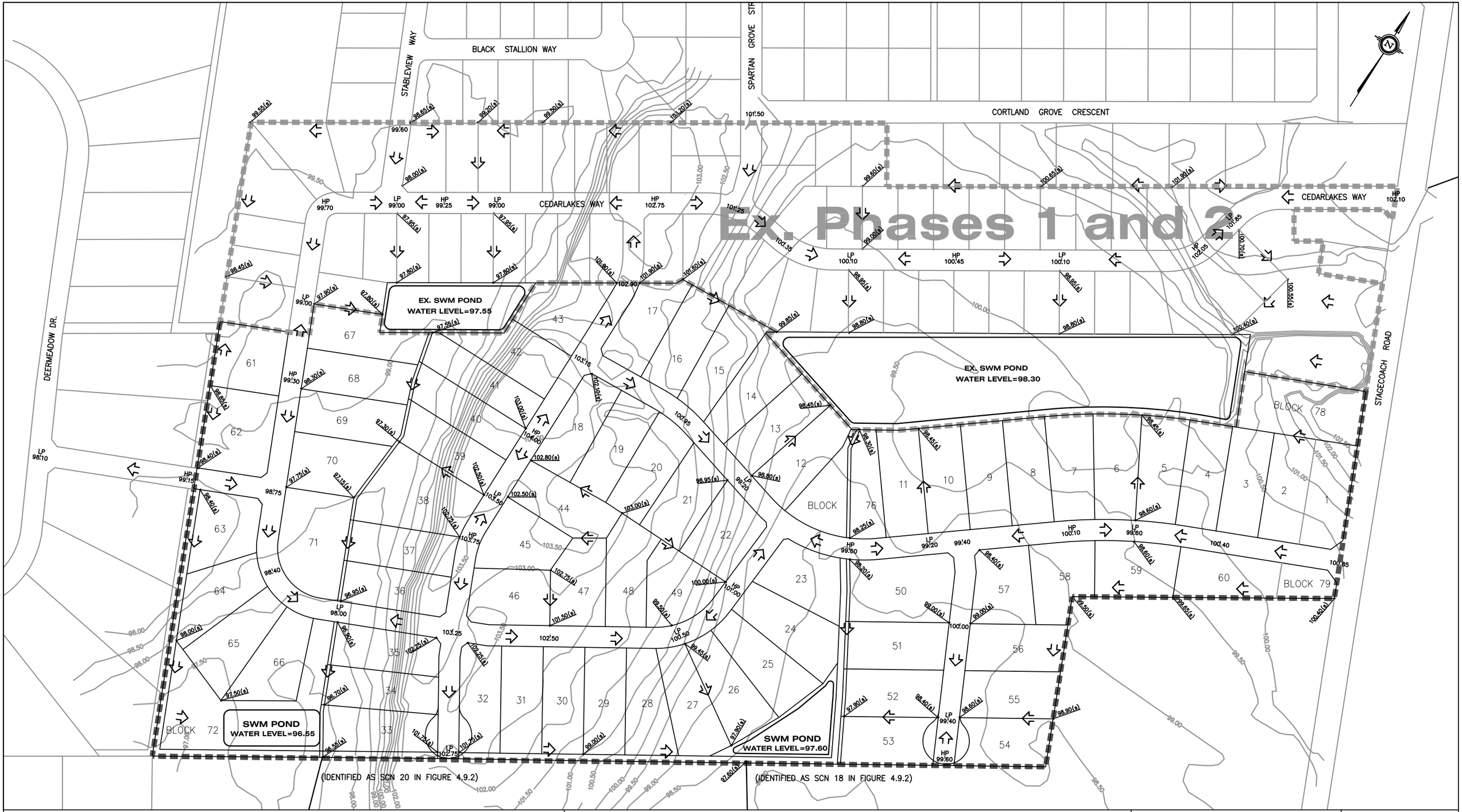
N:\PROJECTS\100500\100554.003\DRAFTING\HYD R2\100554.003_HYD_R2_2025_03.DWG

APPENDIX A

Storm Drainage and Macro Grading Plan
(ARK Engineering and Development)



LEGEND:

- RUNOFF FLOW DIRECTION
- DRAINAGE AREA BOUNDARY
- 97.55(s) PROPOSED SWALE AND DITCH ELEVATIONS
- 98.55 PROPOSED CENTER LINE OF ROAD ELEVATIONS

STORM DRAINAGE AND MACRO GRADING PLAN
CEDAR LAKES - PHASES 3 to 4

CITY OF OTTAWA - Formerly TOWNSHIP OF OSGOODE

Completed By:
ARK ENGINEERING AND DEVELOPMENT

Scale: NTS

Date: DEC 2023

Drawing No.: SK-2

APPENDIX B

Background MECP Water Well Records

MECP WELL RECORD SEARCH (CEDAR LAKES PHASE 1 and 2)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Recommended Pumping Rate (L/min)	Stratigraphic Layers (ft)
7206677	OSGOODE TOWNSHIP CON 03 007	7/15/2013	DO	84.7	7.01	42.4	5.6	UT 0268 UT 0271	75.71	SAND CLAY BLDR 0023 GREY LMSN 0250 GREY SNDS 0268 GREY SNDS 0271 GREY SNDS 0278
7206688	OSGOODE TOWNSHIP CON 03 007	7/5/2013	DO	61.0	3.96	39.9	6.0	UT 0188 UT 0193	56.78	SAND GRVL BLDR 0013 GREY LMSN 0178 GREY SNDS 0188 GREY SNDS 0193 WHIT SNDS 0200
7206697	OSGOODE TOWNSHIP CON 03 007	6/12/2013	DO	87.2	9.45	39.9	5.6	UT 0183 UT 0280	75.71	SAND 0015 SAND GRVL BLDR 0031 GREY LMSN 0118 GREY LMSN SNDS 0183 GREY LMSN SNDS 0225 WHIT SNDS 0280 WHIT SNDS 0286
7209277	OSGOODE TOWNSHIP CON 03 007	8/26/2013	DO	61.0	4.27	40.5	7.1	UT 0182 UT 0194	75.71	SAND GRVL BLDR 0014 GREY LMSN 0182 GREY LMSN 0194 GREY LMSN 0200
7209287	OSGOODE TOWNSHIP CON 03 007	7/30/2013	DO	85.3	10.97	39.9	5.5	UT 0254 UT 0272	75.71	SAND BLDR GRVL 0036 GREY LMSN 0185 WHIT SNDS 0254 WHIT SNDS 0272 WHIT SNDS 0280
7209290	OSGOODE TOWNSHIP CON 03 007	8/9/2013	DO	74.4	6.40	39.9	7.7	UT 0231 UT 0238	75.71	SAND BLDR 0021 GREY LMSN 0207 GREY LMSN SNDS 0232 WHIT SNDS 0238 WHIT SNDS 0244
7213072	OSGOODE TOWNSHIP CON 03 007	10/23/2013	DO	61.0	6.10	40.2	4.5	UT 0183 UT 0192	64.35	SAND GRVL BLDR 0017 GREY LMSN 0138 GREY LMSN SAND 0183 GREY LMSN SNDS 0192 GREY LMSN SNDS 0200
7213072	OSGOODE TOWNSHIP CON 03 007	11/7/2013	DO	61.0	5.18	40.2	4.6	UT 0183 UT 0192	75.71	SAND GRVL BLDR 0017 GREY LMSN 0138 GREY LMSN SAND 0183 GREY LMSN SNDS 0192 GREY LMSN SNDS 0200
7218731	OSGOODE TOWNSHIP	4/1/2014	DO	83.8	11.89	39.9	4.0	UT 0190 UT 0270	26.50	BRWN LOAM STNS 0010 GREY SAND BLDR LOOS 0024 GREY TILL BLDR PCKD 0038 GREY LMSN SNDS HARD 0275
7222301	OSGOODE TOWNSHIP CON 03 007	4/24/2014	DO	79.2	8.84	39.9	5.5	UT UT 0054	75.71	SAND CLAY BLDR 0029 GREY LMSN 0180 GREY SNDS 0181 GREY SNDS 0220 WHIT SNDS 0254 WHIT SNDS 0260
7222309	OSGOODE TOWNSHIP CON 03 007	5/28/2014	DO	67.1	5.49	40.2	4.7	UT 0150 UT 0214	75.71	SAND GRVL CLAY 0018 GREY LMSN 0150 GREY LMSN 0214 GREY LMSN 0220
7222318	OSGOODE TOWNSHIP CON 03 007	5/6/2014	DO	67.1	8.84	42.4	4.5	UT 0173 UT 0211	75.71	SAND GRVL BLDR 0029 GREY LMSN 0160 WHIT SNDS 0173 WHIT SNDS 0211 WHIT SNDS 0220
7222321	OSGOODE TOWNSHIP CON 03 007	5/20/2014	DO	61.0	8.53	39.9	4.9	UT 0158 UT 0172 UT 0194	75.71	SAND 0022 GRVL BLDR 0028 GREY LMSN 0140 GREY SNDS LMSN 0158 GREY SNDS LMSN 0172 GREY SNDS LMSN 0194 GREY SNDS LMSN 0200
7222329	OSGOODE TOWNSHIP CON 03 007	5/22/2014	DO	73.8	5.18	40.5	7.2	UT 0233	75.71	SAND BLDR 0017 GREY LMSN 0197 WHIT SNDS 0233 WHIT SNDS 0242
7222332	OSGOODE TOWNSHIP CON 03 007	5/23/2014	DO	91.4	7.92	39.9	4.9	UT 0188 UT 0255 UT 0293	75.71	BLDR SAND CLAY 0026 GREY LMSN 0188 GREY LMSN 0190 BRWN SNDS 0255 BRWN SNDS 0260 BRWN SNDS LMSN 0293 BRWN SNDS LMSN 0300
7222334	OSGOODE TOWNSHIP CON 03 007	6/2/2014	DO	73.2	8.53	40.2	8.1	UT 0221 UT 0233	75.71	SAND 0020 GRVL BLDR 0028 GREY LMSN 0169 WHIT SNDS 0221 WHIT SNDS 0233 WHIT SNDS 0240
7226477	OSGOODE TOWNSHIP CON 03 007	5/26/2014	DO	97.5	13.11	39.9	7.8	UT 0288 UT 0299	75.71	SAND GRVL BLDR 0043 GREY LMSN 0201 GREY SNDS 0288 GREY SNDS 0299 GREY SNDS 0320
7226505	OSGOODE TOWNSHIP CON 03 007	7/31/2014	DO	91.4	8.84	40.2	5.9	UT 0180 UT 0248 UT 0294	75.71	SAND CLAY 0011 GRVL BLDR 0029 GREY LMSN 0180 GREY LMSN 0190 GREY SNDS 0248 GREY SNDS 0294 GREY SNDS 0300
7228012	OSGOODE TOWNSHIP CON 03 007	8/27/2014	DO	73.2	10.97	42.7	5.3	UT 0230	75.71	PEAT 0004 GREY SAND GRVL BLDR 0036 GREY LMSN 0180 GREY SNDS LMSN 0230 GREY SNDS LMSN 0240
7230309	OSGOODE TOWNSHIP CON 03 007	9/2/2014	DO	73.2	6.40	39.9	3.6	UT 0232	75.71	SAND GRVL BLDR 0021 GREY LMSN 0119 GREY SNDS LMSN 0232 GREY SNDS LMSN 0240
7230311	OSGOODE TOWNSHIP CON 03 007	9/4/2014	DO	67.1	7.62	40.2	5.2	UT 0213	75.71	SAND GRVL BLDR 0025 GREY LMSN 0125 GREY LMSN SNDS 0150 GREY SNDS 0213 GREY SNDS 0220
7230313	OSGOODE TOWNSHIP CON 03 007	11/13/2014	DO	86.9	9.75	39.9	8.0	UT 0266 UT 0279	75.71	SAND GRVL BLDR 0032 GREY LMSN 0180 GREY SNDS 0266 GREY SNDS 0279 GREY SNDS 0285
7233596	OSGOODE TOWNSHIP	5/1/2015	DO	61.0	4.57	39.9	5.3	UT 0029 UT 0115 UT 0187	45.50	BRWN CLAY STNS PCKD 0008 BRWN SAND STNS LOOS 0015 GREY LMSN HARD 0142 GREY SNDS HARD 0200
7243023	OSGOODE TOWNSHIP CON 03 007	5/27/2015	DO	48.8	9.14	39.9	6.3	UT 0138 UT 0140 UT 0154	75.71	SAND BLDR GRVL 0030 GREY LMSN 0138 GREY LMSN 0140 GREY LMSN 0154 GREY LMSN 0160
7244913	OSGOODE TOWNSHIP CON 03 007	7/7/2015	DO	61.0	5.18	39.9	11.4	UT 0194	75.71	SAND BLDR 0017 GREY LMSN 0140 GREY SNDS 0194 GREY SNDS 0200
7248797	OSGOODE TOWNSHIP CON 03 007	7/10/2015	DO	77.1	9.14	39.9	11.3	UT 0168 UT 0246	75.71	SAND GRVL BLDR 0030 GREY LMSN 0160 WHIT SNDS LMSN 0168 WHIT SNDS LMSN 0246 WHIT SNDS LMSN 0253
7248800	OSGOODE TOWNSHIP CON 03 007	9/9/2015	DO	76.2	8.84	39.9	4.4	UT 0240 UT 0244	75.71	SAND CLAY BLDR 0029 GREY LMSN 0101 GREY SNDS LMSN 0242 GREY SNDS LMSN 0250
7252286	OSGOODE TOWNSHIP CON 03 007	12/9/2015	DO	85.3	7.92	39.9	4.7	UT 0223 UT 0271	75.71	SAND GRVL BLDR 0026 GREY LMSN 0113 GREY SNDS 0223 GREY SNDS 0271 GREY SNDS 0280
7255463	OSGOODE TOWNSHIP CON 03 007	12/21/2015	DO	73.2	5.79	39.9	8.3	UT 0205 UT 0234	75.71	SAND GRVL BLDR 0019 GREY LMSN 0103 GREY SNDS 0205 GREY SNDS 0234 GREY SNDS 0240
7266070	OSGOODE TOWNSHIP	6/1/2016	DO	54.9	12.80	36.6	9.1	FR 0153 FR 0168	37.85	BRWN SAND 0008 BLUE SAND STNS GRVL 0042 GREY LMSN 0160 WHIT SNDS 0180
7268457	OSGOODE TOWNSHIP CON 03 007	6/2/2016	DO	67.4	4.57	39.9	9.2	UT 0212	75.71	SAND GRVL BLDR 0015 GREY LMSN 0110 GREY SNDS 0212 GREY SNDS 0221
7268458	OSGOODE TOWNSHIP CON 03 007	7/4/2016	DO	67.1	5.18	39.9	7.5	UT 0212 UT 0214	75.71	SAND GRVL BLDR 0017 GREY LMSN 0112 GREY SNDS LMSN 0125 GREY SNDS 0212 GREY SNDS 0214 GREY SNDS 0220
7268401	OSGOODE TOWNSHIP CON 03 007	5/30/2016	DO	75.9	9.75	40.2	9.5	UT 0140 UT 0241	75.71	SAND GRVL BLDR 0032 GREY LMSN 0104 GREY SNDS 0140 GREY SNDS 0241 GREY SNDS 0249
7268432	OSGOODE TOWNSHIP CON 03 007	8/11/2016	DO	62.5	11.28	39.9	11.8	UT 0199	75.71	SAND BLDR 0029 GRVL 0037 GREY LMSN 0116 GREY SNDS 0199 GREY SNDS 0205
7272964	OSGOODE TOWNSHIP CON 03 007	12/14/2016	DO	49.4	10.97	39.9	5.9	UT 0135 UT 0153	75.71	SAND GRVL BLDR 0036 GREY LMSN 0111 GREY SNDS LMSN 0135 GREY SNDS LMSN 0153 GREY SNDS LMSN 0162
7279820	OSGOODE TOWNSHIP CON 03 007	6/1/2017	DO	62.8	7.92	39.9	4.9	UT 0197 UT 0200	75.71	SAND BLDR 0023 GREY LMSN 0112 GREY SNDS 0197 GREY SNDS 0200 GREY SNDS 0206
7292119	OSGOODE TOWNSHIP CON 03 007	7/10/2017	DO	67.4	6.10	39.9	4.9	UT 0216	75.71	CLAY GRVL 0020 GREY LMSN 0101 GREY SNDS LMSN 0216 GREY SNDS LMSN 0221
7296288	OSGOODE TOWNSHIP CON 03 007	7/17/2017	DO	61.6	6.40	39.9	5.3	UT 0188 UT 0094	75.71	SAND GRVL 0012 CLAY 0016 GRVL 0021 GREY LMSN 0127 GREY SNDS 0202
7296291	OSGOODE TOWNSHIP CON 03 007	11/13/2017	DO	61.0	6.10	39.9	4.4	UT 0187 UT 0194	75.71	SAND GRVL 0020 GREY LMSN 0169 GREY SNDS 0200
7301334	OSGOODE TOWNSHIP CON 03 007	10/18/2017	DO	67.1	9.45	39.9	3.6	UT 0214	75.71	SAND GRVL 0031 GREY LMSN 0109 GREY SNDS 0220
7301341	OSGOODE TOWNSHIP CON 03 007	12/3/2017	DO	70.4	5.18	39.9	4.8	UT 0197 UT 0225	75.71	SAND GRVL 0017 GREY LMSN 0127 GREY SNDS 0231
7301368	OSGOODE TOWNSHIP CON 03 007	3/1/2018	DO	64.3	6.40	39.9	8.0	UT 0197 UT 0205	75.71	SAND GRVL 0021 GREY LMSN 0101 GREY SNDS 0211
7310006	OSGOODE TOWNSHIP CON 03 007	3/6/2018				39.9	4.8		56.78	
7310019	OSGOODE TOWNSHIP CON 03 007	7/5/2018	DO	61.0	6.10	39.9	9.5	UT 0190 UT 0192	75.71	SAND CLAY 0020 GREY LMSN 0117 GREY SNDS 0200
7318097	OSGOODE TOWNSHIP CON 03 007	7/3/2018	DO	67.1	5.18	39.9	9.0	UT 0210	75.71	SAND GRVL 0017 GREY LMSN 0147 GREY SNDS 0220
7321082	OSGOODE TOWNSHIP CON 03 007	8/23/2018	DO	58.5	5.79	39.9	7.5	UT 0186	75.71	GRVL SAND 0019 GREY LMSN 0083 GREY SNDS LMSN 0107 GREY SNDS 0192
7321156	OSGOODE TOWNSHIP CON 03 007	11/28/2018	DO	61.0	5.18	39.9	4.2	UT 0194	75.71	BLDR SAND 0017 GREY LMSN 0148 GREY SNDS 0200
7325694	OSGOODE TOWNSHIP CON 03 007	4/5/2019	DO	43.0	6.71	39.9	4.2	UT 0135	75.71	SAND GRVL BLDR 0022 GREY LMSN 0103 GREY SNDS LMSN 0135 GREY SNDS LMSN 0141
7336806	OSGOODE TOWNSHIP CON 03 007	10/3/2019	DO	73.5	5.79	39.9	6.5	UT 0173 UT 0231	75.71	SAND GRVL BLDR 0019 GREY LMSN 0116 GREY SNDS 0173 GREY SNDS 0233 GREY SNDS 0241
7346278	OSGOODE TOWNSHIP CON 03 007	7/24/2020	DO	64.6	7.92	39.9	12.2	UT 0206	75.71	SAND CLAY BLDR 0026 GREY LMSN 0124 WHIT LMSN 0206 GREY LMSN 0212
7367011	OSGOODE TOWNSHIP CON 03 007	11/11/2020	DO	59.1	9.75	39.9	12.2	UT 0188	75.71	SAND CLAY BLDR 0027 GRVL 0032 GREY LMSN 0112 GREY SNDS GREY LMSN 0194
7377719	OSGOODE TOWNSHIP CON 03 007	7/13/2021	DO	73.1	4.88	39.9	4.3	UT 0171 UT 0234	68.14	SAND BLDR 0016 GREY LMSN GREY SNDS 0177 GREY SNDS 0240

https://www.ontario.ca/page/map-well-records

"Well Use"

DO	Domestic
ST	Livestock
IR	Irrigation
IN	Industrial
CO	Commercial
MN	Municipal
PS	Public
AC	Cooling and A/C
NU	Not Used
OT	Other
TH	Test Hole
DE	Dewatering
MO	Monitoring
MT	Monitoring Test

"Water Detail"

FR	Fresh
SA	Salty
SU	Sulphur
MN	Mineral
UK	Unknown
GS	Gas
IR	Iron

Other

NA

Parameter	10th Percentile	90th Percentile	Geometric Mean
Static Water Level (m)	4.2	10.8	6.2
Depth to Bedrock (m)	4.9	11.0	7.2
Total Well Depth (m)	58.6	86.6	68.4
Recommended Pump Rate (L/min)	59.1	75.7	71.3
Bearing Zone Depth (m)	43.3	82.5	59.5

GEMTEC
Consulting Engineers and Scientists

MECP WELL RECORD SEARCH (East and West)

ID	Township	Completion Date (yyyy-mm-dd)	Water Use	Well Depth (m)	Bedrock Depth (m)	Minimum Casing Depth (m)	Static Water Levels (m)	Water Types and Bearing Zone Depths (ft)	Recommended Pumping Rate (L/min)	Stratigraphic Layers (ft)
WEST OF SITE (Figure 6)										
1533532	OSGOODE TOWNSHIP CON 04 009	12/18/2002	DO	48.8	12.2	15.8	12.2	UK 0114 UK 0151	45.4	SAND GRVL BLDR 0040 GREY LMSN 0160
7195941	OSGOODE TOWNSHIP CON 03 008	11/29/2012	DO	65.5	13.1	14.9	6.3	UT 0196 UT 0208	75.7	SAND GRVL 0021 SAND CLAY 0043 GREY LMSN 0142 GREY SNDS 0196 GREY SNDS 0208 GREY SNDS 0215
1529970	OSGOODE TOWNSHIP CON 03 008	4/13/1998	DO	14.3	13.4	13.4	4.9	FR 0045	45.4	BRWN SAND 0018 GREY SAND 0025 GREY CLAY QSND 0042 GREY SAND GRVL 0044 GREY LMSN ROCK 0047
1530643	OSGOODE TOWNSHIP CON 03 008	7/6/1999	DO	61.0	38.1	7.9	6.1	UK 0169	18.9	BRWN SAND 0008 GREY SAND 0014 GREY SAND GRVL BLDR 0125 GREY SNDS VERY HARD 0200
1530950	OSGOODE TOWNSHIP CON 03 008	10/25/1999	DO	61.0	6.1	7.9	6.7	UK 0030 UK 0191	18.9	BRWN LOAM STNS 0020 GREY LMSN 0095 GREY SNDS 0200
1530951	OSGOODE TOWNSHIP CON 03 008	10/26/1999	DO	22.9	4.6	7.0	1.5	UK 0035 UK 0062	18.9	BRWN SAND 0009 GREY SAND GRVL BLDR 0015 GREY LMSN 0075
1531517	OSGOODE TOWNSHIP CON 03 008	10/11/2000	DO	16.8	6.4	9.9	1.8	UK 0048	18.9	BRWN LOAM SNDY 0008 GREY SAND STNS 0021 GREY LMSN 0055
1531518	OSGOODE TOWNSHIP CON 03 008	10/11/2000	DO	14.6	4.6	8.1	1.8	UK 0042	18.9	BRWN SAND 0008 GREY SAND STNS 0015 GREY LMSN 0048
1532051	OSGOODE TOWNSHIP CON 03 008	6/19/2001	DO	78.6	9.8	10.7	6.7	UK 0250	18.9	BRWN SAND 0008 GREY SAND 0026 GREY SAND GRVL BLDR 0032 GREY LMSN 0130 GREY SNDS 0258
1532535	OSGOODE TOWNSHIP CON 03 008	11/20/2001	DO	14.6	4.9	7.9	2.1	UK 0037	18.9	BRWN SAND 0005 GREY SAND WBRG 0012 GREY CLAY STNS 0016 GREY LMSN 0048
1532536	OSGOODE TOWNSHIP CON 03 008	11/20/2001	DO	22.3	7.3	10.1	2.7	UK 0066	18.9	BRWN SAND STNS 0005 GREY SAND 0009 GREY SAND GRVL BLDR 0024 GREY LMSN 0073
1532703	OSGOODE TOWNSHIP CON 03 008	3/14/2002	DO	14.3	4.9	8.2	1.5	UK 0035	18.9	BRWN SAND 0007 GREY SAND 0012 GREY SAND GRVL BLDR 0016 GREY LMSN LYRD 0022 GREY LMSN HARD 0047
1533529	OSGOODE TOWNSHIP CON 03 008	11/26/2002	DO	25.6	6.1	9.4	3.4	UK 0060 UK 0073	83.3	SAND BLDR 0020 GREY LMSN 0084
1533781	OSGOODE TOWNSHIP CON 03 007	6/3/2003	DO	79.6	10.1	14.0	4.6	UK 0251	75.7	SAND GRVL 0033 GREY LMSN 0103 GREY SNDS 0261
7118473	OSGOODE TOWNSHIP CON 03 009	12/4/2008	DO	79.2	10.7	13.3	2.4	UT 0246	75.7	CLAY 0015 SAND 0025 GRVL 0035 GREY LMSN 0208 GREY LMSN SNDS 0260
7121811	OSGOODE TOWNSHIP CON 03 009	2/25/2009	DO	85.3	9.1	11.6	2.6	UT 0171 UT 0261 UT 0276	75.7	SAND GRVL BLDR 0030 GREY LMSN 0148 GREY SNDS LMSN 0280
7121812	OSGOODE TOWNSHIP CON 03 009	2/24/2009	DO	85.3	9.1	11.6	2.9	UT 0166 UT 0256 UT 0272	75.7	SAND GRVL BLDR 0030 GREY LMSN 0145 GREY SNDS LMSN 0280
7126823	OSGOODE TOWNSHIP 006	7/13/2009	DO	69.7	8.8	12.1	2.6	FR 0209	170.3	BLUE SAND SOFT 0006 GREY CLAY SAND SOFT 0029 GREY LMSN DLMT HARD 0229
7139849	OSGOODE TOWNSHIP CON 03 009	10/10/2009	DO	22.2	10.1	13.1	2.2	UT 0065	172.2	BRWN LOAM SNDY STNS 0012 GREY CLAY STNS 0033 GREY LMSN 0073
7156837	OSGOODE TOWNSHIP CON 03 009	11/10/2010	DO	42.6	9.7	12.8	3.2	UT 0131	132.5	BRWN CSND HARD 0011 GREY CSND HARD 0025 GREY GRVL STNS PCKD 0032 GREY SNDS LYRD 0140
EAST OF SITE (FIGURE 6)										
1514884	OSGOODE TOWNSHIP CON 04 007	6/26/1975	DO	16.8	12.5	13.1	0.9	FR 0054	18.9	GREY SAND 0008 GREY CLAY STNS 0041 GREY LMSN 0055
1521974	OSGOODE TOWNSHIP CON 04 008	8/6/1987	DO	60.0	18.6	19.2	2.4	FR 0180	37.9	BRWN SAND STNS 0009 GREY SAND GRVL BLDR 0061 GREY LMSN 0178 GREY SNDS ROCK FCRD 0197
1529955	OSGOODE TOWNSHIP CON 04 008	10/24/1997	DO	64.0	14.3	17.1	9.8	FR 0143 FR 0202 FR 0204	132.5	SAND GRVL BLDR 0047 GREY LMSN 0167 GREY SNDS 0210
1531681	OSGOODE TOWNSHIP CON 04 008	11/30/2000	DO	61.0	14.9	18.3	8.5	UK 0187	18.9	BRWN SAND BLDR 0014 GREY HPAN BLDR 0049 GREY LMSN HARD 0143 GREY SNDS HARD 0200
1531733	OSGOODE TOWNSHIP CON 04 010	1/9/2001	DO	18.0	-	16.8	3.7	UK 0055	37.9	BRWN SAND FILL 0018 GREY TILL GRVL SAND 0052 GREY GRVL SAND 0059
1531933	OSGOODE TOWNSHIP CON 04 009	5/29/2001	DO	38.1	16.5	19.5	5.2	UK 0116	18.9	BRWN SAND GRVL BLDR 0032 GREY HPAN BLDR 0054 GREY LMSN 0125
1533235	OSGOODE TOWNSHIP CON 08 013	10/9/2002	DO	42.7	16.5	19.5	7.3	FR 0130	75.7	BRWN SAND PCKD 0010 GREY GRVL SAND PCKD 0054 GREY LMSN ROCK FCRD 0060 GREY LMSN ROCK HARD 0140
1533532	OSGOODE TOWNSHIP CON 04 009	12/18/2002	DO	48.8	12.0	6.7	12.2	UK 0114 UK 0151	45.4	SAND GRVL BLDR 0040 GREY LMSN 0160
1533607	OSGOODE TOWNSHIP CON 04 007	2/27/2003	DO	25.3	-	6.7	7.3	FR 0078	-	BRWN TILL HARD 0008 GREY TILL HARD 0042 GREY LMSN LYRD 0083
1534632	OSGOODE TOWNSHIP CON 04 008	4/7/2004	AC	61.0	12.2	6.7	6	UK 0169 UK 0189	91.0	SAND GRVL 0040 GREY LMSN 0180 GREY SNDS 0200
1534633	NORTH GOWER TOWNSHIP CON 04 008	4/5/2004	DO	61.0	12.3	6.7		UK 0130 UK 0144	91.0	SAND GRVL 0040 GREY LMSN 0165 GREY SNDS 0200
1535992	OSGOODE TOWNSHIP 04 010	9/30/2005	DO	30.5	14.3	18.3	7.1	0082 0094	91.0	SAND BLDR 0047 GREY LMSN 0100
1536208	OSGOODE TOWNSHIP CON 04 007	11/11/2005	DO	57.9	13.7	16.4	5.9	0182	91.0	SAND GRVL BLDR 0045 GREY LMSN 0120 GREY SNDS 0190
7169519	OSGOODE TOWNSHIP CON 04 009	9/16/2011	DO	25.8	18.5	-	6.2	FR 0063	45.0	BRWN SAND BLDR LOOS 0025 GREY GRVL SAND SHLE 0061 GREY LMSN HARD 0084
7195941	OSGOODE TOWNSHIP CON 03 008	11/29/2012	DO	65.5	13.1	14.9	6.3	UT 0196 UT 0208	75.7	SAND GRVL 0021 SAND CLAY 0043 GREY LMSN 0142 GREY SNDS 0196 GREY SNDS 0208 GREY SNDS 0215
7371675	OSGOODE TOWNSHIP CON 04 007	7/3/2020	DO	43.6	14.0	15.8	4.6	UT 0062 UT 0100 UT 0135	75.7	BLDR SAND 0046 GREY SHLE LMSN 0143
7400063	-	8/10/2021	-	-	-	-	-	-	-	-
7418274	-	3/29/2022	-	-	-	-	-	-	-	-

https://www.ontario.ca/page/map-well-records

"Well Use"

DO	Domestic

"Water Detail"

FR	Fresh
SA	Salty
SU	Sulphur
MN	Mineral
UK	Unknown
GS	Gas
IR	Iron

Parameter	10th Percentile	90th Percentile	Geometric Mean	10th Percentile	90th Percentile	Geometric Mean
	WEST OF SITE			EAST OF SITE		
Static Water Level (m)	1.5	6.7	3.3	1.8	10.8	5.4
Casing Length (m)	7.9	14.8	10.7	6.7	19.5	13.3
Depth to Bedrock (m)	4.6	13.4	8.6	12.1	18.5	14.4
Total Well Depth (m)	14.4	84.8	37.3	17.6	64.5	41.2
Bearing Zone Depth (m)	17.8	61.9	26.2	17.8	61.9	38.5
Recommended Pump Rate (L/min)	18.9	166.6	43.2	18.9	107.6	53.2
Available Drawdown (metres)	9.6	78.9	27.7	12.4	56.8	31.6

GEMTEC
Consulting Engineers and Scientists

TEST WELL RECORDS

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Well Tag No. (Below) A 089354

A089354

Page ____ of ____

Measurements recorded in: [ ] Metric [X] Imperial

Well Owner's Information

First Name: Sunset Lakes Development — Last Name / Organization — E-mail Address — [ ] Well Constructed by Well Owner

Mailing Address (Street Number/Name): 6598 Pebble Trail Way — Municipality: Greely — Province: Ont — Postal Code: K4P 0B6 — Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name): None — Township: Goode — Lot: 8 — Concession: 3

City/Town/Village: Greely — Province: Ontario — Postal Code

County/District/Municipality: Ottawa-Carleton — Other

Municipal Plan and Subdivision Number

UTM Coordinates: Zone — Easting — Northing

NAD [ ] 3 18 459049 5009857

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	To
	Sand & Gravel			0	25
	Grey Clay			25	32
	Gravel + Boulders			32	38
	Grey & Brown Limestone			38	145
	Grey & White Sandstone			145	180

Test Well #1 — STATUS DEVELOPMENT

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m/ft)
44'	34'	Neat Cement Slurry	7-8
34'	0	Neat Cement Slurry	16-8

Method of Construction

[ ] Cable Tool [ ] Diamond [ ] Rotary (Conventional) [ ] Jetting [ ] Rotary (Reverse) [ ] Driving [ ] Boring [ ] Digging [X] Air percussion [ ] Other, specify

Well Use

[ ] Public [ ] Commercial [ ] Not used [X] 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	To
6"	Steel	.188"	+2'	44'
5 15/16"	Open hole		44'	180'

Construction Record - Screen

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

Status of Well

[X] 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	Water found at Depth (m/ft)	Kind of Water
156	[ ] Fresh [X] Untested [ ] Gas [ ] Other, specify	172	[ ] Fresh [X] Untested [ ] Gas [ ] Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	144	6"
144	180	5 15/16"

Results of Well Yield Testing

After test of well yield, water was: [X] Clear and sand free [ ] Other, specify (Describe)

If pumping discontinued, give reason: X

Pump intake set at (m/ft): 170'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 67'2"

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

Recommended pump depth (m/ft): 140'

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

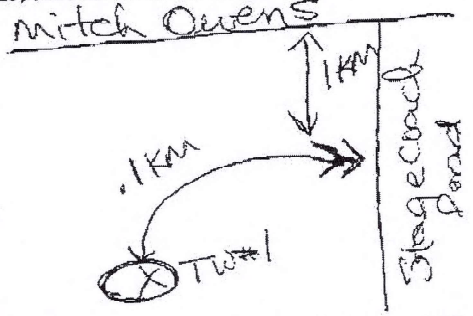
Well production (l/min / GPM): 20

Disinfected? [X] Yes [ ] No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	14'		
1	24'4"	1	
2	30'7"	2	
3	34'9"	3	
4	39'5"	4	
5	42'6"	5	
10	57'9"	10	
15	61'	15	
20	64'6"	20	
25	67'0"	25	
30	67'3"	30	
40	67'2"	40	
50	67'2"	50	
60	67'2"	60	

Map of Well Location

Please provide a map below following instructions on the back



Comments: Test Well #1

Well Contractor and Well Technician Information

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

Business Address (Street Number/Name): RR#4 — Municipality: Richmond — Province: ONT — Postal Code: K0A 2Z0 — Business E-mail Address

Bus. Telephone No. (inc. area code): 6138382170 — Name of Well Technician (Last Name, First Name): Graham Ryan

Well Technician's Licence No: T3484 — Signature of Technician and/or Contractor — Date Submitted

Date Received (dd/mm/yyyy)

Well owner's information package delivered: [X] Yes [ ] No — Date Package Delivered: 2009/12/15

Date Work Completed: 2009/12/14

Ministry Use Only — Audit No. Z 108228

Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. (Place Sticker and/or Print Below) A089354

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
6980848	Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
#105-76 10 Village Centre Place	Greely	Ont	K4P0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	454049	5007857		TW# 1/A

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
	Existing 6" Drilled well Attached			0'	180'
	4 INCH LINER INSTALLED 135 FEET				
	TW#1 - Siastris Development - Dec 14, 2009 (PREV TW1)				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
135'	125'	Pelt Plug	1 Pail
125	50'	Neat Cement Slurry	3.9
50'	10'	Pelt Plug	2 bails

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
4"	Plastic	.250	135'	10'

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	Depth To	Diameter (cm/in)
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

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

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 31'3"

If flowing give rate (l/min/GPM): 0

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min/GPM): 15

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	18'0"		31'3"
1	26.6	1	20.2
2	28.	2	18.6
3	28.7	3	18'0"
4	29.1	4	18'0"
5	29.4	5	
10	30.1	10	
15	30.4	15	
20	30.7	20	
25	30.9	25	
30	31.1	30	
40	31.3	40	
50	31.3	50	
60	31.3	60	

Map of Well Location

Please provide a map below following instructions on the back.

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
AR Rock Drilling Co Ltd	7681

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

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
6138882170	Hanna-Jeremy	T3632		2019/10/30

Comments: 3/4HP - 15GPM Set @ 100 Ft

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☐ Yes ☒ No		2019/10/11

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Received

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Measurements recorded in: ☑ Metric ☐ Imperial

Well Tag No. A209552 — Tag#: A 209552

Well Record

Regulation 903 Ontario Water Resources Act

TW B

Page 1 of 1

[redacted]

Address of Well Location (Street Number/Name): Cedar Lakes, St

Township: Osgoode.

Lot:

Concession:

County/District/Municipality: OTTAWA - City

City/Town/Village: Greely

Province: Ontario

Postal Code: K4P 1M4

UTM Coordinates: NAD 83 Zone 18 Easting 445399 Northing 5010146

Municipal Plan and Subplot Number: 4M-1479

Other: Block 46

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Grey	Sand	Gravel	Soft	0	3.03
Grey	Gravel		Soft	3.03	9.09
Grey	Gravel	Boulders	Loose.	9.09	13.03
Grey	Limestone		Hard.	13.03	60.60

Annular Space

Depth Set at (m/ft) From	Depth Set at (m/ft) To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
0	42.42	Quick Crete	16 Bag

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☑ Rotary (Reverse) AIR ☐ 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
15.55	Steel	0.48	+0.60	42.42

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	Hole Diameter Depth To	Hole Diameter (cm/in)
9.69 ☐ Gas	☑ Fresh ☐ Untested ☐ Other, specify	0	42.42	25.40
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	0	60.60	15.55
(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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 30.30

Pumping rate (l/min / GPM): 45.00

Duration of pumping: 1 hrs + 00 min

Final water level end of pumping (m/ft): 6.75

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

Recommended pump depth (m/ft): 30.30

Recommended pump rate (l/min / GPM): 45.00

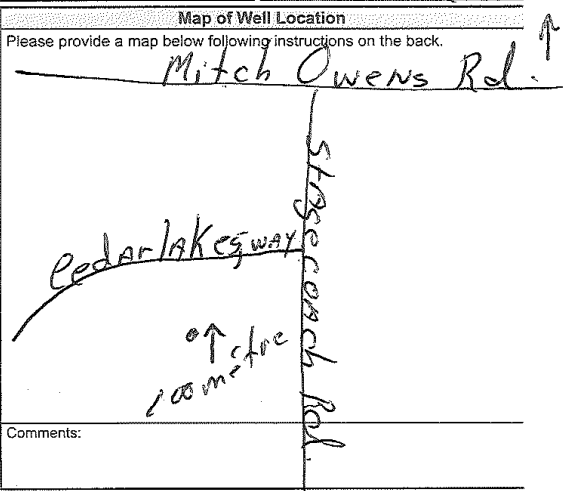
Well production (l/min / GPM): 90.00

Disinfected? ☑ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	6.40		6.75
1	6.71	1	6.55
2	6.72	2	6.48
3	6.73	3	6.45
4	6.73	4	6.43
5	6.74	5	6.41
10	6.75	10	6.40
15	6.75	15	6.40
20	6.75	20	6.40
25	6.75	25	6.40
30	6.75	30	6.40
40	6.75	40	6.40
50	6.75	50	6.40
60	6.75	60	6.60

Map of Well Location

Please provide a map below following instructions on the back.



Comments:

Well Contractor and Well Technician Information

Business Name of Well Contractor: DXR Water well Drilling

Well Contractor's Licence No.: 7526

Business Address (Street Number/Name): 1763 - Route 600 west

Municipality: Nation

Province: ON

Postal Code: K0A 3G0

Business E-mail Address:

Bus. Telephone No. (inc. area code): 613 987 5588

Name of Well Technician (Last Name, First Name): Monette Karl

Well Technician's Licence No.: 3773

Signature of Technician and/or Contractor: Karl Monette

Date Submitted: 2017/09/19

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

Date Package Delivered: 2017/09/18

Date Work Completed: 2017/09/17

Ministry Use Only

Audit No. Z252213

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A 093609

Ontario Ministry of the Environment

Well Record

Regulation 903 Ontario Water Resources Act

Page ___ of ___

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Sticker): A093609

Well Owner's Information

First Name: Sunset Lakes Development | Last Name / Organization | E-mail Address | ☐ Well Constructed by Well Owner

Mailing Address (Street Number/Name): 6598 Pebble Trail Way | Municipality: Greely | Province: Ont | Postal Code: K4P0B6 | Telephone No. (inc. area code)

Well Location

Address of Well Location (Street Number/Name): (NO CIVIC) Empire Grove | Township: Osgoode | Lot: 8 | Concession: 3

County/District/Municipality: Ottawa-Carleton | City/Town/Village: Greely | Province: Ontario | Postal Code

Municipal Plan and Sublot Number | Other

UTM Coordinates: Zone: 18 | Easting: 453338 | Northing: 5099666 | NAD 83

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	To
	Sand, Gravel & Boulders			0	47'2
	Grey + Brown		limestone	47'2	180'

Test Well #5 - STARTS DEVELOPMENT

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
58'	48'	Neat Cement Slurry	7.8
48'	0	Neat Bentonite Slurry	16.8

Method of Construction

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

☐ Diamond ☐ Jetting ☐ Driving ☐ Digging

Well Use

☐ Public ☒ Domestic ☐ Livestock ☐ Irrigation ☐ Industrial ☐ Other, specify

☐ Commercial ☐ Municipal ☐ Test Hole ☐ Cooling & Air Conditioning

☐ Not used ☐ Dewatering ☐ Monitoring

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
6"	Steel	.188"	0'	58'
6'8"	Open hole		58'	180'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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	Other, specify
62'	☐ Fresh ☒ Untested	Gas
171'	☐ Fresh ☒ Untested	Gas
	☐ Fresh ☐ Untested	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	58'	6"
58'	180'	6'8"

Well Contractor and Well Technician Information

Business Name of Well Contractor: A1 Rock Drilling Co Ltd | Well Contractor's Licence No.: 1119

Business Address (Street Number/Name): RR 1 | Municipality: Richmond | Province: Ont | Postal Code: K0A2Z0 | Business E-mail Address

Well Technician's Telephone No. (inc. area code): 613 838 3170 | Name of Well Technician (Last Name, First Name): GRAHAM RYAN

Well Technician's Licence No.: T3484 | Signature of Technician and/or Contractor | Date Submitted: 2010 01 22

Results of Well Yield Testing

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

If pumping discontinued, give reason:

Pump intake set at (m/ft): 170'

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs 0 min

Final water level end of pumping (m/ft): 46'2"

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

Recommended pump depth (m/ft): 40'

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

Well production (l/min / GPM): 25

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	17'		46'2"
1	33'	1	34'2"
2	38'1"	2	27'7"
3	39'7"	3	
4	40'5"	4	
5	41'3"	5	
10	42'8"	10	
15	44'1"	15	
20	44'4"	20	
25	45'	25	
30	45'5"	30	
40	45'7"	40	
50	45'9"	50	
60	46'2"	60	

Map of Well Location

Please provide a map below following instructions on the back.

Comments: Test Well #5

Well owner's information package delivered: ☒ Yes ☐ No | Date Package Delivered: 2010/01/04

Date Work Completed: 2009/12/23

Ministry Use Only

Audit No.: Z 108216

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0506E (12/2007)

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Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. (Place Sticker and/or Print Below) A093609

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
6980848	Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
#105-7610 Village Centre Place	Greely	Ont	K4P0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
#1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453333	5009666	TW# 3/C	

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
	Existing 6" Drilled Well - Abandoned			0'	180'
	4 INCH LINER INSTALLED 135 FEET				
	TW#3 - Siatris Development - Dec. 23, 2009 (Prev TW5)				

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
135'	125	Pelt Plug	1 Pail
125'	50	Neat Cement Slurry	3.9
50'	10'	Pelt Plug	2 Pails

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	To
4"	Plastic	.250	135'	10'

Construction Record - Screen

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

Status of Well

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

Water Details

Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify
Water found at Depth (m/ft)	☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)

Results of Well Yield Testing

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

If pumping discontinued, give reason: X

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

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 44'9"

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

Recommended pump depth (m/ft): 100'

Recommended pump rate (l/min/GPM): 15

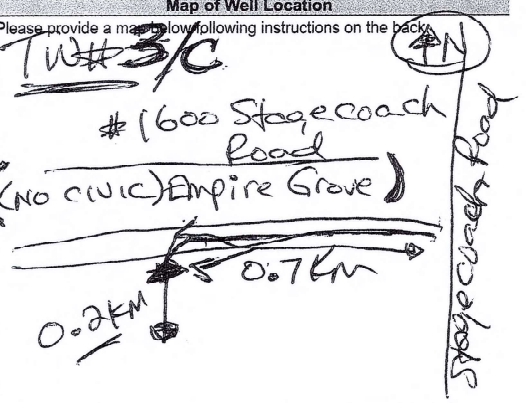
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	30'2"			44'9"
1	37.9	1	33.4	
2	39.8	2	33.1	
3	40.7	3	32.9	
4	41.2	4	32.8	
5	41.6	5	32.7	
10	42.9	10	32.4	
15	43.6	15	32.1	
20	44'	20	31.9	
25	44.3	25	31.7	
30	44.5	30	31.6	
40	44.7	40	31.4	
50	44.8	50	31.3	
60	44'9"	60	31.2	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4HP-15GPM Set @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
AIR ROCK DRILLING CO LTD	7681

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

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 (YYYY/MM/DD)
6138378178	HANNA Jeremy	T3632		2023/10/30

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

Date Work Completed: 2023/10/11

Ministry Use Only

Audit No. Z408173

Received

Ontario — Ministry of the Environment, Conservation and Parks

Tag#:A378947 (Print Below) A378947 TW D

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name/Organization	E-mail Address	☐ Well Constructed by Well Owner
	6980848 Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
105 - 7610 Village Centre Place	Greely	ON	K4P 0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453604	5009437	(Cedarlakes Phase III)	Test Well #5

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	To
(Hard Packed →)	Gravel	&	Boulders	0′	35′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	35′	186′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	186′	194′
Grey & Black	Limestone	w/ layers Grey	Sandstone Mix	194′	200′

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131′	121′	Neat cement	12.48
121′	0′	Bentonite slurry	42.00

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	To
6 1/4"	Steel	.188"	+2′	131′
6"	Open Hole		131′	200′

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

Construction Record - Screen

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

Water Details

Water found at Depth	Kind of Water	Hole Diameter Depth From	To	Diameter (cm/in)
186 (m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify			
Water found at Depth 194 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	0′	131	9 3/4"
Water found at Depth (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, specify	131	200	6"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6098 Flanktown Road	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	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted (Y Y Y Y M M D D)
13632		2023 10 31

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): 60.2′

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

Recommended pump depth (m/ft): 100′

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

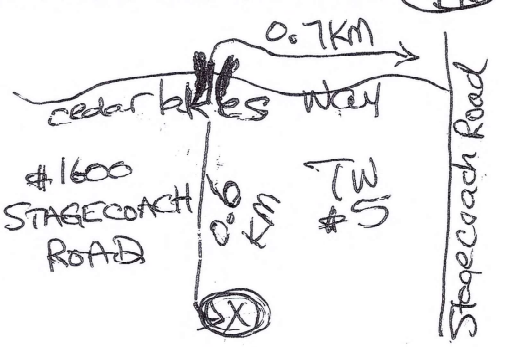
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	18′5″		60.2′
1	26.7	1	41.1
2	31.4	2	34.1
3	34.9	3	29.3
4	37.7	4	26.4
5	40	5	24.5
10	48.6	10	21.6
15	50.1	15	18.9
20	52.5	20	18.5
25	54.2	25	18.5
30	55.4	30	18.5
40	57.1	40	18.5
50	58.6	50	18.5
60	60.2′	60	18.5′

Map of Well Location

Please provide a map below following instructions on the back.



Comments: HP-20 GPM Set @ 100 ft

Well owner's information package delivered	Date Package Delivered (Y Y Y Y M M D D)	Ministry Use Only
☒ Yes ☐ No	2023 10 17	Audit No. Z407939

Received

Ministry's Copy

Ontario — Ministry of the Environment, Conservation and Parks

Wel Tag#:A378948 nt Below)

A378948 TW E

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
	6980848 Canada Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
105 - 7610 Village Centre Place	Greely	ON	K4P 0C8	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1600 Stagecoach Road	Osgoode	8	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453683	5009731	(Cedar Lakes Phase III)	Test Well #6

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	To
	Sand & Gravel	& Boulders		0	20
Grey & Black	Limestone			20	184
Grey & Black	Limestone			184	194
Grey & Black	Limestone			194	200

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131	121	Neat cement	10.92
121	0	Bentonite slurry	54.60

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	To
6 1/4"	Steel	.188"	+2	131
6"	Open Hole		131	200

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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: ☐ Fresh ☐ Untested ☐ Gas ☐ Other, specify
184	☒
194	☒

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	131	9 3/4"
131	200	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): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 57.6

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

Recommended pump depth (m/ft): 100

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

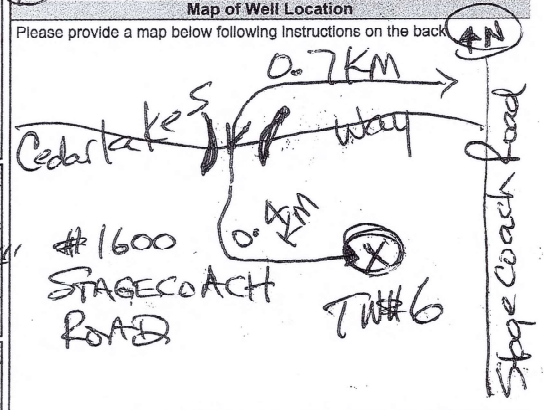
Well production (l/min/GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	143		57.6
1	23	1	39.8
2	28.5	2	31.6
3	32.2	3	26
4	35.3	4	22.1
5	37.8	5	19.4
10	45.5	10	15.2
15	49.6	15	14.3
20	51.6	20	14.3
25	53.1	25	14.3
30	54	30	14.3
40	55.2	40	14.3
50	56.1	50	14.3
60	57.6	60	14.3

Map of Well Location

Please provide a map below following instructions on the back.



Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7881

Business Address (Street Number/Name)	Municipality
6059 Frankford Road	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	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
13632		2023 10 31 (Y Y Y Y M M D D)

Comments: HP-20 GPM Set @ 100 FT

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

Date Package Delivered: 2023 10 17

Ministry Use Only — Audit No. Z407940 — Received 2023/10/18

PRIVATE WELL RECORDS

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☒ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*: A229133

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1794 Cedarlakes Way	Osgoode	P/L 7	3
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
Ottawa Carleton	Greely	Ontario	
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 8 3 — 18 — 453606 — 5009970	4M-1479	S/L 16 2	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand & Gravel			0	19
Grey	Limestone			19	83
Grey	Sandstone	w/ Grey Limestone		83	107
Grey	Sandstone			107	186
Grey	Sandstone			186	192

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m^3/ft)
131'	121'	Neat cement	10.9
121'	0'	Bentonite slurry	33.8

Method of Construction

☐ Cable Tool ☐ Diamond ☒ Air percussion
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ 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'	131'
6"	Open Hole		131'	192'

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	Depth To	Diameter (cm/in)
186 ☐ Gas	☐ Fresh ☐ Untested ☒ Other, specify			
☐ Gas	☐ Fresh ☐ Untested Other, specify	0'	131'	9 3/4"
☐ Gas	☐ Fresh ☐ Untested Other, specify	131'	192'	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): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 46.5'

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

Recommended pump depth (m/ft): 100'

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

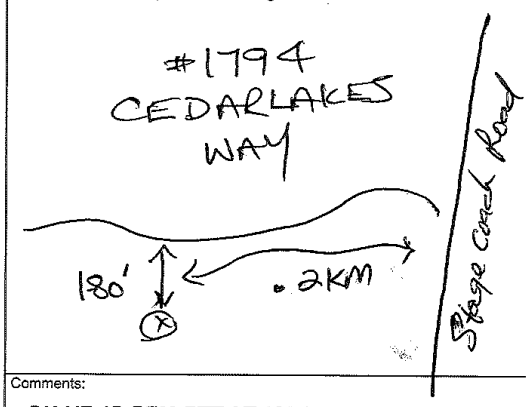
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	29.5"		46.5'
1	37.2	1	33.7
2	40.6	2	31.4
3	42.5	3	30.8
4	43.6	4	30.4
5	44.3	5	30.2
10	45.8	10	29.6
15	46.1	15	29.5
20	46.1	20	29.5
25	46.2	25	29.6
30	46.3	30	29.5
40	46.4	40	29.5
50	46.5	50	29.5
60	46.5'	60	29.5'

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
3/4 HP 15 GPM SET AT 100 FEET

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**
8659 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	Hanna, Jeremy
Well Technician's Licence No.	**Signature of Technician and/or Contractor**	**Date Submitted**
T3632		2018 07 31

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2018 07 04	2018 07 03

Ministry Use Only

Audit No. Z276745

Received OCT 29 2018

0506E (2014/11)

Ministry's Copy

Ontario Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#:A305055 (Print Below)

A305055

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1826 Cedarlakes Way	Osgoode	[redacted]	P/L 7 3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453527	5009848	4M-1555 (Phase 2)	SIL 20-2

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	To
	Sand	& Boulders		0'	16'
Grey	Limestone			16'	115'
Grey	Limestone	w/ Grey Sandstone Mix		115'	171'
Grey	Limestone	w/ Grey Sandstone Mix		171'	177'
Grey	Sandstone			177'	234'
Grey	Sandstone			234'	240'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/A³)
131'	121'	Neat cement	12.4
121'	0'	Bentonite slurry	25.2

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	To
6 1/4"	Steel	.188"	+2'	131'
5 15/16"	Open Hole		131'	240'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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	
171	☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify
234	☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify
(m/ft)	☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	131'	9 3/4"
131'	240'	5 15/16"

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): 220

Pumping rate (l/min / GPM): 18

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 154'.3"

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

Recommended pump depth (m/ft): [redacted] 180'

Recommended pump rate (l/min/GPM): 18

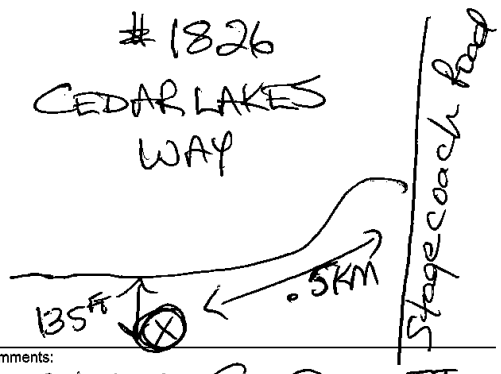
Well production (l/min/GPM): 18

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Water Level (m/ft)	Recovery Time (min)	Water Level (m/ft)
Static Level	14'.3"		154'.3"
1	26.3	1	111
2	36.2	2	101
3	44.8	3	92.6
4	52.5	4	84.4
5	54.3	5	76.5
10	85.3	10	45
15	102	15	25
20	113	20	15.2
25	121	25	14.3
30	126	30	14.3
40	136	40	14.3
50	146	50	14.3
60	154'.3"	60	14'.3"

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 1 HP-15 GPM Set @ 180 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681

Business Address (Street Number/Name)	Municipality
6659 Franktown Road	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)
6133832170	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		2020 11 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2020 11 14	2020 11 11

Ministry Use Only

Audit No. Z344113

Received JAN 08 2021

Ministry's Copy

Ontario — Ministry of the Environment

Tag#: A144728

(Print Below) A144728

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
	Trillium Homes		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
519 St. Pierre Road	Vars	ON	K0A 3H0	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1850 Cedarlakes Way	Osgooode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	18	453420	5009821	4M-1479	S/L 29

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
	Boulders	+	Sand+Clay	0	26
Grey	Limestone			26	188
Grey	Limestone			188	190
Brown	Sandstone			190	255
Brown	Sandstone			255	260
Brown	Sandstone	w/ Grey	Limestone	260	293
Brown	Sandstone	w/ Grey	Limestone	293	300

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131	121	Neat cement	7.8
121	0	Bentonite slurry	29.4

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	131
5 7/8"	Open Hole		131	300

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	Hole Diameter Depth To	Hole Diameter (cm/in)
188 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, specify			
255 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, specify	0	131	9 3/4"
293 (m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☒ Untested ☐ Other, specify	131	300	5 7/8"

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): 280

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 48

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

Recommended pump depth (m/ft): 100

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

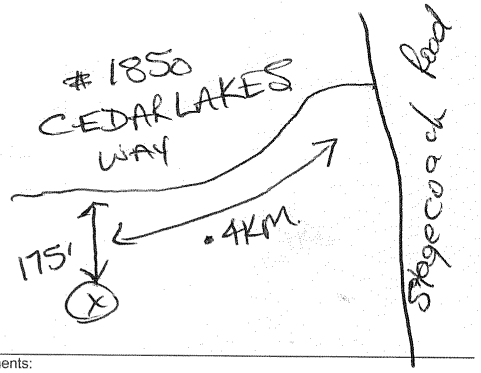
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level	23.6		48
1	30.7	1	28.3
2	34.7	2	24.6
3	35.5	3	23.6
4	36.6	4	23.6
5	37.6	5	
10	37.4	10	
15	40.3	15	
20	41.5	20	
25	42.7	25	
30	43.7	30	
40	45.4	40	
50	46.9	50	
60	48	60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
1 [redacted] HP - 15 GPM SET @ 100 FT

Well Contractor and Well Technician Information

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

Business Address (Street Number/Name)	Municipality
6659 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
T3058		2014 06 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2014 05 27	2014 05 22

Ministry Use Only
Audit No. Z 166899
Received JUN 24 2014

Ministry's Copy

Ontario — Ministry of the Environment

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#: A144727

(Print Below) A144727

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1858 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453401	5009822	4M-1479	S/L 30

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	To
	Sandy	Clay		0'	11'
	Gravel	& Boulders		11'	29'
Grey	Limestone			29'	180'
Grey	Limestone			180'	190'
Grey & White	Sandstone			190'	248'
Grey & White	Sandstone			248'	294'
Grey & White	Sandstone			294'	300'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/cu ft)
132'	122'	Neat cement	7.8
122'	0'	Bentonite slurry	50.4

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	To
6 1/4"	Steel	.188"	+2'	132'
5 15/16"	Open Hole		132'	300'

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	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 (m/ft) From	To	Diameter (cm/in)
180 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	0'	132'	9 3/4"
248 ☐ Gas	☐ Fresh ☒ Untested ☐ Other, specify	132'	300'	5 15/16"
294 ☐ 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): 280

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 29.8'

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

Recommended pump depth (m/ft): 100'

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

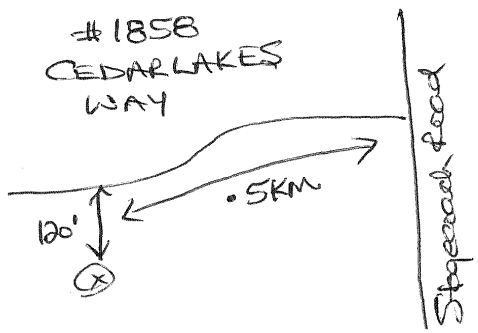
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		25.5'		29.8'
1	28.7	1	25.5	
2	29.1	2	25.5	
3	29.3	3	25.5	
4	29.4	4	25.5	
5	29.4	5	25.5	
10	29.5	10	25.5	
15	29.5	15	25.5	
20	29.6	20	25.5	
25	29.6	25	25.5	
30	29.6	30	25.5	
40	29.7	40	25.5	
50	29.8	50	25.5	
60	29.8'	60	25.5'	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP - 15 GPM SET @ 100 FT

Well Contractor and Well Technician Information

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

Business Address (Street Number/Name)	Municipality
6559 Perth Town 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	Hanna, Jeremy

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
T3632		2014 06 30

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☒ Yes ☐ No	2014 05 27	2014 05 26

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Audit No. Z 166907

Received SEP 02 2014

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Tag#: A135456

W[illegible] - A135456 (Print Below)

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Patrick & Frances Muldoon		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
c/o 7320 Blue Water Crescent	Greely	ON	K4P 0C5	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1922 Cedarlakes Way	Osgoode	P/L 7	3

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

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	18	453176	5009664	4M-1479	S/L 38

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 & Clay &	Boulders		0'	29'
Grey	Limestone			29'	180'
Grey	Sandstone			180'	181'
Grey	Sandstone			181'	220'
White	Sandstone			220'	254'
White	Sandstone			254'	280'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131'	121'	Neat cement	10.9
121'	0'	Bentonite slurry	42

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'	131'
5 15/16"	Open Hole		131'	280'

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

Construction Record - Screen

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

Water Details

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

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	131'	9 3/4"
131'	260'	5 15/16"

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
6658 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
T3058		2014 04 30

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): 250

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 16.6

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

Recommended pump depth (m/ft): 100'

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

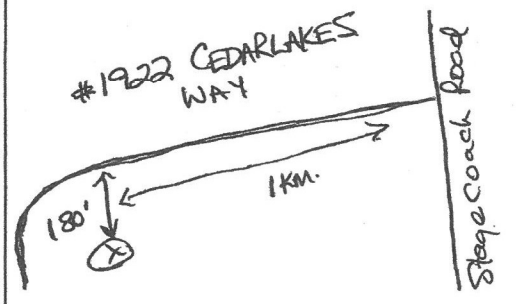
Well production (l/min / GPM): 20+

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		13'		16.6'
1		16.3	1	13
2		16.3	2	13
3		16.3	3	13
4		16.3	4	13
5		16.3	5	13
10		16.4	10	13
15		16.4	15	13
20		16.4	20	13
25		16.5	25	13
30		16.5	30	13
40		16.6	40	13
50		16.6	50	13
60		16.6'	60	13'

Map of Well Location

Please provide a map below following instructions on the back.



Comments: 3/4 HP 15 GPM SET @ 100 FEET

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☒ Yes ☐ No	2014 04 07	Audit No. Z 166858
	Date Work Completed: 2014 4 04	Received

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Ontario Ministry of the Environment

Well Tag Number: A014478 (A014478)

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 15009 CON CON 0 LOT 06

Well Owner's Information and Location of Well Information

[redacted]

RR#/Street Number/Name: 6342 Elkwood

City/Town/Village: Greely

Site/Compartment/Block/Tract etc.: Subdivision 32 Plan 4M787 Lot 3

GPS Reading: NAD 83 Zone 18 Easting 452820 Northing 5009435

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)
	clay	gravel		0	9.14
grey	Limestone			9.14	24.4

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	24.4	15.55

Water Record

Water found at Metres	Kind of Water
152 m	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
210	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:
222	☐ Fresh ☐ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:

NOT tested

After test of well yield, water was: ☑ Clear and sediment free ☐ Other, specify: NOT tested

Chlorinated ☑ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To (Metres)
Casing				
15.88	☑ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	10.7
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		10.0	24.4

Test of Well Yield

Pumping test method: Submp.

Pump intake set at - (metres) 21.3

Pumping rate - (litres/min) 45.6

Duration of pumping 1 hrs + — min

Final water level end of pumping 10.3 metres

Recommended pump type: ☐ Shallow ☑ Deep

Recommended pump depth 15.2 metres

Recommended pump rate 45.6 (litres/min)

If flowing give rate - (litres/min) —

If pumping discontinued, give reason.

Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	2.08		
1	3.70	1	8.26
2	4.62	2	5.60
3	5.60	3	4.65
4	6.40	4	3.99
5	7.09	5	3.51
10	8.55	10	2.51
15	9.68	15	2.33
20	10.0	20	2.20
25	10.17	25	2.16
30	10.27	30	2.13
40	10.3	40	2.09
50	10.3	50	2.08
60	10.3	60	2.08

Plugging and Sealing Record

☑ Annular space ☐ Abandonment

Depth set at - Metres From	To	Material and type (bentonite slurry, neat cement slurry) etc.	Volume Placed (cubic metres)
10.0	7.0	Cement Slurry	0.1770
7.0	0	bentonite slurry	1.180

Method of Construction

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

Water Use

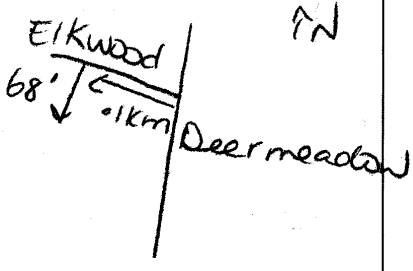
☑ Domestic ☐ Industrial ☐ Public Supply ☐ Other
☐ Stock ☐ Commercial ☐ Not used
☐ Irrigation ☐ Municipal ☐ Cooling & air conditioning

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 14581

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

Date Well Completed: YYYY 2004 MM 07 DD 12

Date Delivered: YYYY 2004 MM 07 DD 13

Well Contractor/Technician Information

Name of Well Contractor: Air Rock Drilling Ltd

Well Contractor's Licence No.: 1119

Business Address (street name, number, city etc.): RR#1 Richmond, Ont

Name of Well Technician (last name, first name): Purcell Shannon

Well Technician's Licence No.: TO122

Signature of Technician/Contractor: x [signature]

Date Submitted: YYYY 2004 MM 07 DD 16

Ministry Use Only

Data Source

Contractor: 1119

Date Received: JUL 21 2004

Date of Inspection: YYYY MM DD

Remarks

Well Record Number: 1534798

0506E (09/03) Contractor's Copy ☐ Ministry's Copy ☑ Well Owner's Copy ☐ *Cette formule est disponible en français*

Ontario — Ministry of the Environment, Conservation and Parks

Measurements recorded in: ☐ Metric ☒ Imperial

Tag#: A295368 (Print Below)

A295368

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

[redacted]

Address of Well Location (Street Number/Name)	Township	Lot	Concession
1738 Cedarlakes Way	Osgoode	P/L 7	3
County/District/Municipality	**City/Town/Village**	**Province**	**Postal Code**
Ottawa Carleton	Greely	Ontario	
UTM Coordinates Zone / Easting / Northing	**Municipal Plan and Sublot Number**	**Other**	
NAD 8 3 — 18 — 453853 — 5010034	4M-1555	S/L 9-2	

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

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
	Sand	&	Boulders	0'	27'
	Gravel			27'	32'
Grey	Limestone			32'	112'
Grey	Sandstone	w/ Grey	Limestone	112'	188'
Grey	Sandstone	w/ Grey	Limestone	188'	194'

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
131'	121'	Neat cement	12.4
121'	0'	Bentonite slurry	25.2

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	To
2 1/4"	Steel	.188"	+2'	131'
6"	Open Hole		131'	194'

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

Construction Record - Screen

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

Water Details

Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water	Water found at Depth (m/ft)	Kind of Water
188 (m/ft) ☐ Gas	☒ Fresh ☐ Untested ☐ Other, specify	☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify	☐ Gas	☐ Fresh ☐ Untested ☐ Other, specify

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0'	131'	9 3/4"
131'	194'	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): 180

Pumping rate (l/min / GPM): 20

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping (m/ft): 41.2'

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

Recommended pump depth (m/ft): 100'

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

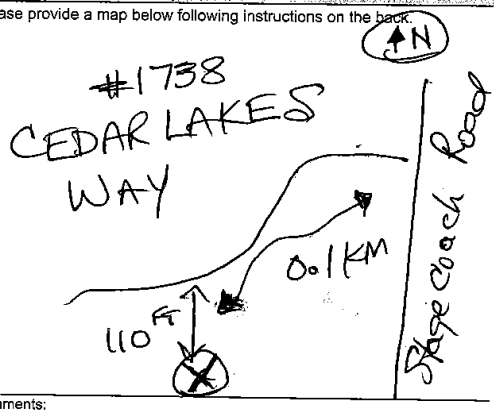
Well production (l/min / GPM): 20

Disinfected? ☒ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level		40.6'		41.2'
1	41		1	40.6
2	41.1		2	40
3	41.2		3	40
4	41.2		4	40
5	41.2		5	40.6'
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments:
3/4 HP - 15 GPM SET @ 100 FT

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Air Rock Drilling Co. Ltd.	7681
Business Address (Street Number/Name)	**Municipality**
6659 Franktown Road	Richmond
Province	**Postal Code**
ON	K0A 2Z0
Business E-mail Address	
air-rock@sympatico.ca	
Telephone No. (inc. area code)	**Name of Well Technician (Last Name, First Name)**
6138882170	Hanna, Jeremy
Well Technician's Licence No.	**Signature of Technician and/or Contractor**
13632	

Date Submitted: 2020 07 31 (Y Y Y Y M M D D)

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

Date Package Delivered: 2020 07 28

Date Work Completed: 2020 07 24

Ministry Use Only

Audit No. Z337514

Received SEP 08 2020

E (2018/12)

Ministry's Copy

Ontario Ministry of the Environment

Well A059531 (number below)
A059531

Well Record
Regulation 903 Ontario Water Resources Act

page ___ of ___

Instructions for Completing Form

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

Ministry Use Only

MUN | CON | LOT

Well Owner's Information and Location of Well Information

[redacted]

Ottawa - Carleton | Osgoode | Lot 17 | Concession 3

RR#/Street Number/Name: #1544 Stagecoach Road | City/Town/Village: Greely | Site/Compartment/Block/Tract etc.: Plan 4R-22259 Part 1

GPS Reading: NAD 83 | Zone 18 | Easting 453938 | Northing 5010171 | 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
	Sand, Gravel, Boulder			0	13.41
	Grey Limestone			13.41	51.81
	Grey Limestone + Sandstone Mix			51.81	60.96

Hole Diameter

Depth From	Depth To (Metres)	Diameter (Centimetres)
0	60.96	15.25

Water Record

Water found at Metres	Kind of Water	
59.74 m	☐ Fresh ☒ Sulphur ☐ Gas ☐ Salty ☐ Minerals ☐ Other:	NOT TESTED
___ 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: NOT TESTED

Chlorinated ☐ Yes ☐ No

Construction Record

Inside diam centimetres	Material	Wall thickness centimetres	Depth From	Depth To
Casing				
15.88	☒ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	.48	0	15.85
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized			
Screen				
Outside diam	☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete ☐ Galvanized	Slot No.		
No Casing or Screen				
	☒ Open hole		15.24	60.96

Test of Well Yield

Pumping test method: SubPump

Pump intake set at (metres): 54.86

Pumping rate - (litres/min): 91

Duration of pumping: 1 hrs + 0 min

Final water level end of pumping: 58.76 metres

Recommended pump type: ☐ Shallow ☒ Deep

Recommended pump depth: 42.67 metres

Recommended pump rate: 91 (litres/min)

If flowing give rate - (litres/min):

If pumping discontinued, give reason:

	Draw Down Time min	Draw Down Water Level Metres	Recovery Time min	Recovery Water Level Metres
Static Level	6.60		6.96	
1	6.66	1	6.72	
2	6.80	2	6.70	
3	6.80	3	6.69	
4	6.84	4	6.68	
5	6.85	5	6.67	
10	6.88	10	6.65	
15	6.89	15	6.59	
20	6.90	20	6.56	
25	6.91	25	6.47	
30	6.92	30	6.40	
40	6.93	40	6.29	
50	6.95	50	6.15	
60	6.96	60	6.20	

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)
15.24	12.19	Neat Cement Slurry	.4994
12.19	0	Bentonite Slurry	.858

Method of Construction

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

Water Use

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

Final Status of Well

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

Well Contractor/Technician Information

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

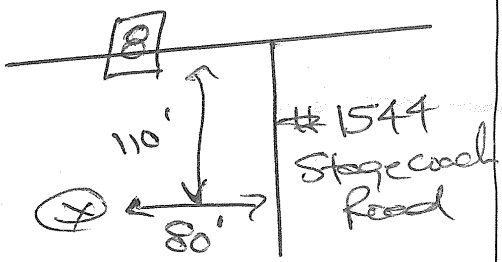
Business Address (street name, number, city etc.): RR#1 RICHMOND ONT K0A2Z0

Name of Well Technician (last name, first name): Desaulniers Ken | Well Technician's Licence No.: T4

Signature of Technician/Contractor: X [signature] | Date Submitted: 2007 10 16

Location of Well

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



Audit No.: Z 65121 | Date Well Completed: 2007 10 18 (YYYY MM DD)

Was the well owner's information package delivered? ☒ Yes ☐ No | Date Delivered: 2007 10 23

Ministry Use Only

Data Source | Contractor

Date Received: OCT 12 2007 | Date of Inspection

Remarks | Well Record Number

0506E (08/2006)

Ministry's Copy

Cette formule est disponible en français

APPENDIX C

Borehole Logs and Soil Characterization
GEMTEC (2023)
Paterson (2011 and 2023)

RECORD OF BOREHOLE 23-1

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

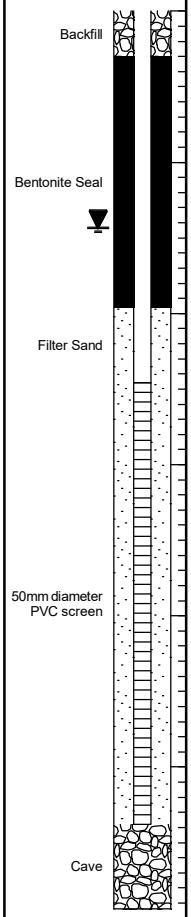
SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Auger Hollow Stem Auger (210mm OD)	Ground Surface		100.23				
		Loose, brown SAND			1	SS	380	8
				98.71				
		Compact, grey brown SAND, trace to some gravel, trace silt		1.52	2	SS	430	18
					3	SS	600	19
					4	SS	380	16
				96.32				
		Stiff, grey brown SILTY CLAY (WEATHERED CRUST)		3.91	5	SS	300	10
				95.81				
		Compact, grey brown CLAYEY SILT, some gravel, trace sand, with possible cobbles and boulders (GLACIAL TILL)		4.42	6	SS	400	11
					7	SS	360	21
				94.29				
		End of Borehole		5.94				
		Note: auger refusal at 5.5 metres depth						

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, 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



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	1.4	98.8
23/10/19	1.4	98.8

GEMTEC
Consulting Engineers and Scientists

LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/12/23

RECORD OF BOREHOLE 23-2

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
		Ground Surface		98.35				
0	Auger	Loose, grey brown SAND, trace silt						
1	Hollow Stem Auger (210mm OD)				1	SS	350	5
2					2	SS	300	6
				96.06				
		Stiff, grey brown SILTY CLAY to CLAYEY SILT (WEATHERED CRUST)		2.29	3	SS	400	1
3					4	SS	550	2
4					5	SS	650	2
5					6	SS	600	WH
				93.17				
		Compact, grey brown SAND and GRAVEL, some silt, with possible cobbles and boulders (GLACIAL TILL)		5.18	7	SS	300	16
				92.41				
6		End of Borehole		5.94				
7								
8								
9								
10								

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, 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

Bentonite Seal

50mm diameter PVC screen

GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	-0.3	98.6
23/10/19	-0.3	98.6

GEMTEC
Consulting Engineers and Scientists

LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/12/23

RECORD OF BOREHOLE 23-3

CLIENT: ARK Engineering and Development
PROJECT: Hydrogeological Investigation and Terrain Analysis, Proposed Residential Subdivision, 1600 Stagecoach Road, Ottawa, Ontario
JOB#: 100554.003
LOCATION: 1600 Stagecoach - Refer to Figure 1 for location.

SHEET: 1 OF 1
DATUM: CGVD2013
BORING DATE: Sep 21 2023

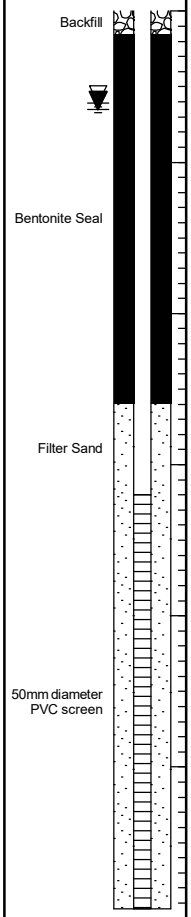
DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	NUMBER	TYPE	RECOVERY, mm	BLOWS/0.3m
0	Auger Hollow Stem Auger (210mm OD)	Ground Surface		98.67				
		Brown SILTY SAND, some gravel		97.91 / 0.76				
1		Compact, grey brown SILTY SAND, some gravel		97.30 / 1.37	1	SS	320	19
		Compact, grey brown SANDY SILT, trace gravel (GLACIAL TILL)			2	SS	490	-
2					3	SS	150	19
				95.77 / 2.90				
3		Loose, grey brown SILTY SAND, some gravel, trace clay, with possible cobbles and boulders (GLACIAL TILL)			4	SS	320	9
4					5	SS	270	7
				94.10 / 4.57				
5		Compact to dense, grey brown SILTY SAND, some gravel, trace clay, with possible cobbles and boulders (GLACIAL TILL)			6	SS	300	13
					7	SS	430	33
6				92.73 / 5.94				
		End of Borehole						
7								
8								
9								
10								

SAMPLES

PENETRATION RESISTANCE (N), BLOWS/0.3m
DYNAMIC PENETRATION RESISTANCE, 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



GROUNDWATER OBSERVATIONS

DATE	DEPTH (m)	ELEV. (m)
23/09/21	0.6 ▽	98.1
23/10/19	0.7 ▼	98.0

GEMTEC
Consulting Engineers and Scientists

LOGGED: SE
CHECKED: BR

GEO - BOREHOLE LOG 100554.003.GPJ GEMTEC 2018.GDT 12/12/23

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 375729.06 **NORTHING:** 5011207.383 **ELEVATION:** 98.39

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 1-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.39 m											
TOPSOIL 0.16 m EL 98.23 m		G1	#				0				
Loose, brown SILTY SAND		G2	#				1				
1.4 m EL 96.99 m		G3	#				2				
Loose, grey SILTY SAND with gravel and seashells							3				
3.7 m EL 94.69 m		G4	#				4				
GLACIAL TILL: Loose, grey silty sand with gravel, cobbles, occasional boulders, trace clay							5				
4.5 m EL 93.89 m							6				
End of Test Pit							7				
(Groundwater infiltration at 1.5m depth)											

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 375856.031 **NORTHING:** 5011075.963 **ELEVATION:** 97.53

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 2-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 97.53 m											
TOPSOIL 0.16 m EL 97.37 m		G1	#				0				
Loose, brown SILTY SAND		G2	#								
- grey by 0.9m depth		G3	#				1				
							2				
							3				
3.9 m EL 93.63 m							4		35		
Firm, grey SILTY CLAY		G4	#								
4.4 m EL 93.13 m							5				
End of Test Pit											
(Groundwater infiltration at 1.0m depth)							6				
							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 375824.699 **NORTHING:** 5011274.313 **ELEVATION:** 98.14

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 3-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.14 m											
TOPSOIL 0.03 m EL 98.11 m		G1	[#]				0				
Loose, brown SILTY SAND 0.4 m EL 97.74 m		G2	[#]								
Loose, grey SILTY SAND with gravel 0.6 m EL 97.54 m		G3	[#]						79		
Stiff, grey SILTY CLAY 1.1 m EL 97.04 m		G4	[#]				1		82		
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and seashells 2.3 m EL 95.84 m							2				
End of Test Pit							3				
(Groundwater infiltration at 0.7m depth)							4				
							5				
							6				
							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 375919.947 **NORTHING:** 5011167.493 **ELEVATION:** 103.36

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 4-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 103.36 m											
TOPSOIL 0.3 m EL 103.06 m		G1	#				0				
		G2	#								
Loose, brown SAND (pit-run) with gravel, cobbles and boulders							1				
							2				
							3				
		G3	#				4				
5 m EL 98.36 m		G4	#				5				
GLACIAL TILL: Grey silty clay with gravel and cobbles 5.2 m EL 98.16 m											
End of Test Pit							6				
(TP dry upon completion)							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 375912.061 **NORTHING:** 5010978.983 **ELEVATION:** 98.72

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 5-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.72 m											
TOPSOIL 0.05 m EL 98.67 m		G1	#				0				
Loose, brown SILTY SAND		G2	#								
0.9 m EL 97.82 m		G3	#				1				
Loose, brown SAND with gravel											
2.3 m EL 96.42 m							2		26, 51, 55		
Firm to stiff, grey SILTY CLAY		G4	#				3				
5.3 m EL 93.42 m							4				
End of Test Pit							5				
(Groundwater infiltration at 1.0m depth)							6				
							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 376232.883 **NORTHING:** 5011443.557 **ELEVATION:** 98.57

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. PG6871

HOLE NO. TP 6-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.57 m											
PEAT 0.3 m EL 98.27 m		G1	[#]				0				
		G2	[#]								
Loose, grey SILTY SAND 0.6 m EL 97.97 m		G3	[#]				1				
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders		G4	[#]				2				
							3				
3.8 m EL 94.77 m End of Test Pit (Groundwater infiltration at 1.0m depth)							4				
							5				
							6				
							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 376276.215 **NORTHING:** 5011467.143 **ELEVATION:** 98.66

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

FILE NO. **PG6871**

HOLE NO. TP 6A-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.66 m											
TOPSOIL 0.05 m EL 98.61 m		G1	#				0				
Compact, brown SILTY SAND 0.4 m EL 98.26 m		G2	#								
Compact, grey SILTY SAND with gravel, some clay, occasional cobbles, trace seashells 0.5 m EL 98.16 m		G3	#				1				
GLACIAL TILL: Dense, grey silty sand with gravel, cobbles and boulders							2				
		G4	#				3				
3.8 m EL 94.86 m							4				
End of Test Pit											
(Groundwater infiltration at 1.0m depth)							5				
							6				
							7				

SOIL PROFILE AND TEST DATA

GEOTECHNICAL INVESTIGATION

Part of Lot 8, Concession 3, Greely, Ontario

DATUM: Geodetic **EASTING:** 376351.584 **NORTHING:** 5011467.606 **ELEVATION:** 98.9

PROJECT: Proposed Residential Dev. - Cedar Lakes Subdivision

FILE NO. **PG6871**

BORINGS BY: Excavator

REMARKS:

DATE: October 4, 2023

HOLE NO. TP 7-23

SAMPLE DESCRIPTION	STRATA PLOT	SAMPLE No.	SAMPLE Type	SAMPLE % RECOVERY	N VALUE or RQD	WATER CONTENT %	DEPTH (m)	Remoulded Shear Strength (kPa) 0 25 50 75 100	Peak Shear Strength (kPa) 0 25 50 75 100	Pen. Resist. Blows/0.3m (50 mm Dia. Cone) 0 25 50 75 100	Piezometer Construction
Ground Surface EL 98.9 m											
TOPSOIL 0.2 m EL 98.7 m		G1	#				0				
Loose, brown SILTY SAND		G2	#								
- grey by 0.8m depth		G3	#				1				
1.6 m EL 97.3 m											
GLACIAL TILL: Dense, grey silty sand with gravel, cobbles and boulders		G4	#				2				
							3				
3.5 m EL 95.4 m											
End of Test Pit							4				
(Groundwater infiltration at 1.0m depth)							5				
							6				
							7				

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

DATUM Grades interpolated based on topographic information by others.

FILE NO. **PH1276**

REMARKS

HOLE NO. **TP 7**

BORINGS BY Backhoe DATE 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	101.40		
TOPSOIL 0.40									
Red-brown to grey medium **SAND**		G	12			1	100.40		
		G	13			2	99.40		
						3	98.40		
3.40 End of Test Pit (Water infiltration @ 1.1m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %; scale 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP 9**

BORINGS BY Backhoe

DATE 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	100.20		
TOPSOIL 0.25		G	16						
Red-brown to grey-brown medium **SAND** with gravel		G	17			1	99.20		
2.75		G	18			2	98.20		
Firm, grey-brown **SILTY CLAY**		G	19			3	97.20		
3.50									
End of Test Pit									
(Water infiltration @ 2.2m depth)									

Water Content % scale: 20 40 60 80

Shear Strength (kPa) scale: 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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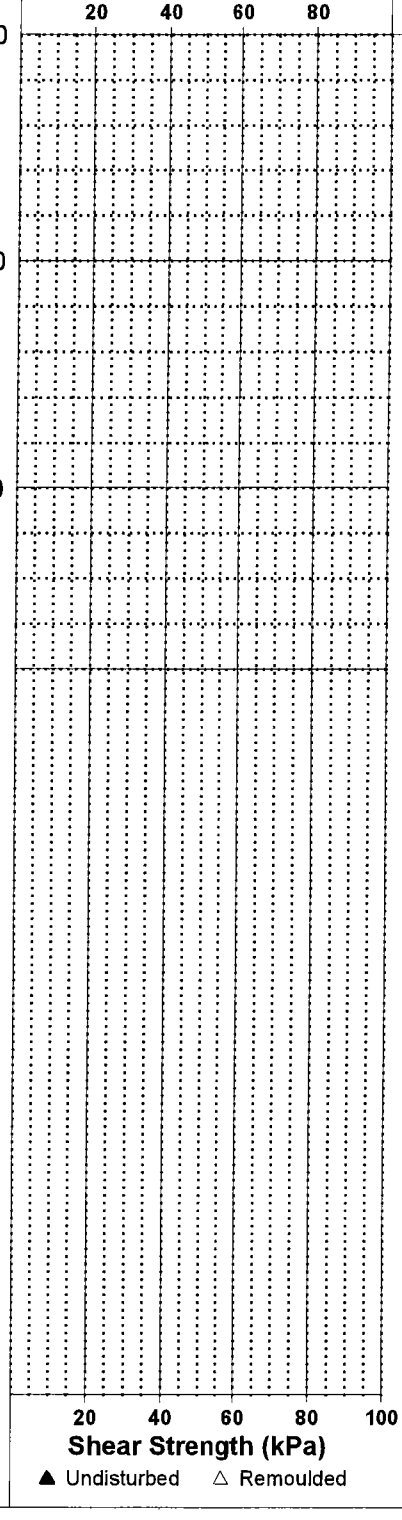
FILE NO. **PH1276**

REMARKS

HOLE NO. **TP10**

BORINGS BY Backhoe DATE 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.60		
TOPSOIL 0.10									
Dark brown **SILTY SAND**		G	20						
0.50						1	102.60		
Dense, light brown **SILTY SAND/SANDY SILT** with gravel		G	21						
2.80						2	101.60		
End of Test Pit									
(TP dry upon completion)									



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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

DATUM Grades interpolated based on topographic information by others.

FILE NO. **PH1276**

REMARKS

HOLE NO. **TP11**

BORINGS BY Backhoe DATE 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	101.80		
TOPSOIL 0.30									
GLACIAL TILL: Light brown silty sand with gravel, cobbles and boulders		G	22			1	100.80		
						2	99.80		
2.70									
End of Test Pit									
(Water infiltration @ 0.35m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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FILE NO. PH1276

REMARKS

HOLE NO. TP12

BORINGS BY Backhoe **DATE** 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	100.50	20 40 60 80	
TOPSOIL 0.30		G	23			1	99.50		▽
Brown to grey-brown medium **SAND**		G	24			2	98.50		
3.80						3	97.50		
End of Test Pit (Water infiltration @ 1.0m depth)								20 40 60 80 100 **Shear Strength (kPa)** ▲ Undisturbed △ Remoulded	

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

DATUM Grades interpolated based on topographic information by others.

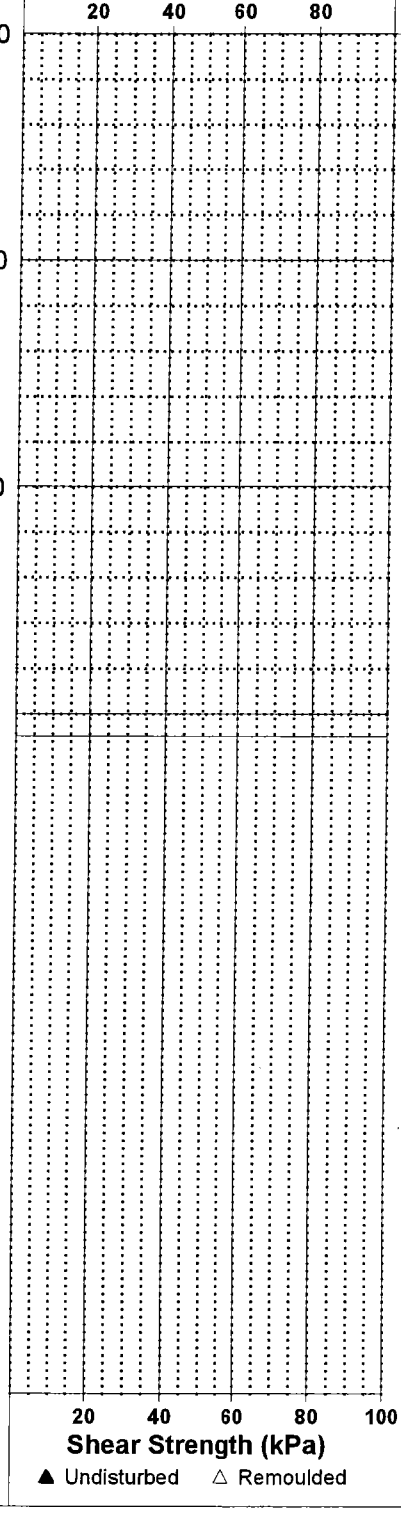
FILE NO. PH1276

REMARKS

HOLE NO. TP18

BORINGS BY Backhoe **DATE** 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	102.00		
TOPSOIL 0.60									
SAND with cobbles and boulders 1.60						1	101.00		
GLACIAL TILL: Silty clay with sand, gravel, cobbles and boulders 3.10						2	100.00		
End of Test Pit (TP dry upon completion)						3	99.00		



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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP19**

BORINGS BY Backhoe

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	100.00		
TOPSOIL 0.30									
SAND 0.70						1	99.00		
GLACIAL TILL: Silty clay with sand, gravel, cobbles and boulders						2	98.00		
2.60									
End of Test Pit Practical refusal on boulders @ 2.60m depth (TP dry upon completion)									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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Ottawa (Greely), Ontario

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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP20**

BORINGS BY Backhoe DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.50
TOPSOIL 0.40							
SAND						1	97.50
						2	96.50
2.70							
End of Test Pit							
(GWL @ 0.7m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

▽

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP21**

BORINGS BY Backhoe

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.20		
TOPSOIL 0.30									
SAND 1.60						1	98.20		
MARL 2.00									
SAND with boulders 2.70						2	97.20		
End of Test Pit (GWL @ 1.6m depth)									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP22**

BORINGS BY Backhoe

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.40	20 40 60 80	
TOPSOIL 0.50									
SILTY CLAY with sand 1.30						1	98.40		▽
SILT with boulders 3.50						2	97.40		
						3	96.40		
End of Test Pit (GWL @ 1.0m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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Ottawa (Greely), Ontario

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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP23**

BORINGS BY Backhoe

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.00	20 40 60 80	
TOPSOIL 0.30									
SAND with marl 0.50						1	98.00		
GLACIAL TILL: Silty sand with cobbles and boulders						2	97.00		
						3	96.00		
End of Test Pit 3.50 (GWL @ 0.2m depth)								20 40 60 80 100 Shear Strength (kPa) ▲ Undisturbed △ Remoulded	

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

DATUM Grades interpolated based on topographic information by others.

FILE NO. **PH1276**

REMARKS

HOLE NO. **TP24**

BORINGS BY Backhoe

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	99.70
TOPSOIL 0.40							
SILTY SAND 0.80						1	98.70
GLACIAL TILL: Silty sand with cobbles and boulders						2	97.70
3.20						3	96.70
End of Test Pit							
(GWL @ 0.7m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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28 Concourse Gate, Unit 1, Ottawa, ON K2E 7T7

SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

DATUM Grades interpolated based on topographic information by others.

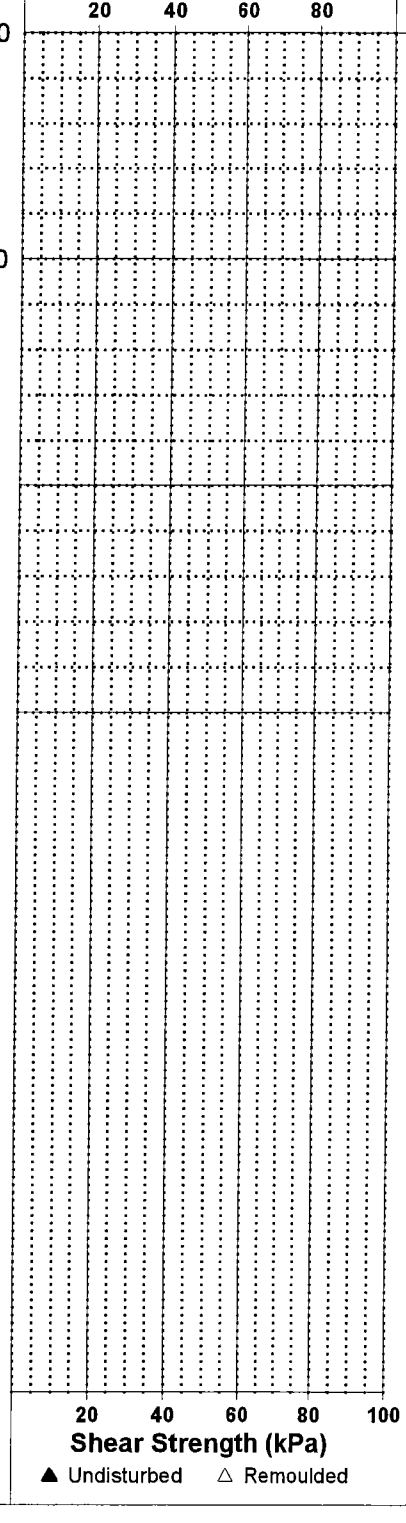
FILE NO. **PH1276**

REMARKS

HOLE NO. **TP25**

BORINGS BY Backhoe DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	101.20		
TOPSOIL 0.30									
SAND						1	100.20		
						2	99.20		
3.00						3	98.20		
End of Test Pit									
(GWL @ 0.5m depth)									



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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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FILE NO. **PH1276**

REMARKS

HOLE NO. **TP26**

BORINGS BY Backhoe

DATE 17 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	98.90
TOPSOIL 0.35							
Brown **SAND** 0.80		G	1			1	97.90
Light brown **SAND**		G	2			2	96.90
3.80						3	95.90
SILTY CLAY 4.00						4	94.90
End of Test Pit							
(GWL @ 1.8m depth)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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FILE NO. PH1276

REMARKS

HOLE NO. TP27

BORINGS BY Backhoe **DATE** 17 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	102.80		
TOPSOIL 0.40									
Brown **SAND** 0.90		G	3			1	101.80		
Light brown **SAND**						2	100.80		
						3	99.80		
4.00						4	98.80		
GLACIAL TILL: Brown silty sand with gravel, cobbles and boulders 4.20									
End of Test Pit									
(GWL @ 1.5m depth)									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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FILE NO. PH1276

REMARKS

HOLE NO. AH 1

BORINGS BY Hand Auger **DATE** 4 October 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.15		
TOPSOIL (high humic content) 0.25									
Brown medium **SAND**						1	98.15		
2.30						2	97.15		
End of Auger Hole (GWL @ 2.12m depth)									

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
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FILE NO. **PH1276**

REMARKS

HOLE NO. **AH 4**

BORINGS BY Hand Auger

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	98.50		
TOPSOIL 0.25									
SAND						1	97.50		
1.60									
End of Auger Hole									
(GWL @ 0.8m depth)									

Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
Ripley Subdivision - Stagecoach Road
Ottawa (Greely), Ontario

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FILE NO. **PH1276**

REMARKS

HOLE NO. **AH 5**

BORINGS BY Hand Auger

DATE 7 December 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	98.00	20 40 60 80	
TOPSOIL 0.25									
SAND						1	97.00		▽
1.60									
End of Auger Hole									
(GWL @ 0.8m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Terrain Analysis & Hydrogeological Study
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FILE NO. PH1276

REMARKS

HOLE NO. MW 1

BORINGS BY Backhoe **DATE** 28 August 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.00	20 40 60 80	
TOPSOIL 0.15									
Medium **SAND,** trace silt						1	98.00		
1.20									
Brown **SAND**									
2.00						2	97.00		
End of Monitoring Well									
(GWL @ 1.4m-Sept. 22/10)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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FILE NO. **PH1276**

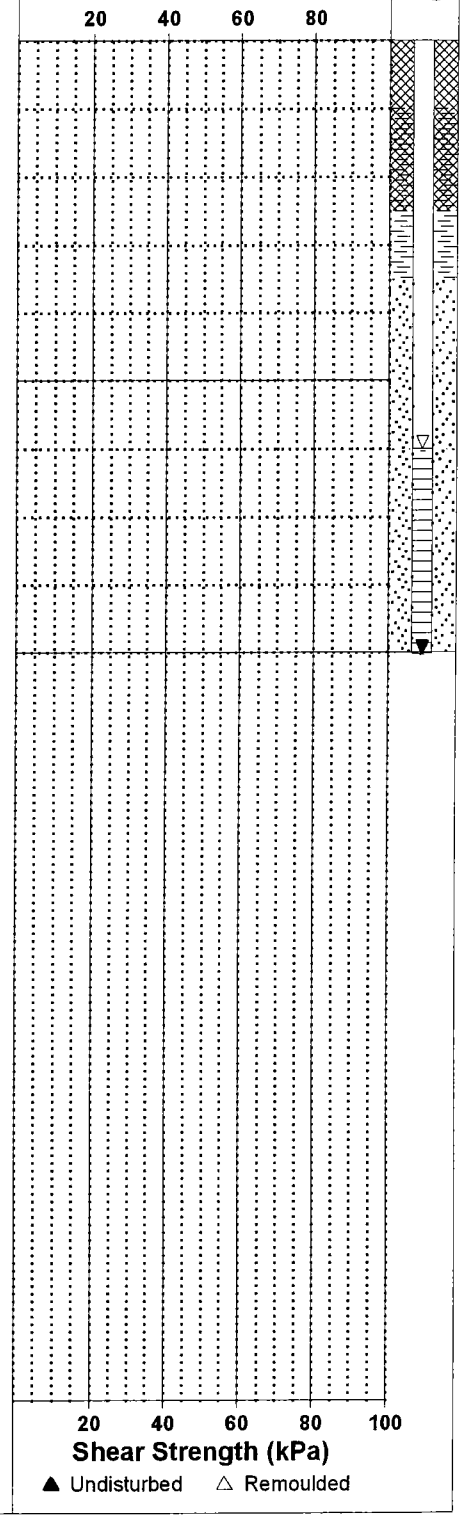
REMARKS

HOLE NO. **MW 3**

BORINGS BY Hand Auger

DATE 29 August 2010

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	99.20		
TOPSOIL 0.20									
Red-brown **SAND**, trace silt 0.50									
Brown **SAND**						1	98.20		
1.80									
End of Monitoring Well									
(GWL @ 1.2m-Sept. 22/10)									



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SOIL PROFILE AND TEST DATA

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FILE NO. PH1276

REMARKS

HOLE NO. MW 7

BORINGS BY Backhoe **DATE** 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	100.90
TOPSOIL 0.20							
Red-brown **SAND,** trace silt 0.50						1	99.90
Brown **SAND**						2	98.90
3.00 End of Monitoring Well (GWL @ 1.4m-Sept. 22/10)						3	97.90

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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FILE NO. **PH1276**

REMARKS

HOLE NO. **MW 8**

BORINGS BY Backhoe

DATE 24 November 2009

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	103.70	20 40 60 80	
TOPSOIL 0.20									
Red-brown **SAND,** trace silt 0.50						1	102.70		
Brown **SAND**						2	101.70		
3.00						3	100.70		
End of Monitoring Well (GWL @ 0.6m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

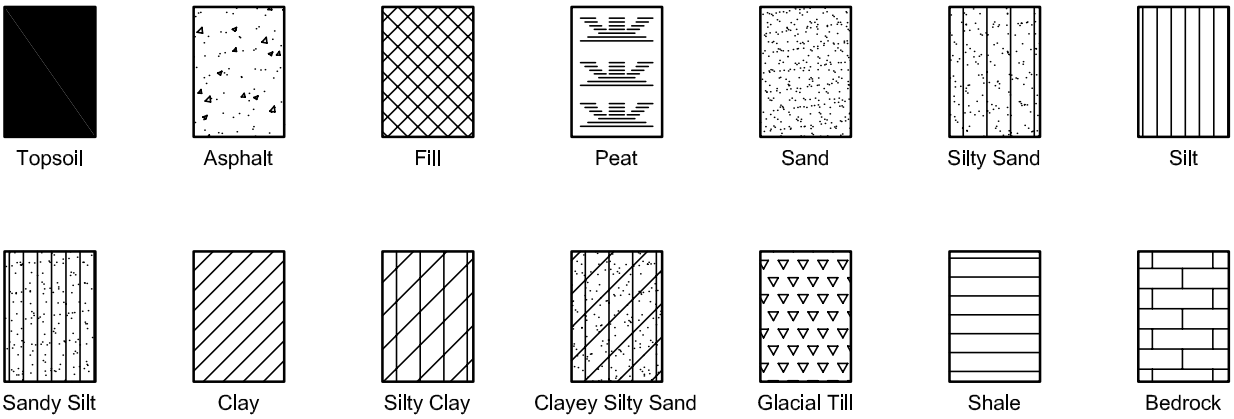
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

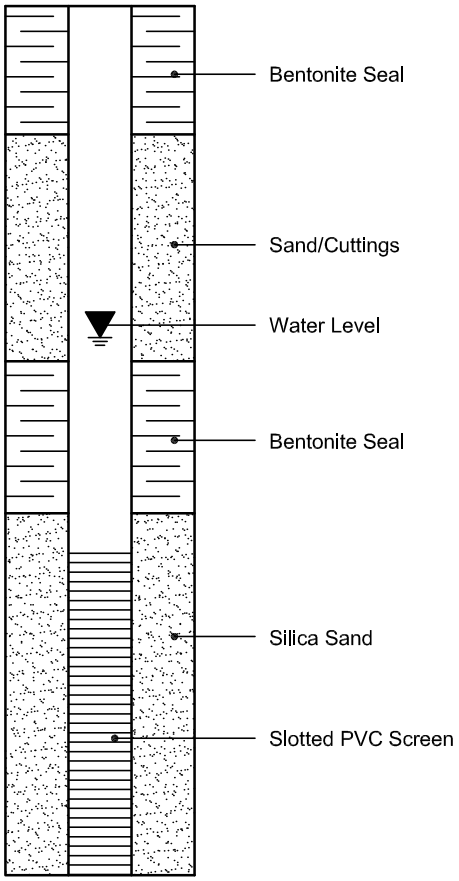
SYMBOLS AND TERMS (continued)

STRATA PLOT

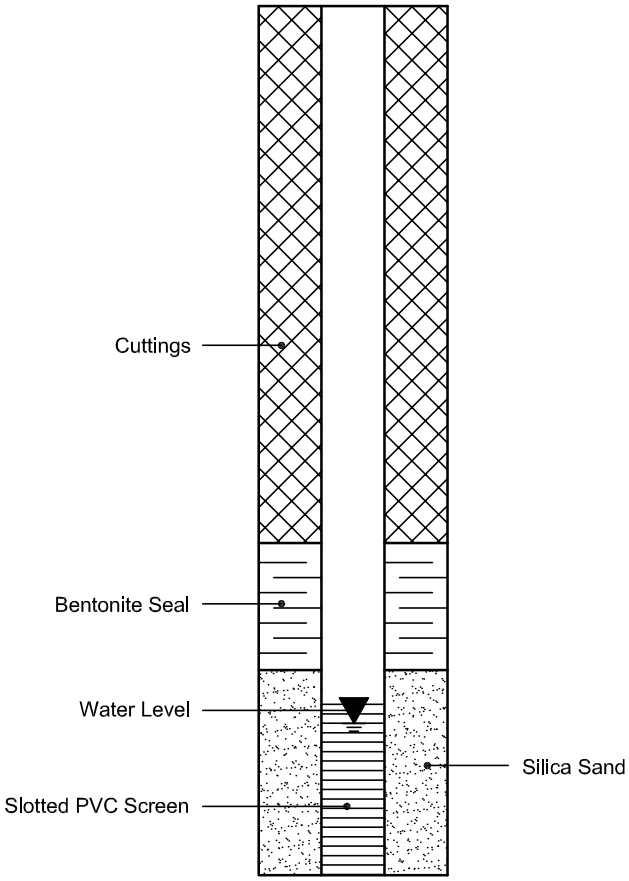


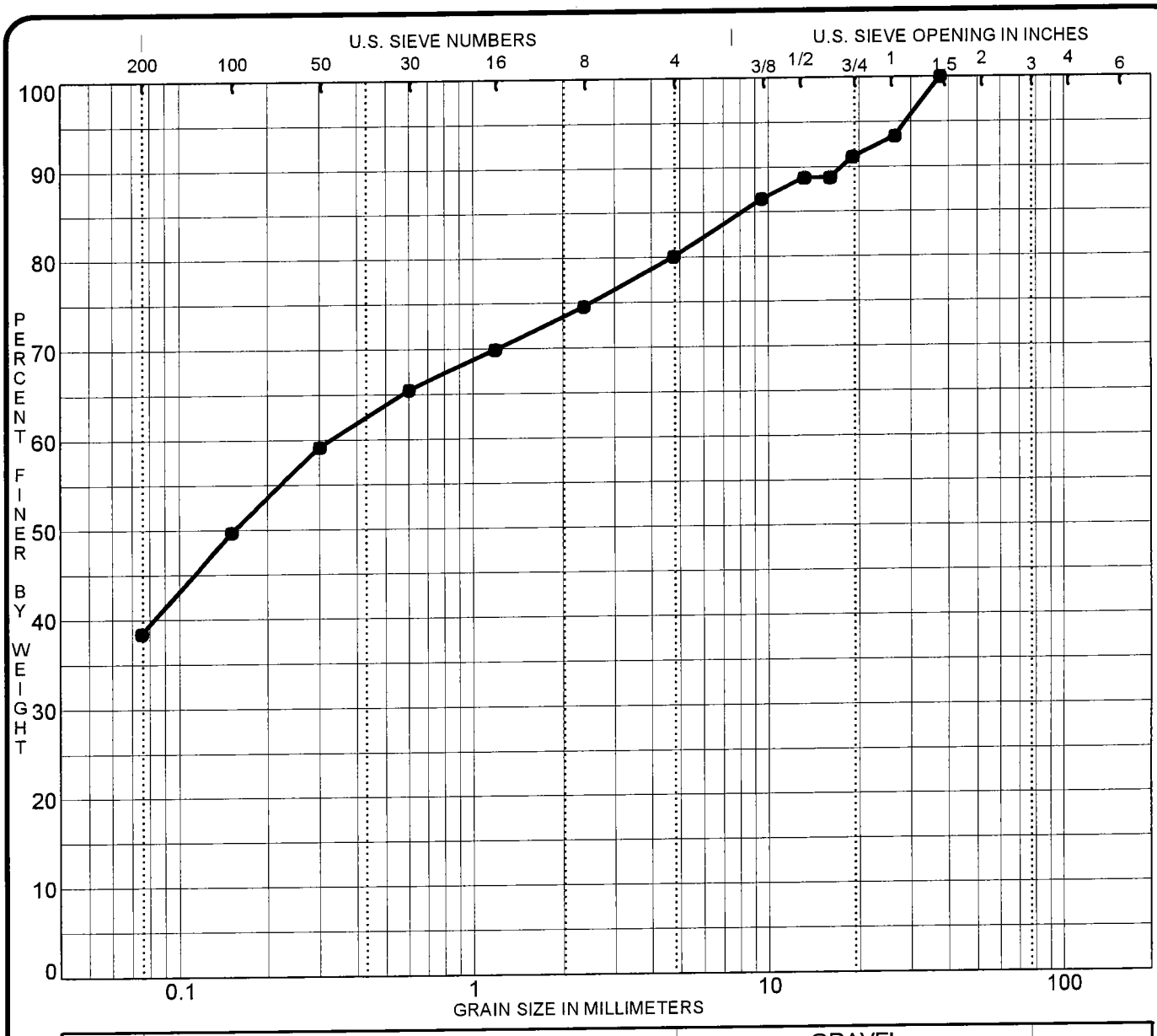
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





SILT	SAND			GRAVEL		COBBLES
	fine	medium	coarse	fine	coarse	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	TP11	G 22	**Glacial Till**						
⧓									
▲									
★			Based on ASTM D 2487						

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP11	G 22	**37.50**	**0.33**			**19.9**	**41.7**	**38.4**	
⧓										
▲										
★										

CLIENT **Sunset Lakes Development Corp.**

PROJECT **Terrain Analysis & Hydrogeological Study - Ripley Subdivision - Stagecoach Road**

FILE NO. **PH1276**

DATE **24 Nov 09**

patersongroup Consulting Engineers

28 Concouse Gate, Unit 1, Ottawa, Ontario K2E 7T7

GRAIN SIZE DISTRIBUTION

APPENDIX D

Water Quality Results and Lab Certificates

Summary of Test Well Water Quality Measurements

Parameter	Units	TW A			TW B			TW C			TW D			TW E			Ontario Drinking Water Standard	Type of Standard
		TWA-3hr 11/08/2023 10:30 AM	TWA-6hr 11/08/2023 11:30 AM	TWA-6hr 11/08/2023 12:30 PM	TWB-3hr 11/02/2023 11:15 AM	TWB-6hr 11/02/2023 02:15 PM	TWB-6hr 11/02/2023 02:15 PM	TWC-3hr 10/30/2023 01:00 PM	TWC-6hr 10/30/2023 04:00 PM	TWC-6hr 10/30/2023 04:00 PM	TWD-3hr 10/30/2023 01:00 PM	TWD-6hr 10/30/2023 04:00 PM	TWD-6hr 10/30/2023 04:00 PM	TWE-3hr 10/30/2023 01:00 PM	TWE-6hr 10/30/2023 04:00 PM	TWE-6hr 10/30/2023 04:00 PM		
Microbiological Parameters																		
E. Coli	CFU/100mL	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	0	MAC
Total Coliforms	CFU/100mL	ND (1)	ND (1)	NA	**1**	ND (1)	NA	**14**	**8**	NA	ND (1)	ND (1)	NA	**3**	**10**	NA	-	-
Fecal Coliforms	CFU/100mL	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	ND (1)	ND (1)	NA	0	MAC
Heterotrophic Plate Count	CFU/mL	30	ND (10)	NA	ND (10)	ND (10)	NA	10	20	NA	60	30	NA	20	10	NA	-	-
General Inorganics																		
Alkalinity, total	mg/L	218	232	NA	353	352	NA	249	249	NA	267	268	NA	238	238	NA	30-500	OG
Ammonia as N	mg/L	0.27	0.20	NA	ND (0.01)	0.02	NA	0.13	0.11	NA	0.20	0.19	NA	0.12	0.08	NA	-	-
Dissolved Organic Carbon	mg/L	1.4	1.2	NA	1.4	1.4	NA	1.2	1.2	NA	1.5	1.6	NA	1.0	0.7	NA	10	MAC
Colour	TCU	2	ND (2)	NA	ND (2)	ND (2)	NA	2	2	NA	ND (2)	ND (2)	NA	2	ND (2)	NA	5	AO
Colour, apparent	ACU	28	23	NA	17	15	NA	9	9	NA	37	28	NA	**33**	**32**	NA	5	AO
Conductivity	uS/cm	737	826	NA	1540	1480	NA	724	752	NA	1030	1020	NA	758	751	NA	80-100	OG
Hardness	mg/L	300	326	NA	469	465	NA	345	342	NA	373	388	NA	356	362	NA	-	-
pH	pH Units	8.3	8.3	NA	7.9	7.9	NA	8.0	8.0	NA	8.0	8.0	NA	8.1	8.1	NA	6.5-8.5	OG
Phenolics	mg/L	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	500	AO
Total Dissolved Solids	mg/L	432	476	NA	**916**	**900**	NA	422	426	NA	**562**	**588**	NA	416	410	NA	500	AO
Sulphide	mg/L	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	ND (0.02)	ND (0.02)	NA	-	-
Tannin & Lignin	mg/L	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	-	-
Total Kjeldahl Nitrogen	mg/L	0.3	0.2	NA	0.2	0.2	NA	0.1	0.2	NA	0.3	0.3	NA	**0.2**	0.1	NA		
Turbidity	NTU	3.1	2.3	NA	2.2	2.0	NA	1.0	0.8	NA	5.0	3.7	NA	**5.5**	**5.2**	NA	5	AO
Anions																		
Chloride	mg/L	85	99	NA	246	243	NA	61	61	NA	140	143	NA	68	68	NA	250	AO
Fluoride	mg/L	0.2	0.1	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	0.1	0.1	NA	0.1	0.1	NA	1.5	MAC
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	NA	1.8	1.6	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	ND (0.1)	ND (0.1)	NA	10(4)	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	ND (0.05)	ND (0.05)	NA	1.0(4)	MAC
Sulphate	mg/L	50	60	NA	123	125	NA	68	68	NA	82	83	NA	65	64	NA	500	AO
Metals																		
Mercury	mg/L	NA	NA	ND (0.0001)	NA	NA	ND (0.0001)	NA	NA	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	0.001	
Aluminum	mg/L	NA	**0.135**	0.019	NA	0.006	ND (0.001)	NA	0.003	ND (0.001)	NA	0.062	0.003	NA	0.087	0.002	0.1	OG
Antimony	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	0.006	MAC
Arsenic	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.025	MAC
Barium	mg/L	NA	0.218	0.211	NA	0.143	0.138	NA	0.157	0.155	NA	0.212	0.206	NA	0.152	0.147	1	MAC
Beryllium	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Boron	mg/L	NA	0.09	0.09	NA	0.05	0.04	NA	0.02	0.02	NA	0.07	0.07	NA	0.04	0.04	5	MAC
Cadmium	mg/L	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	0.005	MAC
Calcium	mg/L	62.6	68.3	67.4	121	120	119	71.3	70.9	70.2	82.5	84.9	95.2	75.7	74.3	76.1	-	-
Chromium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.05	MAC
Cobalt	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	0.0049	0.0049	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Copper	mg/L	MA	ND (0.0005)	0.0009	NA	0.0006	0.0006	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	0.0005	NA	ND (0.0005)	ND (0.0005)	1	AO
Iron	mg/L	0.2	0.2	0.1	0.2	0.2	ND (0.1)	0.2	0.2	0.2	0.3	0.4	0.3	**0.4**	**0.4**	0.3	0.3	AO
Lead	mg/L	NA	0.0002	ND (0.0001)	NA	0.0004	0.0003	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	0.0001	ND (0.0001)	0.01	MAC
Magnesium	mg/L	35.0	37.7	36.6	40.7	40.1	40.4	40.6	40.1	38.6	40.6	42.7	46.0	40.5	42.9	41.5	-	-
Manganese	mg/L	0.026	0.028	0.029	0.032	0.032	0.031	0.026	0.027	0.026	0.029	0.029	0.031	0.026	0.025	0.024	0.05	AO
Molybdenum	mg/L	NA	0.0192	0.0192	NA	0.0667	0.0683	NA	0.0041	0.0040	NA	0.0062	0.0072	NA	0.0085	0.0087	-	-
Nickel	mg/L	NA	ND (0.001)	ND (0.001)	NA	0.021	0.021	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	-	-
Potassium	mg/L	5.6	5.9	5.7	4.6	4.6	4.5	2.5	2.5	2.5	6.3	6.3	7.5	3.4	3.5	3.4	-	-
Selenium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	0.01	MAC
Silver	mg/L	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	NA	ND (0.0001)	ND (0.0001)	-	-
Sodium	mg/L	41.2	47.5	48.2	130	126	128	14.2	14.2	13.7	61.4	61.9	68.4	37.1	37.3	36.2	200 (20)[1]	AO
Strontium	mg/L	NA	1.46	1.44	NA	0.44	0.43	NA	0.53	0.52	NA	1.04	1.11	NA	0.54	0.53	-	-
Thallium	mg/L	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	NA	ND (0.001)	ND (0.001)	-	-
Uranium	mg/L	NA	0.0004	0.0004	NA	0.0042	0.0040	NA	0.0002	0.0002	NA	0.0002	0.0002	NA	0.0003	0.0003	0.02	MAC
Vanadium	mg/L	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	NA	ND (0.0005)	ND (0.0005)	-	-
Zinc	mg/L	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	ND (0.005)	NA	ND (0.005)	0.007	5	AO

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration
AO: Aesthetic Objective
OG: Operational Guideline
1 - The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

Summary of Private Well Water Quality Measurements

Parameter	Units	PW-1794 11/08/2023 10:30 AM	PW-1826 11/08/2023 11:30 AM	PW-1850 11/08/2023 12:30 PM	PW-1858 11/08/2023 01:30 PM	PW-1922 11/08/2023 02:30 PM	PW-6266 11/28/2023 10:30 AM	PW-6342 11/28/2023 11:30 AM	Ontario Drinking Water Standard	Type of Standard
Microbiological Parameters										
E. Coli	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0	MAC
Total Coliforms	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	-	-
Fecal Coliforms	CFU/100mL	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	0	MAC
Heterotrophic Plate Count	CFU/mL	ND (10)	ND (10)	100	10	220	90	ND (10)	-	-
General Inorganics										
Alkalinity, total	mg/L	299	288	304	281	247	324	295	30-500	OG
Ammonia as N	mg/L	0.05	0.07	0.06	0.06	0.08	0.12	0.18	-	-
Dissolved Organic Carbon	mg/L	1.1	1	1	1.1	1.3	6.2	3.8	10	MAC
Colour	TCU	2	ND (2)	ND (2)	ND (2)	ND (2)	**6**	3	5	AO
Colour, apparent	ACU	**228**	**28**	**159**	**85**	**120**	**167**	**92**	5	AO
Conductivity	uS/cm	1420	1400	916	1380	1230	1090	963	80-100	OG
Hardness	mg/L	474	468	434	458	421	415	359	-	-
pH	pH Units	7.6	7.7	7.8	7.7	7.8	7.7	7.8	6.5-8.5	OG
Phenolics	mg/L	0.001	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	ND (0.001)	500	AO
Total Dissolved Solids	mg/L	**844**	**788**	**534**	**764**	**678**	**672**	**534**	500	AO
Sulphide	mg/L	0.05	ND (0.02)	0.04	ND (0.02)	ND (0.02)	ND (0.02)	ND (0.02)	-	-
Tannin & Lignin	mg/L	0.2	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	0.3	0.1		-
Total Kjeldahl Nitrogen	mg/L	0.1	0.1	0.1	**0.2**	0.1	**0.3**	**0.3**		
Turbidity	NTU	**45.4**	3.8	**26.7**	**13.5**	**19.4**	**19.2**	**11.8**	5	AO
Anions										
Chloride	mg/L	245	237	84	231	205	125	96	250 1.5	AO
Fluoride	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	10(4)	MAC
Nitrate as N	mg/L	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	1.0(4)	MAC
Nitrite as N	mg/L	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	500	MAC
Sulphate	mg/L	119	118	76	113	105	98	81		AO
Metals										
Calcium	mg/L	116	112	93.9	109	99.2	109	95.3	-	-
Iron	mg/L	**2.6**	**0.4**	**2**	**1**	**1.4**	**1.8**	**1.1**	0.3	AO
Magnesium	mg/L	44.5	45.7	48.5	45.1	42	34.6	29.4	-	-
Manganese	mg/L	0.042	0.031	0.039	0.034	0.041	**0.228**	**0.116**	0.05	AO
Potassium	mg/L	4.6	5.1	2.9	4.1	4.2	1.9	2.1	-	-
Sodium	mg/L	128	113	21	117	90	51.4	46.9	200 (20)[1]	AO

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration
AO: Aesthetic Objective
OG: Operational Guideline
1 - The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

Summary of Monitoring Well Water Quality Measurements

Parameter	Units	MW23-1		MW23-2		MW23-3		Ontario Drinking Water Standard	Type of Standard
		09/25/2023 01:00 PM	10/27/2023 09:00 AM	09/25/2023 02:13 PM	10/27/2023 09:00 AM	09/25/2023 11:53 AM	10/27/2023 09:00 AM		
General Inorganics									
Ammonia as N	mg/L	ND (0.01)	NA	0.12	NA	0.06	NA	10	MAC
Total Kjeldahl Nitrogen	mg/L	0.2	NA	1.6	NA	1.3	NA		
Anions									
Nitrate as N	mg/L	3.4	2.6	ND (0.1)	ND (0.1)	ND (0.1)	ND (0.1)	10	MAC
Nitrite as N	mg/L	ND (0.05)	0.09	ND (0.05)	ND (0.05)	ND (0.05)	ND (0.05)	1	MAC

Notes:
NA: Not Analyzed
ND: Non-Detect
MAC: Maximum Acceptable Concentration

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December 2023
100554.003

Summary of Test Well Field Water Quality Measurements

Test Well ID	Date	Time Since Initiaion of Pump (hrs)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
TW A	31-Oct-23	3	7.5	7.78	727	304	4.38	0	-	-	0.05
		6	6.9	7.97	794	396	3.66	0	-	-	0
TW B	2-Nov-23	3	8.5	7.87	1314	655	1.91	2	0	-	0
		6	8.6	7.7	1303	651	1.86	-	-	-	0
TW C	30-Oct-23	3	7.3	7.71	671	336	0.9	3	-	-	0.01
		6	8.1	7.96	647	324	0.75	-	-	-	-
TW D	25-Oct-23	3	10.1	7.44	1006	498	-	1	0	-	0
		6	9.8	7.54	1021	511	318	23	0	-	0
TW E	7-Nov-23	3	8.1	7.78	620	316	5.44	6	0	0	0
		6	8.6	7.89	628	314	4.28	7	0	0	0

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

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December 2023
100554.003

Summary of Private Well Field Water Quality Measurements

Test Well ID	Date	Time Purging (min)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
PW-1922	8-Nov-23	10	9.62	7.78	1360	872	0	-	-	-	-
		15	9.61	7.81	1350	864	0.3	-	-	-	0
PW-1826	8-Nov-23	10	11.23	8.17	1230	966	1.4	-	-	-	-
		15	11.51	8.01	1510	936	1.4	-	-	-	0
PW-1858	8-Nov-23	10	8.84	7.41	1160	939	1.4	-	-	-	-
		15	8.66	7.33	1460	940	0.7	-	-	-	0
PW-1850	8-Nov-23	10	10.01	7.8	997	651	3.4	-	-	-	-
		15	9.35	7.67	981	629	2.3	0	-	-	0
PW-1794	8-Nov-23	10	11.59	8.62	1620	1041	1.5	-	-	-	-
		15	11.2	8.51	1590	1021	1.2	-	-	-	0
PW-6342	28-Nov-23	10	9.5	7.64	950	474	1.31	0	-	-	0
		15	-	7.67	926	467	1.07	0	-	-	0
PW-6266	28-Nov-23	10	8.8	7.48	1180	571	1.75	0	-	-	0
		15	8.7	7.58	1098	550	1.52	0	-	-	0

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

GEMTEC
Consulting Engineers and Scientists

December 2023
100554.003

Summary of Monitoring Well Field Water Quality Measurements

Test Well ID	Date	Time Since Initiaion of Pump (min)	Temp (°C)	pH	Electrical Conductivity (µS/cm)	Total Dissolved Solids (ppm)	Turbidity (NTU)	Colour (ACU[1])	Colour (ACU[2])	Free Chlorine (mg/L)	Total Chlorine (mg/L)
MW23-1	25-Sep-23	25	14.8	7.47	2517	1271	-	-	-	-	-
MW23-2	25-Sep-23	3	13	8.42	530	259	-	-	-	-	-
MW23-3	25-Sep-23	4.5	12.5	7.63	950	460	-				

Notes:

1. ACU = Actual Colour Units
2. Field filtered using 0.45 micron filter

GEMTEC
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December 2023
100554.003

LAB CERTIFICATES

Relating Report IDs to Lab Sample IDs

Report ID	Lab Sample ID
TW A	TW1
TW B	TW2
TW C	TW3
TW D	TW4
TW E	TW5
MW23-01	MW1
MW23-02	MW2
MW23-03	MW3

GEMTEC
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100554.003
December 2023

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 1596

Report Date: 7-Nov-2023
Order Date: 1-Nov-2023

Order #: 2344227

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

Paracel ID	Client ID
2344227-01	TW1-3hr
2344227-02	TW1-6hr
2344227-03	TW1-6hr (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	3-Nov-23	3-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	2-Nov-23	2-Nov-23
Anions	EPA 300.1 - IC	1-Nov-23	1-Nov-23
Colour	SM2120 - Spectrophotometric	2-Nov-23	2-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	2-Nov-23	2-Nov-23
Conductivity	EPA 9050A- probe @25 °C	3-Nov-23	3-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	1-Nov-23	2-Nov-23
E. coli	MOE E3407	1-Nov-23	1-Nov-23
Fecal Coliform	SM 9222D	1-Nov-23	1-Nov-23
Heterotrophic Plate Count	SM 9215C	1-Nov-23	1-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Nov-23	7-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Nov-23	2-Nov-23
pH	EPA 150.1 - pH probe @25 °C	3-Nov-23	3-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	2-Nov-23	2-Nov-23
Hardness	Hardness as CaCO3	1-Nov-23	2-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	1-Nov-23	1-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Nov-23	6-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	2-Nov-23	3-Nov-23
Turbidity	SM 2130B - Turbidity meter	1-Nov-23	1-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344227

Certificate of Analysis

Report Date: 07-Nov-2023

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

Order Date: 1-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-		
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-	-	-
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	30	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	218	232	-	-	-	-
Ammonia as N	0.01 mg/L	0.27	0.20	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.4	1.2	-	-	-	-
Colour, apparent	2 ACU	28	23	-	-	-	-
Colour	2 TCU	2	<2	-	-	-	-
Conductivity	5 uS/cm	737	826	-	-	-	-
Hardness	mg/L	300	326	-	-	-	-
pH	0.1 pH Units	8.3	8.3	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	432	476	-	-	-	-
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	0.2	-	-	-	-
Turbidity	0.1 NTU	3.1	2.3	-	-	-	-
Anions							
Chloride	1 mg/L	85	99	-	-	-	-
Fluoride	0.1 mg/L	0.2	0.1	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	50	60	-	-	-	-

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-	-	-
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-		
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.135	0.019	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.218	0.211	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.09	0.09	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	62.6	68.3	67.4	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Copper	0.0005 mg/L	-	<0.0005	0.0009	-	-	-
Iron	0.1 mg/L	0.2	0.2	0.1	-	-	-
Lead	0.0001 mg/L	-	0.0002	<0.0001	-	-	-
Magnesium	0.2 mg/L	35.0	37.7	36.6	-	-	-
Manganese	0.005 mg/L	0.026	0.028	0.029	-	-	-
Molybdenum	0.0005 mg/L	-	0.0192	0.0192	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	5.6	5.9	5.7	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	41.2	47.5	48.2	-	-	-
Strontium	0.01 mg/L	-	1.46	1.44	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0004	0.0004	-	-	-

Certificate of Analysis

Report Date: 07-Nov-2023

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

Order Date: 1-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW1-3hr	TW1-6hr	TW1-6hr (Filtered)	-		
	Sample Date:	31-Oct-23 13:00	31-Oct-23 15:30	31-Oct-23 15:30	-	-	-
	Sample ID:	2344227-01	2344227-02	2344227-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
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	16.8	1	mg/L	16.9			0.8	20	
Fluoride	0.39	0.1	mg/L	0.38			2.2	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	19.4	1	mg/L	19.3			0.6	20	
General Inorganics									
Alkalinity, total	216	5	mg/L	218			1.0	14	
Ammonia as N	0.033	0.01	mg/L	0.035			5.1	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.2			30.1	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	28	2	ACU	28			0.0	12	
Conductivity	726	5	uS/cm	737			1.5	5	
pH	8.3	0.1	pH Units	8.3			0.4	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	260	10	mg/L	264			1.5	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.21	0.1	mg/L	0.23			6.5	16	
Turbidity	3.1	0.1	NTU	3.1			1.6	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	ND	0.001	mg/L	ND			NC	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			3.8	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0006	0.0005	mg/L	0.0007			5.9	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0001	0.0001	mg/L	ND			NC	20	
Magnesium	0.6	0.2	mg/L	0.7			5.2	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0029	0.0005	mg/L	0.0029			1.3	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	1.4	0.1	mg/L	1.4			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	345	0.5	mg/L	360			4.3	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	30			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	26.7	1	mg/L	16.9	97.6	70-124			
Fluoride	1.27	0.1	mg/L	0.38	89.1	70-130			
Nitrate as N	1.06	0.1	mg/L	ND	106	77-126			
Nitrite as N	0.946	0.05	mg/L	ND	94.6	82-115			
Sulphate	28.9	1	mg/L	19.3	96.5	70-130			
General Inorganics									
Ammonia as N	1.06	0.01	mg/L	0.035	103	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	1.2	96.9	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	108	10	mg/L	ND	108	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.15	0.1	mg/L	0.23	92.5	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.1	70-130			
Aluminum	50.4	0.001	mg/L	0.496	99.9	80-120			
Arsenic	53.6	0.001	mg/L	0.105	107	80-120			
Barium	45.9	0.001	mg/L	0.173	91.4	80-120			
Beryllium	44.0	0.0005	mg/L	0.0811	87.9	80-120			
Boron	106	0.01	mg/L	65.1	82.2	80-120			
Cadmium	42.7	0.0001	mg/L	0.0209	85.4	80-120			
Calcium	12200	0.1	mg/L	2680	94.7	80-120			
Chromium	51.6	0.001	mg/L	0.038	103	80-120			
Cobalt	49.1	0.0005	mg/L	0.0411	98.2	80-120			
Copper	45.9	0.0005	mg/L	0.686	90.5	80-120			
Iron	2220	0.1	mg/L	2.0	88.9	80-120			
Lead	43.9	0.0001	mg/L	0.0848	87.5	80-120			
Magnesium	10300	0.2	mg/L	672	96.7	80-120			
Manganese	49.7	0.005	mg/L	0.378	98.5	80-120			
Molybdenum	49.5	0.0005	mg/L	2.94	93.2	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.5	0.001	mg/L	0.241	94.5	80-120			
Potassium	11300	0.1	mg/L	1400	98.9	80-120			
Selenium	45.9	0.001	mg/L	0.079	91.6	80-120			
Silver	40.1	0.0001	mg/L	0.0032	80.3	80-120			
Sodium	17600	0.2	mg/L	9500	81.2	80-120			
Thallium	45.0	0.001	mg/L	0.025	90.0	80-120			
Uranium	50.1	0.0001	mg/L	0.0613	100	80-120			
Vanadium	53.8	0.0005	mg/L	0.0485	107	80-120			
Zinc	43.4	0.005	mg/L	4.54	77.8	80-120			QM-07

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.

NC: Not Calculated

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Certificate of Analysis

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

Client PO: Cedar lakes
Project: 100554.003
Custody: 13250

Report Date: 9-Nov-2023
Order Date: 2-Nov-2023

Order #: 2344440

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

Paracel ID	Client ID
2344440-01	TW2-3hr
2344440-02	TW2-6hr
2344440-03	TW2-6hr (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	6-Nov-23	6-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	6-Nov-23	6-Nov-23
Anions	EPA 300.1 - IC	6-Nov-23	6-Nov-23
Colour	SM2120 - Spectrophotometric	3-Nov-23	3-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	3-Nov-23	3-Nov-23
Conductivity	EPA 9050A- probe @25 °C	6-Nov-23	6-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	3-Nov-23	6-Nov-23
E. coli	MOE E3407	3-Nov-23	3-Nov-23
Fecal Coliform	SM 9222D	3-Nov-23	3-Nov-23
Heterotrophic Plate Count	SM 9215C	4-Nov-23	4-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	7-Nov-23	7-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	3-Nov-23	6-Nov-23
pH	EPA 150.1 - pH probe @25 °C	6-Nov-23	6-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	6-Nov-23	6-Nov-23
Hardness	Hardness as CaCO3	3-Nov-23	6-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	3-Nov-23	3-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	4-Nov-23	6-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	6-Nov-23	7-Nov-23
Turbidity	SM 2130B - Turbidity meter	4-Nov-23	4-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344440

Certificate of Analysis

Report Date: 09-Nov-2023

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

Order Date: 2-Nov-2023

Client PO: **Cedar lakes**

Project Description: 100554.003

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-	-	-
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-		
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	1 [1]	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	353	352	-	-	-	-
Ammonia as N	0.01 mg/L	<0.01	0.02	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.4	1.4	-	-	-	-
Colour, apparent	2 ACU	17	15	-	-	-	-
Colour	2 TCU	<2	<2	-	-	-	-
Conductivity	5 uS/cm	1540	1480	-	-	-	-
Hardness	mg/L	469	465	-	-	-	-
pH	0.1 pH Units	7.9	7.9	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	916	900	-	-	-	-
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	0.2	0.2	-	-	-	-
Turbidity	0.1 NTU	2.2	2.0	-	-	-	-
Anions							
Chloride	1 mg/L	246	243	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrate as N	0.1 mg/L	1.8	1.6	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	123	125	-	-	-	-

PARACEL LABORATORIES LTD.

Order #: 2344440

Certificate of Analysis

Report Date: 09-Nov-2023

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

Order Date: 2-Nov-2023

Client PO: **Cedar lakes**

Project Description: 100554.003

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-		
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-	-	-
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.006	<0.001	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.143	0.138	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.05	0.04	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	121	120	119	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	0.0049	0.0049	-	-	-
Copper	0.0005 mg/L	-	0.0006	0.0006	-	-	-
Iron	0.1 mg/L	0.2	0.2	<0.1	-	-	-
Lead	0.0001 mg/L	-	0.0004	0.0003	-	-	-
Magnesium	0.2 mg/L	40.7	40.1	40.4	-	-	-
Manganese	0.005 mg/L	0.032	0.032	0.031	-	-	-
Molybdenum	0.0005 mg/L	-	0.0667	0.0683	-	-	-
Nickel	0.001 mg/L	-	0.021	0.021	-	-	-
Potassium	0.1 mg/L	4.6	4.6	4.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	130	126	128	-	-	-
Strontium	0.01 mg/L	-	0.44	0.43	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0042	0.0040	-	-	-

	Client ID:	TW2-3hr	TW2-6hr	TW2-6hr (Filtered)	-		
	Sample Date:	02-Nov-23 11:15	02-Nov-23 14:15	02-Nov-23 14:15	-	-	-
	Sample ID:	2344440-01	2344440-02	2344440-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
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	79.4	1	mg/L	79.0			0.5	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	155	1	mg/L	155			0.0	20	
General Inorganics									
Alkalinity, total	349	5	mg/L	353			1.2	14	
Ammonia as N	0.018	0.01	mg/L	0.020			7.8	17.7	
Dissolved Organic Carbon	1.2	0.5	mg/L	1.3			13.2	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	17	2	ACU	17			0.0	12	
Conductivity	1550	5	uS/cm	1540			1.0	5	QR-05
pH	7.9	0.1	pH Units	7.9			0.0	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	260	10	mg/L	264			1.5	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.22	0.1	mg/L	0.24			10.2	16	
Turbidity	1.9	0.1	NTU	2.0			1.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.002	0.001	mg/L	0.002			3.1	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.079	0.001	mg/L	0.082			3.2	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	ND	0.01	mg/L	ND			NC	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	101	0.1	mg/L	101			0.7	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0085	0.0005	mg/L	0.0086			1.4	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0003	0.0001	mg/L	0.0003			9.9	20	
Magnesium	27.9	0.2	mg/L	27.8			0.0	20	
Manganese	0.482	0.005	mg/L	0.481			0.1	20	
Molybdenum	0.0005	0.0005	mg/L	0.0006			16.8	20	
Nickel	0.002	0.001	mg/L	0.002			3.3	20	
Potassium	2.7	0.1	mg/L	2.7			0.3	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	5.3	0.2	mg/L	5.6			7.2	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0014	0.0001	mg/L	0.0014			3.8	20	
Vanadium	0.0017	0.0005	mg/L	0.0017			2.4	20	
Zinc	0.006	0.005	mg/L	0.006			3.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	1			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	88.9	1	mg/L	79.0	99.0	70-124			
Fluoride	1.02	0.1	mg/L	ND	102	70-130			
Nitrate as N	1.02	0.1	mg/L	ND	102	77-126			
Nitrite as N	0.904	0.05	mg/L	ND	90.4	82-115			
Sulphate	164	1	mg/L	155	91.9	70-130			
General Inorganics									
Ammonia as N	1.08	0.01	mg/L	0.020	106	81-124			
Dissolved Organic Carbon	11.0	0.5	mg/L	1.4	95.9	60-133			
Phenolics	0.026	0.001	mg/L	ND	102	67-133			
Total Dissolved Solids	108	10	mg/L	ND	108	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.24	90.3	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.1	70-130			
Aluminum	44.4	0.001	mg/L	2.05	84.6	80-120			
Arsenic	53.9	0.001	mg/L	0.261	107	80-120			
Barium	52.2	0.001	mg/L	ND	104	80-120			
Beryllium	44.4	0.0005	mg/L	0.0153	88.8	80-120			
Boron	51.4	0.01	mg/L	8.67	85.5	80-120			
Cadmium	45.2	0.0001	mg/L	0.0470	90.3	80-120			
Calcium	10700	0.1	mg/L	ND	107	80-120			
Chromium	52.4	0.001	mg/L	0.459	104	80-120			
Cobalt	47.6	0.0005	mg/L	0.0907	95.1	80-120			
Copper	52.9	0.0005	mg/L	8.61	88.5	80-120			
Iron	2230	0.1	mg/L	2.8	89.0	80-120			
Lead	42.2	0.0001	mg/L	0.312	83.7	80-120			
Magnesium	10800	0.2	mg/L	ND	108	80-120			
Manganese	96.7	0.005	mg/L	49.6	94.1	80-120			
Molybdenum	46.8	0.0005	mg/L	0.649	92.3	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.9	0.001	mg/L	1.61	92.7	80-120			
Potassium	12600	0.1	mg/L	2730	98.4	80-120			
Selenium	49.8	0.001	mg/L	0.158	99.2	80-120			
Silver	51.5	0.0001	mg/L	ND	103	80-120			
Sodium	14300	0.2	mg/L	5640	86.2	80-120			
Thallium	43.5	0.001	mg/L	0.027	87.0	80-120			
Uranium	45.7	0.0001	mg/L	1.41	88.5	80-120			
Vanadium	54.9	0.0005	mg/L	1.72	106	80-120			
Zinc	48.3	0.005	mg/L	6.10	84.3	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - All sample bottles missing the sample collection time.

Applies to Samples: TW2-3hr, TW2-6hr, TW2-6hr (Filtered)

Sample Qualifiers :

1: Duplicate result for this sample analysis was determined to be ND.

QC Qualifiers:

QR-05 Duplicate RPDs higher than normally accepted. Remaining 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.

NC: Not Calculated

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 17439

Report Date: 6-Nov-2023
Order Date: 31-Oct-2023

Order #: 2344186

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

Paracel ID	Client ID
2344186-01	TW3-3hr
2344186-02	TW3-6hr
2344186-03	TW3-6hr (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	1-Nov-23	1-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	2-Nov-23	2-Nov-23
Anions	EPA 300.1 - IC	1-Nov-23	1-Nov-23
Colour	SM2120 - Spectrophotometric	1-Nov-23	1-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	1-Nov-23	1-Nov-23
Conductivity	EPA 9050A- probe @25 °C	1-Nov-23	1-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	1-Nov-23	2-Nov-23
E. coli	MOE E3407	1-Nov-23	1-Nov-23
Fecal Coliform	SM 9222D	1-Nov-23	1-Nov-23
Heterotrophic Plate Count	SM 9215C	1-Nov-23	1-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	2-Nov-23	2-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	1-Nov-23	2-Nov-23
pH	EPA 150.1 - pH probe @25 °C	1-Nov-23	1-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	2-Nov-23	2-Nov-23
Hardness	Hardness as CaCO3	1-Nov-23	2-Nov-23
Sulphide	SM 4500SE - Colourimetric	3-Nov-23	6-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	6-Nov-23	6-Nov-23
Total Coliform	MOE E3407	1-Nov-23	1-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	2-Nov-23	3-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	1-Nov-23	1-Nov-23
Turbidity	SM 2130B - Turbidity meter	1-Nov-23	1-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2344186

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-	-	-
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-		
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	14	8	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	10	20	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	249	249	-	-	-	-
Ammonia as N	0.01 mg/L	0.13	0.11	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.2	1.2	-	-	-	-
Colour, apparent	2 ACU	9	9	-	-	-	-
Colour	2 TCU	2	2	-	-	-	-
Conductivity	5 uS/cm	724	752	-	-	-	-
Hardness	mg/L	345	342	-	-	-	-
pH	0.1 pH Units	8.0	8.0	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	422	426	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	<0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.2	-	-	-	-
Turbidity	0.1 NTU	1.0	0.8	-	-	-	-
Anions							
Chloride	1 mg/L	61	61	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	68	68	-	-	-	-

PARACEL LABORATORIES LTD.

Order #: 2344186

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-	-	-
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-		
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	-	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.003	<0.001	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.157	0.155	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.02	0.02	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	71.3	70.9	70.2	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Copper	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Iron	0.1 mg/L	0.2	0.2	0.2	-	-	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.6	40.1	38.6	-	-	-
Manganese	0.005 mg/L	0.026	0.027	0.026	-	-	-
Molybdenum	0.0005 mg/L	-	0.0041	0.0040	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	2.5	2.5	2.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	14.2	14.2	13.7	-	-	-
Strontium	0.01 mg/L	-	0.53	0.52	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0002	0.0002	-	-	-

Certificate of Analysis

Report Date: 06-Nov-2023

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

Order Date: 31-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW3-3hr	TW3-6hr	TW3-6hr (Filtered)	-		
	Sample Date:	30-Oct-23 13:00	30-Oct-23 16:00	30-Oct-23 16:00	-	-	-
	Sample ID:	2344186-01	2344186-02	2344186-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
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	16.8	1	mg/L	16.9			0.8	20	
Fluoride	0.39	0.1	mg/L	0.38			2.2	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	19.4	1	mg/L	19.3			0.6	20	
General Inorganics									
Alkalinity, total	247	5	mg/L	249			1.0	14	
Ammonia as N	0.033	0.01	mg/L	0.035			5.1	17.7	
Dissolved Organic Carbon	0.9	0.5	mg/L	1.2			30.1	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	9	2	ACU	9			0.0	12	
Conductivity	721	5	uS/cm	724			0.3	5	
pH	8.0	0.1	pH Units	8.0			0.3	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	844	10	mg/L	844			0.0	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.11	0.1	mg/L	0.12			8.8	16	
Turbidity	0.1	0.1	NTU	0.1			0.0	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	ND	0.001	mg/L	ND			NC	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	ND	0.001	mg/L	ND			NC	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			2.1	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	2.6	0.1	mg/L	2.7			3.8	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	0.0006	0.0005	mg/L	0.0007			5.9	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Lead	0.0001	0.0001	mg/L	ND			NC	20	
Magnesium	0.6	0.2	mg/L	0.7			5.2	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Molybdenum	0.0029	0.0005	mg/L	0.0029			1.3	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	1.4	0.1	mg/L	1.4			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	345	0.5	mg/L	360			4.3	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	ND	0.0001	mg/L	ND			NC	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	11	1	CFU/100mL	14			24.0	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	10			0.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	26.7	1	mg/L	16.9	97.6	70-124			
Fluoride	1.27	0.1	mg/L	0.38	89.1	70-130			
Nitrate as N	1.06	0.1	mg/L	ND	106	77-126			
Nitrite as N	0.946	0.05	mg/L	ND	94.6	82-115			
Sulphate	28.9	1	mg/L	19.3	96.5	70-130			
General Inorganics									
Ammonia as N	1.06	0.01	mg/L	0.035	103	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	1.2	96.9	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	90.0	10	mg/L	ND	90.0	75-125			
Sulphide	0.47	0.02	mg/L	ND	94.6	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.10	0.1	mg/L	0.12	97.3	81-126			
Metals									
Mercury	0.0027	0.0001	mg/L	ND	89.3	70-130			
Aluminum	50.4	0.001	mg/L	0.496	99.9	80-120			
Arsenic	53.6	0.001	mg/L	0.105	107	80-120			
Barium	45.9	0.001	mg/L	0.173	91.4	80-120			
Beryllium	44.0	0.0005	mg/L	0.0811	87.9	80-120			
Boron	106	0.01	mg/L	65.1	82.2	80-120			
Cadmium	42.7	0.0001	mg/L	0.0209	85.4	80-120			
Calcium	12200	0.1	mg/L	2680	94.7	80-120			
Chromium	51.6	0.001	mg/L	0.038	103	80-120			
Cobalt	49.1	0.0005	mg/L	0.0411	98.2	80-120			
Copper	45.9	0.0005	mg/L	0.686	90.5	80-120			
Iron	2220	0.1	mg/L	2.0	88.9	80-120			
Lead	43.9	0.0001	mg/L	0.0848	87.5	80-120			
Magnesium	10300	0.2	mg/L	672	96.7	80-120			
Manganese	49.7	0.005	mg/L	0.378	98.5	80-120			
Molybdenum	49.5	0.0005	mg/L	2.94	93.2	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	47.5	0.001	mg/L	0.241	94.5	80-120			
Potassium	11300	0.1	mg/L	1400	98.9	80-120			
Selenium	45.9	0.001	mg/L	0.079	91.6	80-120			
Silver	40.1	0.0001	mg/L	0.0032	80.3	80-120			
Sodium	17600	0.2	mg/L	9500	81.2	80-120			
Thallium	45.0	0.001	mg/L	0.025	90.0	80-120			
Uranium	50.1	0.0001	mg/L	0.0613	100	80-120			
Vanadium	53.8	0.0005	mg/L	0.0485	107	80-120			
Zinc	43.4	0.005	mg/L	4.54	77.8	80-120			QM-07

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.

NC: Not Calculated

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www.paracellabs.com

Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 19047

Report Date: 2-Nov-2023
Order Date: 26-Oct-2023

Revised Report

Order #: 2343287

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

Paracel ID	Client ID
2343287-01	TW4-3hr
2343287-02	TW4-6hr
2343287-03	TW4-6hr (Filtered)

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

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	27-Oct-23	27-Oct-23
Ammonia, as N	EPA 351.2 - Auto Colour	30-Oct-23	30-Oct-23
Anions	EPA 300.1 - IC	26-Oct-23	26-Oct-23
Colour	SM2120 - Spectrophotometric	26-Oct-23	26-Oct-23
Colour, apparent	SM2120 - Spectrophotometric	26-Oct-23	26-Oct-23
Conductivity	EPA 9050A- probe @25 °C	27-Oct-23	27-Oct-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	30-Oct-23	1-Nov-23
E. coli	MOE E3407	26-Oct-23	26-Oct-23
Fecal Coliform	SM 9222D	26-Oct-23	26-Oct-23
Heterotrophic Plate Count	SM 9215C	26-Oct-23	26-Oct-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	30-Oct-23	31-Oct-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	26-Oct-23	26-Oct-23
pH	EPA 150.1 - pH probe @25 °C	27-Oct-23	27-Oct-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	26-Oct-23	26-Oct-23
Hardness	Hardness as CaCO3	26-Oct-23	26-Oct-23
Sulphide	SM 4500SE - Colourimetric	30-Oct-23	31-Oct-23
Tannin/Lignin	SM 5550B - Colourimetric	30-Oct-23	31-Oct-23
Total Coliform	MOE E3407	26-Oct-23	26-Oct-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	30-Oct-23	30-Oct-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	30-Oct-23	31-Oct-23
Turbidity	SM 2130B - Turbidity meter	26-Oct-23	26-Oct-23

PARACEL LABORATORIES LTD.

Order #: 2343287

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-		
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-	-	-
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND [1]	ND [1]	-	-	-	-
Total Coliforms	1 CFU/100mL	ND [1]	ND [1]	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	60	30	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	267	268	-	-	-	-
Ammonia as N	0.01 mg/L	0.20	0.19	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.5	1.6	-	-	-	-
Colour, apparent	2 ACU	37	28	-	-	-	-
Colour	2 TCU	<2	<2	-	-	-	-
Conductivity	5 uS/cm	1030	1020	-	-	-	-
Hardness	mg/L	373	388	-	-	-	-
pH	0.1 pH Units	8.0	8.0	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	562	588	-	-	-	-
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	5.0	3.7	-	-	-	-
Anions							
Chloride	1 mg/L	140	143	-	-	-	-
Fluoride	0.1 mg/L	0.1	0.1	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	82	83	-	-	-	-

PARACEL LABORATORIES LTD.

Order #: 2343287

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-	-	-
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-		
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.062	0.003	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.212	0.206	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.07	0.07	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	82.5	84.9	95.2	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Copper	0.0005 mg/L	-	<0.0005	0.0005	-	-	-
Iron	0.1 mg/L	0.3	0.4	0.3	-	-	-
Lead	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.6	42.7	46.0	-	-	-
Manganese	0.005 mg/L	0.029	0.029	0.031	-	-	-
Molybdenum	0.0005 mg/L	-	0.0062	0.0072	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	6.3	6.3	7.5	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	61.4	61.9	68.4	-	-	-
Strontium	0.01 mg/L	-	1.04	1.11	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0002	0.0002	-	-	-

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 26-Oct-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW4-3hr	TW4-6hr	TW4-6hr (Filtered)	-		
	Sample Date:	25-Oct-23 11:00	25-Oct-23 14:00	25-Oct-23 14:00	-	-	-
	Sample ID:	2343287-01	2343287-02	2343287-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	<0.005	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
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	143	1	mg/L	143			0.2	20	
Fluoride	0.13	0.1	mg/L	0.12			4.1	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	83.9	1	mg/L	83.4			0.6	10	
General Inorganics									
Alkalinity, total	267	5	mg/L	267			0.0	14	
Ammonia as N	ND	0.01	mg/L	0.187			NC	17.7	
Dissolved Organic Carbon	1.4	0.5	mg/L	1.5			10.0	37	
Colour	ND	2	TCU	ND			NC	12	
Colour, apparent	36	2	ACU	37			2.7	12	
Conductivity	984	5	uS/cm	1030			4.5	5	
pH	8.0	0.1	pH Units	8.0			0.2	3.3	
Phenolics	0.002	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	572	10	mg/L	588			2.8	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.25	0.1	mg/L	0.31			NC	16	
Turbidity	5.0	0.1	NTU	5.0			1.8	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.056	0.001	mg/L	0.062			10.5	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.218	0.001	mg/L	0.212			2.7	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.07	0.01	mg/L	0.07			0.8	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	84.6	0.1	mg/L	84.9			0.3	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	ND	0.0005	mg/L	ND			NC	20	
Iron	0.4	0.1	mg/L	0.4			1.0	20	
Lead	ND	0.0001	mg/L	ND			NC	20	
Magnesium	43.3	0.2	mg/L	42.7			1.4	20	
Manganese	0.029	0.005	mg/L	0.029			0.6	20	
Molybdenum	0.0059	0.0005	mg/L	0.0062			4.0	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	6.3	0.1	mg/L	6.3			0.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	64.1	0.2	mg/L	61.9			3.5	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0001	0.0001	mg/L	0.0002			3.4	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC01
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC01
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	30			100.0	30	BAC04

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	153	1	mg/L	143	101	70-124			
Fluoride	0.96	0.1	mg/L	0.12	83.4	70-130			
Nitrate as N	1.05	0.1	mg/L	ND	105	77-126			
Nitrite as N	0.872	0.05	mg/L	ND	87.2	82-115			
Sulphate	94.8	1	mg/L	83.4	113	74-126			
General Inorganics									
Ammonia as N	1.25	0.01	mg/L	0.187	106	81-124			
Dissolved Organic Carbon	11.1	0.5	mg/L	1.6	95.0	60-133			
Phenolics	0.028	0.001	mg/L	ND	110	67-133			
Total Dissolved Solids	100	10	mg/L	ND	100	75-125			
Sulphide	0.50	0.02	mg/L	ND	100	79-115			
Tannin & Lignin	1.1	0.1	mg/L	ND	106	71-113			
Total Kjeldahl Nitrogen	1.30	0.1	mg/L	0.31	99.3	81-126			
Metals									
Mercury	0.0026	0.0001	mg/L	ND	85.8	70-130			
Aluminum	103	0.001	mg/L	62.2	82.1	80-120			
Arsenic	54.5	0.001	mg/L	0.076	109	80-120			
Barium	250	0.001	mg/L	212	75.2	80-120			QM-07
Beryllium	46.5	0.0005	mg/L	0.0228	93.0	80-120			
Boron	108	0.01	mg/L	71.3	72.5	80-120			QM-07
Cadmium	47.3	0.0001	mg/L	0.0022	94.6	80-120			
Calcium	10700	0.1	mg/L	ND	107	80-120			
Chromium	53.3	0.001	mg/L	0.502	106	80-120			
Cobalt	50.0	0.0005	mg/L	0.0342	99.9	80-120			
Copper	46.4	0.0005	mg/L	0.147	92.5	80-120			
Iron	2730	0.1	mg/L	360	94.6	80-120			
Lead	42.0	0.0001	mg/L	0.0343	84.0	80-120			
Magnesium	49200	0.2	mg/L	42700	64.5	80-120			QM-07
Manganese	80.2	0.005	mg/L	29.3	102	80-120			
Molybdenum	53.6	0.0005	mg/L	6.17	94.8	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	49.6	0.001	mg/L	0.858	97.5	80-120			
Potassium	16100	0.1	mg/L	6320	97.5	80-120			
Selenium	47.1	0.001	mg/L	ND	94.1	80-120			
Silver	43.8	0.0001	mg/L	ND	87.5	80-120			
Sodium	10600	0.2	mg/L	ND	106	80-120			
Thallium	45.1	0.001	mg/L	0.006	90.1	80-120			
Uranium	49.8	0.0001	mg/L	0.154	99.4	80-120			
Vanadium	55.0	0.0005	mg/L	0.181	110	80-120			
Zinc	44.9	0.005	mg/L	0.921	88.0	80-120			

Qualifier Notes:

Login Qualifiers :

Container and COC sample IDs don't match - All bottles, with the exception of 1 x bacteria bottle are labelled as PW4-3hr, chain of custody reads TW4-3hr.
Applies to Samples: TW4-3hr

Sample Qualifiers :

1: Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.

QC Qualifiers:

BAC01	Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.
BAC04	Duplicate QC data falls within method prescribed 95% confidence limits.
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:

All bottles read PW4-3hr. 1 bacteria bottle reads TW-3hr.

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 19522

Report Date: 13-Nov-2023
Order Date: 7-Nov-2023

Order #: 2345203

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

Paracel ID	Client ID
2345203-01	TW5 3hr
2345203-02	TW5 6hr
2345203-03	TW5 6hr (Filtered)

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	9-Nov-23	9-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	8-Nov-23	8-Nov-23
Anions	EPA 300.1 - IC	8-Nov-23	8-Nov-23
Colour	SM2120 - Spectrophotometric	8-Nov-23	8-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	8-Nov-23	8-Nov-23
Conductivity	EPA 9050A- probe @25 °C	9-Nov-23	9-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	10-Nov-23	13-Nov-23
E. coli	MOE E3407	8-Nov-23	8-Nov-23
Fecal Coliform	SM 9222D	8-Nov-23	8-Nov-23
Heterotrophic Plate Count	SM 9215C	8-Nov-23	8-Nov-23
Mercury by CVAA	EPA 245.2 - Cold Vapour AA	9-Nov-23	9-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	8-Nov-23	8-Nov-23
pH	EPA 150.1 - pH probe @25 °C	9-Nov-23	9-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	8-Nov-23	8-Nov-23
Hardness	Hardness as CaCO3	8-Nov-23	8-Nov-23
Sulphide	SM 4500SE - Colourimetric	9-Nov-23	10-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	9-Nov-23	9-Nov-23
Total Coliform	MOE E3407	8-Nov-23	8-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	8-Nov-23	9-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	8-Nov-23	10-Nov-23
Turbidity	SM 2130B - Turbidity meter	8-Nov-23	8-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2345203

Certificate of Analysis

Report Date: 13-Nov-2023

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

Order Date: 7-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-		
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-	-	-
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	3	10	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	20	10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	238	238	-	-	-	-
Ammonia as N	0.01 mg/L	0.12	0.08	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.0	0.7	-	-	-	-
Colour, apparent	2 ACU	33	32	-	-	-	-
Colour	2 TCU	2	<2	-	-	-	-
Conductivity	5 uS/cm	758	751	-	-	-	-
Hardness	mg/L	356	362	-	-	-	-
pH	0.1 pH Units	8.1	8.1	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	416	410	-	-	-	-
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	0.2	0.1	-	-	-	-
Turbidity	0.1 NTU	5.5	5.2	-	-	-	-
Anions							
Chloride	1 mg/L	68	68	-	-	-	-
Fluoride	0.1 mg/L	0.1	0.1	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	65	64	-	-	-	-

Certificate of Analysis

Report Date: 13-Nov-2023

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

Order Date: 7-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-		
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-	-	-
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Mercury	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Aluminum	0.001 mg/L	-	0.087	0.002	-	-	-
Antimony	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Arsenic	0.001 mg/L	-	<0.001	<0.001	-	-	-
Barium	0.001 mg/L	-	0.152	0.147	-	-	-
Beryllium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Boron	0.01 mg/L	-	0.04	0.04	-	-	-
Cadmium	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Calcium	0.1 mg/L	75.7	74.3	76.1	-	-	-
Chromium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Cobalt	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Copper	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Iron	0.1 mg/L	0.4	0.4	0.3	-	-	-
Lead	0.0001 mg/L	-	0.0001	<0.0001	-	-	-
Magnesium	0.2 mg/L	40.5	42.9	41.5	-	-	-
Manganese	0.005 mg/L	0.026	0.025	0.024	-	-	-
Molybdenum	0.0005 mg/L	-	0.0085	0.0087	-	-	-
Nickel	0.001 mg/L	-	<0.001	<0.001	-	-	-
Potassium	0.1 mg/L	3.4	3.5	3.4	-	-	-
Selenium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Silver	0.0001 mg/L	-	<0.0001	<0.0001	-	-	-
Sodium	0.2 mg/L	37.1	37.3	36.2	-	-	-
Strontium	0.01 mg/L	-	0.54	0.53	-	-	-
Thallium	0.001 mg/L	-	<0.001	<0.001	-	-	-
Uranium	0.0001 mg/L	-	0.0003	0.0003	-	-	-

	Client ID:	TW5 3hr	TW5 6hr	TW5 6hr (Filtered)	-		
	Sample Date:	07-Nov-23 11:00	07-Nov-23 14:00	07-Nov-23 14:00	-	-	-
	Sample ID:	2345203-01	2345203-02	2345203-03	-		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	-		
	MDL/Units						
Metals							
Vanadium	0.0005 mg/L	-	<0.0005	<0.0005	-	-	-
Zinc	0.005 mg/L	-	<0.005	0.007	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Fluoride	ND	0.1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
Sulphate	ND	1	mg/L					
General Inorganics								
Alkalinity, total	ND	5	mg/L					
Ammonia as N	ND	0.01	mg/L					
Dissolved Organic Carbon	ND	0.5	mg/L					
Colour	ND	2	TCU					
Colour, apparent	ND	2	ACU					
Conductivity	ND	5	uS/cm					
Phenolics	ND	0.001	mg/L					
Total Dissolved Solids	ND	10	mg/L					
Sulphide	ND	0.02	mg/L					
Tannin & Lignin	ND	0.1	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Mercury	ND	0.0001	mg/L					
Aluminum	ND	0.001	mg/L					
Antimony	ND	0.0005	mg/L					
Arsenic	ND	0.001	mg/L					
Barium	ND	0.001	mg/L					
Beryllium	ND	0.0005	mg/L					
Boron	ND	0.01	mg/L					
Cadmium	ND	0.0001	mg/L					
Calcium	ND	0.1	mg/L					
Chromium	ND	0.001	mg/L					
Cobalt	ND	0.0005	mg/L					
Copper	ND	0.0005	mg/L					
Iron	ND	0.1	mg/L					

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Lead	ND	0.0001	mg/L					
Magnesium	ND	0.2	mg/L					
Manganese	ND	0.005	mg/L					
Molybdenum	ND	0.0005	mg/L					
Nickel	ND	0.001	mg/L					
Potassium	ND	0.1	mg/L					
Selenium	ND	0.001	mg/L					
Silver	ND	0.0001	mg/L					
Sodium	ND	0.2	mg/L					
Strontium	ND	0.01	mg/L					
Thallium	ND	0.001	mg/L					
Uranium	ND	0.0001	mg/L					
Vanadium	ND	0.0005	mg/L					
Zinc	ND	0.005	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
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	ND	1	mg/L	ND			NC	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	0.11	0.1	mg/L	0.11			0.6	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	5.01	1	mg/L	4.96			0.9	20	
General Inorganics									
Alkalinity, total	200	5	mg/L	203			1.7	14	
Ammonia as N	0.118	0.01	mg/L	0.122			3.4	17.7	
Dissolved Organic Carbon	0.6	0.5	mg/L	0.7			19.6	37	
Colour	2	2	TCU	2			0.0	12	
Colour, apparent	33	2	ACU	33			0.0	12	
Conductivity	511	5	uS/cm	516			1.0	5	
pH	8.1	0.1	pH Units	8.0			0.7	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	794	10	mg/L	812			2.2	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	
Turbidity	1.8	0.1	NTU	1.8			1.1	10	
Metals									
Mercury	ND	0.0001	mg/L	ND			NC	20	
Aluminum	0.082	0.001	mg/L	0.087			6.8	20	
Antimony	ND	0.0005	mg/L	ND			NC	20	
Arsenic	ND	0.001	mg/L	ND			NC	20	
Barium	0.156	0.001	mg/L	0.152			2.9	20	
Beryllium	ND	0.0005	mg/L	ND			NC	20	
Boron	0.04	0.01	mg/L	0.04			3.9	20	
Cadmium	ND	0.0001	mg/L	ND			NC	20	
Calcium	75.9	0.1	mg/L	74.3			2.2	20	
Chromium	ND	0.001	mg/L	ND			NC	20	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Cobalt	ND	0.0005	mg/L	ND			NC	20	
Copper	ND	0.0005	mg/L	ND			NC	20	
Iron	0.4	0.1	mg/L	0.4			4.0	20	
Lead	0.0001	0.0001	mg/L	0.0001			17.6	20	
Magnesium	40.8	0.2	mg/L	42.9			5.0	20	
Manganese	0.025	0.005	mg/L	0.025			0.9	20	
Molybdenum	0.0085	0.0005	mg/L	0.0085			1.0	20	
Nickel	ND	0.001	mg/L	ND			NC	20	
Potassium	3.5	0.1	mg/L	3.5			1.2	20	
Selenium	ND	0.001	mg/L	ND			NC	20	
Silver	ND	0.0001	mg/L	ND			NC	20	
Sodium	35.4	0.2	mg/L	37.3			5.1	20	
Thallium	ND	0.001	mg/L	ND			NC	20	
Uranium	0.0003	0.0001	mg/L	0.0003			2.9	20	
Vanadium	ND	0.0005	mg/L	ND			NC	20	
Zinc	ND	0.005	mg/L	ND			NC	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	3	1	CFU/100mL	3			0.0	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	20			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	11.5	1	mg/L	ND	115	70-124			
Fluoride	0.98	0.1	mg/L	ND	98.4	70-130			
Nitrate as N	1.13	0.1	mg/L	0.11	102	77-126			
Nitrite as N	1.06	0.05	mg/L	ND	106	82-115			
Sulphate	15.5	1	mg/L	4.96	106	70-130			
General Inorganics									
Ammonia as N	1.13	0.01	mg/L	0.122	100	81-124			
Dissolved Organic Carbon	10.8	0.5	mg/L	0.7	100	60-133			
Phenolics	0.027	0.001	mg/L	ND	107	67-133			
Total Dissolved Solids	80.0	10	mg/L	ND	80.0	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.05	0.1	mg/L	ND	105	81-126			
Metals									
Mercury	0.0028	0.0001	mg/L	ND	92.7	70-130			
Aluminum	134	0.001	mg/L	87.5	93.5	80-120			
Arsenic	55.1	0.001	mg/L	0.092	110	80-120			
Barium	197	0.001	mg/L	152	90.2	80-120			
Beryllium	53.2	0.0005	mg/L	0.0211	106	80-120			
Boron	88.8	0.01	mg/L	41.4	95.0	80-120			
Cadmium	49.3	0.0001	mg/L	0.0056	98.6	80-120			
Calcium	12300	0.1	mg/L	ND	123	80-120			QS-02
Chromium	58.1	0.001	mg/L	0.620	115	80-120			
Cobalt	53.2	0.0005	mg/L	0.0559	106	80-120			
Copper	49.8	0.0005	mg/L	0.174	99.3	80-120			
Iron	3030	0.1	mg/L	426	104	80-120			
Lead	47.1	0.0001	mg/L	0.106	94.1	80-120			
Magnesium	12200	0.2	mg/L	ND	122	80-120			QS-02
Manganese	79.3	0.005	mg/L	25.5	108	80-120			
Molybdenum	58.6	0.0005	mg/L	8.54	100	80-120			

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Nickel	52.7	0.001	mg/L	0.594	104	80-120			
Potassium	14000	0.1	mg/L	3480	105	80-120			
Selenium	49.6	0.001	mg/L	0.017	99.1	80-120			
Silver	50.3	0.0001	mg/L	0.0005	101	80-120			
Sodium	11800	0.2	mg/L	ND	118	80-120			
Thallium	46.8	0.001	mg/L	0.003	93.6	80-120			
Uranium	49.2	0.0001	mg/L	0.261	97.8	80-120			
Vanadium	57.9	0.0005	mg/L	0.233	115	80-120			
Zinc	45.3	0.005	mg/L	0.333	90.0	80-120			

Qualifier Notes:

Sample Qualifiers :

QC Qualifiers:

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

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO: Cedarlakes
Project: 100554.003
Custody: 12636

Report Date: 14-Nov-2023
Order Date: 8-Nov-2023

Order #: 2345308

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

Paracel ID	Client ID
2345308-01	PW-1794
2345308-02	PW-1826
2345308-03	PW-1850
2345308-04	PW-1858
2345308-05	PW-1922

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	9-Nov-23	9-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	13-Nov-23	13-Nov-23
Anions	EPA 300.1 - IC	9-Nov-23	9-Nov-23
Colour	SM2120 - Spectrophotometric	9-Nov-23	9-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	9-Nov-23	9-Nov-23
Conductivity	EPA 9050A- probe @25 °C	9-Nov-23	9-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	13-Nov-23	13-Nov-23
E. coli	MOE E3407	9-Nov-23	9-Nov-23
Fecal Coliform	SM 9222D	9-Nov-23	9-Nov-23
Heterotrophic Plate Count	SM 9215C	9-Nov-23	9-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	9-Nov-23	10-Nov-23
pH	EPA 150.1 - pH probe @25 °C	9-Nov-23	9-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	10-Nov-23	10-Nov-23
Hardness	Hardness as CaCO3	9-Nov-23	10-Nov-23
Sulphide	SM 4500SE - Colourimetric	9-Nov-23	10-Nov-23
Tannin/Lignin	SM 5550B - Colourimetric	9-Nov-23	9-Nov-23
Total Coliform	MOE E3407	9-Nov-23	9-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	9-Nov-23	13-Nov-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	9-Nov-23	10-Nov-23
Turbidity	SM 2130B - Turbidity meter	9-Nov-23	9-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2345308

Certificate of Analysis

Report Date: 14-Nov-2023

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

Order Date: 8-Nov-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	PW-1794	PW-1826	PW-1850	PW-1858	-	-
	Sample Date:	08-Nov-23 10:30	08-Nov-23 11:30	08-Nov-23 12:30	08-Nov-23 13:30		
	Sample ID:	2345308-01	2345308-02	2345308-03	2345308-04		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	Drinking Water		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	ND	ND	-	-
Total Coliforms	1 CFU/100mL	ND	ND	ND	ND	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	ND	ND	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	<10	100	10	-	-
General Inorganics							
Alkalinity, total	5 mg/L	299	288	304	281	-	-
Ammonia as N	0.01 mg/L	0.05	0.07	0.06	0.06	-	-
Dissolved Organic Carbon	0.5 mg/L	1.1	1.0	1.0	1.1	-	-
Colour, apparent	2 ACU	228	28	159	85	-	-
Colour	2 TCU	2	<2	<2	<2	-	-
Conductivity	5 uS/cm	1420	1400	916	1380	-	-
Hardness	mg/L	474	468	434	458	-	-
pH	0.1 pH Units	7.6	7.7	7.8	7.7	-	-
Phenolics	0.001 mg/L	0.001	<0.001	<0.001	<0.001	-	-
Total Dissolved Solids	10 mg/L	844	788	534	764	-	-
Sulphide	0.02 mg/L	0.05	<0.02	0.04	<0.02	-	-
Tannin & Lignin	0.1 mg/L	0.2	<0.1	<0.1	<0.1	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	0.1	0.1	0.2	-	-
Turbidity	0.1 NTU	45.4	3.8	26.7	13.5	-	-
Anions							
Chloride	1 mg/L	245	237	84	231	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	-	-
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	-	-
Sulphate	1 mg/L	119	118	76	113	-	-

Certificate of Analysis

Report Date: 14-Nov-2023

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

Order Date: 8-Nov-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	PW-1794	PW-1826	PW-1850	PW-1858	-	-
	Sample Date:	08-Nov-23 10:30	08-Nov-23 11:30	08-Nov-23 12:30	08-Nov-23 13:30		
	Sample ID:	2345308-01	2345308-02	2345308-03	2345308-04		
	Matrix:	Drinking Water	Drinking Water	Drinking Water	Drinking Water		
	MDL/Units						
Metals							
Calcium	0.1 mg/L	116	112	93.9	109	-	-
Iron	0.1 mg/L	2.6	0.4	2.0	1.0	-	-
Magnesium	0.2 mg/L	44.5	45.7	48.5	45.1	-	-
Manganese	0.005 mg/L	0.042	0.031	0.039	0.034	-	-
Potassium	0.1 mg/L	4.6	5.1	2.9	4.1	-	-
Sodium	0.2 mg/L	128	113	21.0	117	-	-

	Client ID:	PW-1922				-	-
	Sample Date:	08-Nov-23 14:30					
	Sample ID:	2345308-05					
	Matrix:	Drinking Water					
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	220	-	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	247	-	-	-	-	-
Ammonia as N	0.01 mg/L	0.08	-	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	1.3	-	-	-	-	-
Colour, apparent	2 ACU	120	-	-	-	-	-
Colour	2 TCU	<2	-	-	-	-	-
Conductivity	5 uS/cm	1230	-	-	-	-	-
Hardness	mg/L	421	-	-	-	-	-
pH	0.1 pH Units	7.8	-	-	-	-	-
Phenolics	0.001 mg/L	<0.001	-	-	-	-	-
Total Dissolved Solids	10 mg/L	678	-	-	-	-	-
Sulphide	0.02 mg/L	<0.02	-	-	-	-	-
Tannin & Lignin	0.1 mg/L	<0.1	-	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.1	-	-	-	-	-
Turbidity	0.1 NTU	19.4	-	-	-	-	-
Anions							
Chloride	1 mg/L	205	-	-	-	-	-
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	105	-	-	-	-	-

	Client ID:	PW-1922				-	-
	Sample Date:	08-Nov-23 14:30					
	Sample ID:	2345308-05					
	Matrix:	Drinking Water					
	MDL/Units						
Metals							
Calcium	0.1 mg/L	99.2	-	-	-	-	-
Iron	0.1 mg/L	1.4	-	-	-	-	-
Magnesium	0.2 mg/L	42.0	-	-	-	-	-
Manganese	0.005 mg/L	0.041	-	-	-	-	-
Potassium	0.1 mg/L	4.2	-	-	-	-	-
Sodium	0.2 mg/L	90.0	-	-	-	-	-

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	205	1	mg/L	205			0.0	20	
Fluoride	ND	0.1	mg/L	ND			NC	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	107	1	mg/L	105			1.2	20	
General Inorganics									
Alkalinity, total	200	5	mg/L	203			1.7	14	
Ammonia as N	0.095	0.01	mg/L	0.077			NC	17.7	
Dissolved Organic Carbon	1.1	0.5	mg/L	1.0			6.9	37	
Colour	ND	2	TCU	2			NC	12	
Colour, apparent	228	2	ACU	228			0.0	12	
Conductivity	511	5	uS/cm	516			1.0	5	
pH	8.1	0.1	pH Units	8.0			0.7	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	ND	10	mg/L	ND			NC	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	ND			NC	11	
Total Kjeldahl Nitrogen	0.13	0.1	mg/L	0.12			7.2	16	
Turbidity	45.0	0.1	NTU	45.4			0.9	10	
Metals									
Calcium	105	0.1	mg/L	104			0.5	20	
Iron	ND	0.1	mg/L	ND			NC	20	
Magnesium	32.0	0.2	mg/L	34.2			6.6	20	
Manganese	ND	0.005	mg/L	ND			NC	20	
Potassium	3.6	0.1	mg/L	3.6			0.5	20	
Sodium	43.9	0.2	mg/L	47.1			7.2	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	BAC01
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	BAC01
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	214	1	mg/L	205	92.6	70-124			
Fluoride	1.02	0.1	mg/L	ND	102	70-130			
Nitrate as N	1.02	0.1	mg/L	ND	102	77-126			
Nitrite as N	0.958	0.05	mg/L	ND	95.8	82-115			
Sulphate	114	1	mg/L	105	88.2	70-130			
General Inorganics									
Ammonia as N	1.08	0.01	mg/L	0.077	100	81-124			
Dissolved Organic Carbon	11.4	0.5	mg/L	1.3	101	60-133			
Phenolics	0.027	0.001	mg/L	ND	108	67-133			
Total Dissolved Solids	92.0	10	mg/L	ND	92.0	75-125			
Sulphide	0.48	0.02	mg/L	ND	96.8	79-115			
Tannin & Lignin	1.0	0.1	mg/L	ND	99.9	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.12	102	81-126			
Metals									
Calcium	11900	0.1	mg/L	ND	119	80-120			
Iron	2520	0.1	mg/L	11.4	100	80-120			
Magnesium	11400	0.2	mg/L	ND	114	80-120			
Manganese	52.0	0.005	mg/L	1.21	101	80-120			
Potassium	14300	0.1	mg/L	3630	107	80-120			
Sodium	53200	0.2	mg/L	45000	82.1	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - 1 x 40 ml DOC vial is missing the client name, sample collection date/time.

Applies to Samples: PW-1826

Container and COC sample IDs don't match - 500 ml general chemistry bottle reads as PW-1828, and 1 x 40 ml DOC vial is un-labelled, chain of custody reads as PW-1826.

Applies to Samples: PW-1826

Sample Qualifiers :

QC Qualifiers:

BAC01	Greater than 200 CFU of background colonies present. This may interfere with target growth and ability of the analyst to count E. coli & Total Coliform. The target colonies may be under-represented.

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 72256, 19053

Report Date: 4-Dec-2023
Order Date: 28-Nov-2023

Order #: 2348173

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

Paracel ID	Client ID
2348173-01	PW-6266
2348173-02	PW-6342

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Alkalinity, total to pH 4.5	EPA 310.1 - Titration to pH 4.5	30-Nov-23	30-Nov-23
Ammonia, as N	EPA 351.2 - Auto Colour	30-Nov-23	30-Nov-23
Anions	EPA 300.1 - IC	4-Dec-23	4-Dec-23
Colour	SM2120 - Spectrophotometric	29-Nov-23	29-Nov-23
Colour, apparent	SM2120 - Spectrophotometric	29-Nov-23	29-Nov-23
Conductivity	EPA 9050A- probe @25 °C	30-Nov-23	30-Nov-23
Dissolved Organic Carbon	MOE 3247B - Combustion IR	29-Nov-23	30-Nov-23
E. coli	MOE E3407	29-Nov-23	29-Nov-23
Fecal Coliform	SM 9222D	29-Nov-23	29-Nov-23
Heterotrophic Plate Count	SM 9215C	29-Nov-23	29-Nov-23
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Nov-23	29-Nov-23
pH	EPA 150.1 - pH probe @25 °C	30-Nov-23	30-Nov-23
Phenolics	EPA 420.2 - Auto Colour, 4AAP	29-Nov-23	29-Nov-23
Hardness	Hardness as CaCO3	29-Nov-23	29-Nov-23
Sulphide	SM 4500SE - Colourimetric	1-Dec-23	1-Dec-23
Tannin/Lignin	SM 5550B - Colourimetric	1-Dec-23	1-Dec-23
Total Coliform	MOE E3407	29-Nov-23	29-Nov-23
Total Dissolved Solids	SM 2540C - gravimetric, filtration	1-Dec-23	1-Dec-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	29-Nov-23	29-Nov-23
Turbidity	SM 2130B - Turbidity meter	29-Nov-23	29-Nov-23

PARACEL LABORATORIES LTD.

Order #: 2348173

Certificate of Analysis

Report Date: 04-Dec-2023

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

Order Date: 28-Nov-2023

Client PO:

Project Description: 100554.003

	Client ID:	PW-6266	PW-6342	-	-	-	-
	Sample Date:	28-Nov-23 10:30	28-Nov-23 11:30	-	-		
	Sample ID:	2348173-01	2348173-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	90	<10	-	-	-	-
General Inorganics							
Alkalinity, total	5 mg/L	324	295	-	-	-	-
Ammonia as N	0.01 mg/L	0.12	0.18	-	-	-	-
Dissolved Organic Carbon	0.5 mg/L	6.2	3.8	-	-	-	-
Colour, apparent	2 ACU	167	92	-	-	-	-
Colour	2 TCU	6	3	-	-	-	-
Conductivity	5 uS/cm	1090	963	-	-	-	-
Hardness	mg/L	415	359	-	-	-	-
pH	0.1 pH Units	7.7	7.8	-	-	-	-
Phenolics	0.001 mg/L	<0.001	<0.001	-	-	-	-
Total Dissolved Solids	10 mg/L	672	534	-	-	-	-
Sulphide	0.02 mg/L	<0.02	<0.02	-	-	-	-
Tannin & Lignin	0.1 mg/L	0.3	0.1	-	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.3	0.3	-	-	-	-
Turbidity	0.1 NTU	19.2	11.8	-	-	-	-
Anions							
Chloride	1 mg/L	125	96	-	-	-	-
Fluoride	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	<0.1	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	-	-	-	-
Sulphate	1 mg/L	98	81	-	-	-	-

	Client ID:	PW-6266	PW-6342	-	-		
	Sample Date:	28-Nov-23 10:30	28-Nov-23 11:30	-	-	-	-
	Sample ID:	2348173-01	2348173-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Metals							
Calcium	0.1 mg/L	109	95.3	-	-	-	-
Iron	0.1 mg/L	1.8	1.1	-	-	-	-
Magnesium	0.2 mg/L	34.6	29.4	-	-	-	-
Manganese	0.005 mg/L	0.228	0.116	-	-	-	-
Potassium	0.1 mg/L	1.9	2.1	-	-	-	-
Sodium	0.2 mg/L	51.4	46.9	-	-	-	-

Method Quality Control: Blank

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

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	6.00	1	mg/L	5.88			2.1	20	
Fluoride	0.32	0.1	mg/L	0.33			5.1	20	
Nitrate as N	0.11	0.1	mg/L	0.12			3.8	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
Sulphate	25.4	1	mg/L	24.8			2.2	20	
General Inorganics									
Alkalinity, total	316	5	mg/L	324			2.5	14	
Ammonia as N	0.115	0.01	mg/L	0.116			1.2	17.7	
Dissolved Organic Carbon	6.3	0.5	mg/L	6.2			1.7	37	
Colour	7	2	TCU	6			NC	12	
Colour, apparent	166	2	ACU	167			0.6	12	
Conductivity	1110	5	uS/cm	1090			1.5	5	
pH	7.8	0.1	pH Units	7.7			0.1	3.3	
Phenolics	ND	0.001	mg/L	ND			NC	10	
Total Dissolved Solids	666	10	mg/L	672			0.9	10	
Sulphide	ND	0.02	mg/L	ND			NC	10	
Tannin & Lignin	ND	0.1	mg/L	0.1			NC	11	
Total Kjeldahl Nitrogen	0.30	0.1	mg/L	0.33			10.9	16	
Turbidity	19.1	0.1	NTU	19.2			0.5	10	
Metals									
Calcium	51.0	0.1	mg/L	51.0			0.0	20	
Iron	0.5	0.1	mg/L	0.5			1.8	20	
Magnesium	18.7	0.2	mg/L	18.5			0.9	20	
Manganese	0.016	0.005	mg/L	0.015			9.4	20	
Potassium	2.1	0.1	mg/L	2.0			2.4	20	
Sodium	11.1	0.2	mg/L	11.2			0.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Heterotrophic Plate Count	80	10	CFU/mL	90			12.0	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.4	1	mg/L	5.88	105	70-124			
Fluoride	1.20	0.1	mg/L	0.33	86.7	70-130			
Nitrate as N	1.15	0.1	mg/L	0.12	103	77-126			
Nitrite as N	1.08	0.05	mg/L	ND	108	82-115			
Sulphate	34.5	1	mg/L	24.8	97.3	70-130			
General Inorganics									
Ammonia as N	1.12	0.01	mg/L	0.116	100	81-124			
Dissolved Organic Carbon	14.1	0.5	mg/L	3.8	102	60-133			
Phenolics	0.026	0.001	mg/L	ND	106	67-133			
Total Dissolved Solids	96.0	10	mg/L	ND	96.0	75-125			
Sulphide	0.52	0.02	mg/L	ND	104	79-115			
Tannin & Lignin	1.0	0.1	mg/L	0.1	86.6	71-113			
Total Kjeldahl Nitrogen	1.14	0.1	mg/L	0.33	81.3	81-126			
Metals									
Calcium	57200	0.1	mg/L	51000	62.7	80-120			QM-07
Iron	2660	0.1	mg/L	462	88.1	80-120			
Magnesium	25800	0.2	mg/L	18500	73.2	80-120			QM-07
Manganese	62.7	0.005	mg/L	14.5	96.3	80-120			
Potassium	11600	0.1	mg/L	2000	96.1	80-120			
Sodium	19400	0.2	mg/L	11200	82.0	80-120			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Sample collection time on the containers read 11:30, chain of custody reads 10:30. Report as 11:30 as per the bottles, as directed by the client.
Applies to Samples: PW-6342

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.

NC: Not Calculated

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 3404

Report Date: 29-Sep-2023
Order Date: 25-Sep-2023

Order #: 2339122

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

Paracel ID	Client ID
2339122-01	MW1
2339122-02	MW2
2339122-03	MW3

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ammonia, as N	EPA 351.2 - Auto Colour	28-Sep-23	28-Sep-23
Anions	EPA 300.1 - IC	26-Sep-23	26-Sep-23
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	27-Sep-23	27-Sep-23

Certificate of Analysis

Report Date: 29-Sep-2023

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

Order Date: 25-Sep-2023

Client PO:

Project Description: 100554.003

	Client ID:	MW1	MW2	MW3	-		
	Sample Date:	25-Sep-23 13:00	25-Sep-23 14:13	25-Sep-23 11:53	-	-	-
	Sample ID:	2339122-01	2339122-02	2339122-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
General Inorganics							
Ammonia as N	0.01 mg/L	<0.01	0.12	0.06	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.2	1.6	1.3	-	-	-
Anions							
Nitrate as N	0.1 mg/L	3.4	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Ammonia as N	ND	0.01	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Ammonia as N	ND	0.01	mg/L	ND			NC	18	
Total Kjeldahl Nitrogen	4.74	0.2	mg/L	4.54			4.3	16	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.07	0.1	mg/L	ND	107	77-126			
Nitrite as N	1.02	0.05	mg/L	ND	102	82-115			
General Inorganics									
Ammonia as N	1.01	0.01	mg/L	ND	101	81-124			
Total Kjeldahl Nitrogen	1.04	0.1	mg/L	ND	104	81-126			

Certificate of Analysis

Report Date: 29-Sep-2023

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

Order Date: 25-Sep-2023

Client PO:

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO: Cedarlakes
Project: 100554.003
Custody: 73780

Report Date: 2-Nov-2023
Order Date: 27-Oct-2023

Order #: 2343470

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

Paracel ID	Client ID
2343470-01	MW1
2343470-02	MW2
2343470-03	MW3

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	30-Oct-23	30-Oct-23

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 27-Oct-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

	Client ID:	MW1	MW2	MW3	-		
	Sample Date:	27-Oct-23 09:00	27-Oct-23 09:00	27-Oct-23 09:00	-	-	-
	Sample ID:	2343470-01	2343470-02	2343470-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
Anions							
Nitrate as N	0.1 mg/L	2.6	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	0.09	<0.05	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	3.49	0.1	mg/L	3.56			2.0	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	4.56	0.1	mg/L	3.56	100	77-126			
Nitrite as N	0.988	0.05	mg/L	ND	98.8	82-115			

Certificate of Analysis

Report Date: 02-Nov-2023

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

Order Date: 27-Oct-2023

Client PO: **Cedarlakes**

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

CALIBRATION SHEETS

CERTIFICATE OF CALIBRATION

The HORIBA Instrument listed below has been inspected and calibrated following the Manufacturer's specifications and methods.

Instrument Model: **HORIBA U-22** *Serial Number:* **UNNOMASS** *Calibration Date:* **November 6, 2023**

2-POINT pH	***CONDUCTIVITY***	***TURBIDITY***	***DISSOLVED OXYGEN***	***OXIDIZATION-REDUCTION POTENTIAL***	***TEMPERATURE***
4.00 pH, 7.00 pH	4.49mS/cm ZERO CHECKED	0 & 100 NTU	9 mg/L @ 20.5 DegC SODIUM SULFITE ZERO	240mV	Fisher Scientific s/n 230606647
AutoCal 4.00 pH Solution LOT # 3GE0924	AutoCal Solution LOT # 3GH0985	AutoCal Solution LOT# 3GH0985	Oakton Zero Solution LOT # 767903	Hanna ORP LOT # 8803	
Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: December 1, 2023	Expiry Date: March 1, 2025	
pH 7.00 LOT # 3GH0684	@25 DegC LOT # 3GH0985	Turb. 100 NTU LOT # A2237A			
Expiry Date: August 1, 2025		Expiry Date: August 1, 2024			

The calibration standard used is considered to be a certified standard and is traceable to the National Institute of Standards and Technology (NIST). Certificate of Analysis is available upon request.

The instrument indicated above is now certified to be operating within the Manufacturer's specifications. This does not eliminate the requirement for regular maintenance and pre-use sensor response checks in order to ensure continued complete and accurate operating condition.

Certified By: Jeff Loney

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9 - 148 Colonnade Rd., Ottawa, ON K2E 7R4
(613)224-4747 | Toll Free (888)285-2324

CERTIFICATE OF CALIBRATION

The HORIBA Instrument listed below has been inspected and calibrated following the Manufacturer's specifications and methods.

Instrument Model: **HORIBA U-22** *Serial Number:* **UNNOMASS** *Calibration Date:* **November 6, 2023**

2-POINT pH	***CONDUCTIVITY***	***TURBIDITY***	***DISSOLVED OXYGEN***	***OXIDIZATION-REDUCTION POTENTIAL***	***TEMPERATURE***
4.00 pH, 7.00 pH	4.49mS/cm ZERO CHECKED	0 & 100 NTU	9 mg/L @ 20.5 DegC SODIUM SULFITE ZERO	240mV	Fisher Scientific s/n 230606647
AutoCal 4.00 pH Solution LOT # 3GE0924	AutoCal Solution LOT # 3GH0985	AutoCal Solution LOT# 3GH0985	Oakton Zero Solution LOT # 767903	Hanna ORP LOT # 8803	
Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: August 1, 2024	Expiry Date: December 1, 2023	Expiry Date: March 1, 2025	
pH 7.00 LOT # 3GH0684	@25 DegC LOT # 3GH0985	Turb. 100 NTU LOT # A2237A			
Expiry Date: August 1, 2025		Expiry Date: August 1, 2024			

The calibration standard used is considered to be a certified standard and is traceable to the National Institute of Standards and Technology (NIST). Certificate of Analysis is available upon request.

The instrument indicated above is now certified to be operating within the Manufacturer's specifications. This does not eliminate the requirement for regular maintenance and pre-use sensor response checks in order to ensure continued complete and accurate operating condition.

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Historical Water Quality Data Tables
Paterson (2015)

TABLE 2: Comparison of "Subdivision Package" Test Well #2A (Original and Present)

PARAMETER	UNITS	Original TW 2A (Feb 8, 2010)	Present TW 2A (Jun 19, 2015)
		6 Hour	6 Hour
MICROBIOLOGICAL PARAMETERS			
Escherichia Coli	ct/100 mL	0	0
Faecal Coliforms	ct/100 mL	0	0
Faecal Streptococcus	ct/100 mL	0	0
Total Coliforms	ct/100 mL	0	0
CHEMICAL PARAMETERS (HEALTH)			
Fluoride	mg/L	0.10	0.10
N-NH3 (Ammonia)	mg/L	0.05	<0.05
N-NO2 (Nitrite)	mg/L	<0.10	<0.10
N-NO3 (Nitrate)	mg/L	0.32	<0.10
TKN	mg/L	<0.10	0.22
CHEMICAL PARAMETERS WITH AESTHETIC OBJECTIVES/OPERATIONAL GUIDELINES			
Alkalinity	mg/L	353	353
Chloride	mg/L	194	194
Colour	TCU	2	<2
Conductivity	uS/cm	1440	1450
Dissolved Organic Carbon	mg/L	2.0	1.8
pH		7.90	7.89
Phenols	mg/L	<0.001	<0.002
Sulphate	mg/L	119	111
Tannin & Lignin	mg/L	<0.10	0.40
Total Dossolved Solids	mg/L	938	942
Turbidity (lab)	NTU	76.3	0.10
Hardness	mg/L	522	534
Ion Balance		0.98	1.03
Calcium	mg/L	133	133
Magnesium	mg/L	46	49
Potassium	mg/L	5	6
Sodium	mg/L	95	103
Iron	mg/L	1.21	0.87
Manganese	mg/L	0.04	0.04

TABLE 3: Comparison of "Subdivision Package" Test Well #4 (Original and Present)

PARAMETER	UNITS	Original TW4 (Jan 6, 2010) 6 Hour	Present TW4 (Jul 7, 2015)
MICROBIOLOGICAL PARAMETERS			
Escherichia Coli	ct/100 mL	0	0
Faecal Coliforms	ct/100 mL	0	0
Faecal Streptococcus	ct/100 mL	0	0
Total Coliforms	ct/100 mL	0	0
CHEMICAL PARAMETERS (HEALTH)			
Fluoride	mg/L	0.17	0.14
N-NH3 (Ammonia)		<0.02	<0.05
N-NO2 (Nitrite)	mg/L	<0.10	<0.10
N-NO3 (Nitrate)	mg/L	<0.10	<0.10
TKN		<0.10	0.23
CHEMICAL PARAMETERS WITH AESTHETIC OBJECTIVES/OPERATIONAL GUIDELINES			
Alkalinity	mg/L	221	271
Chloride	mg/L	7	61
Colour	TCU	<2	2
Conductivity	uS/cm	491	774
Dissolved Organic Carbon	mg/L	1.1	1.3
pH		8.11	8.08
Phenols	mg/L	<0.001	<0.002
Sulphate	mg/L	45	66
Tannin & Lignin	mg/L	0.10	0.20
Total Dossolved Solids	mg/L	319	503
Turbidity (lab)	NTU	3.7	2.8
Hardness	mg/L	255	368
Ion Balance		0.95	0.98
Calcium	mg/L	46	75
Magnesium	mg/L	34	44
Potassium	mg/L	1	2
Na	mg/L	4	22
Fe	mg/L	0.08	0.30
Mn	mg/L	0.01	0.02

TABLE 4: Comparison of "Subdivision Package" Original Test Wells vs House Wells

PARAMETER	UNITS	ODWS		TEST WELLS (1, 2A, 4 and 5)	TW2A	TW4	PW1	PW2*	PW3	PW4
		TYPE	LIMIT	ORIGINAL RANGE						
MICROBIOLOGICAL PARAMETERS										
Escherichia Coli	ct/100 mL	MAC	0	**0 - 0**	0	0	0	0	0	0
Faecal Coliforms	ct/100 mL	-	-	**0 - 0**	0	0	0	0	0	0
Faecal Streptococcus	ct/100 mL	-	-	**0 - 0**	0	0	0	0	0	0
Total Coliforms	ct/100 mL	MAC	0	**0 - 0**	0	0	0	0	0	0
CHEMICAL PARAMETERS (HEALTH)										
F	mg/L	MAC	2.4	**0.10 - 0.42**	0.10	0.14	0.16	0.15	0.11	<0.10
N-NO2	mg/L	MAC	10	**<0.10 - <0.10**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
N-NO3 (Nitrate)	mg/L	MAC	10	**<0.10 - 0.32**	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
CHEMICAL PARAMETERS WITH AESTHETIC OBJECTIVES/OPERATIONAL GUIDELINES										
Alkalinity	mg/L	OG	500	**207 - 353**	353	271	251	261	308	261
Cl	mg/L	AO	250	**6 - 205**	194	61	117	26	242	144
Colour	TCU	AO	5	**<2 - 7**	<2	2	3	3	<2	2
DOC	mg/L	A0	5	**<0.50 - 1.8**	1.8	1.3	2.0	1.0	1.2	1
pH		OG	6.5-8.5	**7.90 - 8.16**	7.89	8.08	8.05	8.24	7.95	8.04
SO4	mg/L	AO	500	**36 - 119**	111	66	75	54	114	85
Hardness	mg/L	OG	100	**233 - 538**	534	368	404	<1	516	445
Na	mg/L	AO	200	**3 - 95**	103	22	46	162	111	55
Fe	mg/L	AO	0.30	**0.08 - 1.21**	0.87	0.30	0.66	0.05	0.46	1.07
Mn	mg/L	AO	0.10	**0.01 - 0.04**	0.04	0.02	0.04	<0.01	0.03	0.04
TDS	mg/L	AO	500	**300 - 936**	942	503	629	430	962	682
Turbidity (lab)	NTU	AO/MAC	5/1	**1.1 - 76.3**	0.10	2.8	4.7	1.0	4.1	12.3

* **NOTE**: Water sample taken was treated by a conventional Water Softner including Iron Filter

Supplemental Sampling (2024-2025)
Test Wells
Monitoring Wells
Homeowner Wells

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Certificate of Analysis

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

Client PO: Cedar Lakes
Project: 100554.003
Custody: 19759

Report Date: 21-Nov-2024
Order Date: 14-Nov-2024

Order #: 2446476

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

Paracel ID	Client ID
2446476-01	TWB

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	20-Nov-24	20-Nov-24

Certificate of Analysis

Report Date: 21-Nov-2024

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

Order Date: 14-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

	Client ID:	TWB	-	-	-		
	Sample Date:	14-Nov-24 14:30	-	-	-	-	-
	Sample ID:	2446476-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Anions							
Chloride	1 mg/L	215	-	-	-	-	-
Nitrate as N	0.1 mg/L	1.2	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	6.22	1	mg/L	6.22			0.0	20	
Nitrate as N	0.19	0.1	mg/L	0.20			0.6	20	
Nitrite as N	0.342	0.05	mg/L	0.342			0.2	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	16.6	1	mg/L	6.22	104	70-124			
Nitrate as N	1.22	0.1	mg/L	0.20	102	77-126			
Nitrite as N	1.41	0.05	mg/L	0.342	107	82-115			

Certificate of Analysis

Report Date: 21-Nov-2024

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

Order Date: 14-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Attn: Andrius Paznekas

Client PO:
Project: 100554.003
Custody: 19964

Report Date: 27-Nov-2024
Order Date: 21-Nov-2024

Order #: 2447328

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

Paracel ID	Client ID
2447328-01	TWB

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	21-Nov-24	21-Nov-24

Certificate of Analysis

Report Date: 27-Nov-2024

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

Order Date: 21-Nov-2024

Client PO:

Project Description: 100554.003

	Client ID:	TWB	-	-	-		
	Sample Date:	15-Nov-24 15:30	-	-	-	-	-
	Sample ID:	2447328-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Anions							
Chloride	1 mg/L	214	-	-	-	-	-
Nitrate as N	0.1 mg/L	1.3	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	219	1	mg/L	214			2.2	20	
Nitrate as N	1.37	0.1	mg/L	1.33			2.9	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	223	1	mg/L	214	89.3	70-124			
Nitrate as N	2.27	0.1	mg/L	1.33	94.4	77-126			
Nitrite as N	0.953	0.05	mg/L	ND	95.3	82-115			

Certificate of Analysis

Report Date: 27-Nov-2024

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

Order Date: 21-Nov-2024

Client PO:

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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Attn: Andrius Paznekas

Client PO:
Project: 100554.003
Custody: 12099

Report Date: 4-Dec-2024
Order Date: 28-Nov-2024

Order #: 2448421

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

Paracel ID	Client ID
2448421-01	TWB

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	3-Dec-24	3-Dec-24
Hardness	Hardness as CaCO3	29-Nov-24	2-Dec-24
Metals, ICP-MS	EPA 200.8 - ICP-MS	29-Nov-24	2-Dec-24
Total Dissolved Solids	SM 2540C - gravimetric, filtration	2-Dec-24	3-Dec-24
Turbidity	SM 2130B - Turbidity meter	29-Nov-24	29-Nov-24

Certificate of Analysis

Report Date: 04-Dec-2024

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

Order Date: 28-Nov-2024

Client PO:

Project Description: 100554.003

	Client ID:	TWB	-	-	-		
	Sample Date:	28-Nov-24 03:00	-	-	-	-	-
	Sample ID:	2448421-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
General Inorganics							
Hardness	1 mg/L	441	-	-	-	-	-
Total Dissolved Solids	10 mg/L	900	-	-	-	-	-
Turbidity	0.1 NTU	0.6	-	-	-	-	-
Anions							
Chloride	1 mg/L	212	-	-	-	-	-
Nitrate as N	0.1 mg/L	1.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Metals							
Calcium	0.1 mg/L	114	-	-	-	-	-
Magnesium	0.2 mg/L	37.8	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Total Dissolved Solids	ND	10	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Calcium	ND	0.1	mg/L					
Magnesium	ND	0.2	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	4.86	1	mg/L	4.85			0.3	20	
Nitrate as N	0.19	0.1	mg/L	0.19			1.0	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Total Dissolved Solids	70.0	10	mg/L	68.0			2.9	10	
Turbidity	0.6	0.1	NTU	0.6			0.0	10	
Metals									
Calcium	6.4	0.1	mg/L	6.3			2.0	20	
Magnesium	1.8	0.2	mg/L	1.7			4.2	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	14.4	1	mg/L	4.85	95.8	70-124			
Nitrate as N	1.19	0.1	mg/L	0.19	100	77-126			
Nitrite as N	0.899	0.05	mg/L	ND	89.9	82-115			
General Inorganics									
Total Dissolved Solids	94.0	10	mg/L	ND	94.0	75-125			
Metals									
Calcium	14200	0.1	mg/L	6290	79.0	80-120			QM-07
Magnesium	10300	0.2	mg/L	1730	85.9	80-120			

Qualifier Notes:

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.

NC: Not Calculated

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Attn: Samuel Esenwa

Client PO: Cedar Lakes
Project: 100554.003
Custody: 19758

Report Date: 19-Nov-2024
Order Date: 13-Nov-2024

Order #: 2446364

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

Paracel ID	Client ID
2446364-01	TWC

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	14-Nov-24	14-Nov-24
E. coli	MOE E3407	14-Nov-24	14-Nov-24
Fecal Coliform	SM 9222D	14-Nov-24	14-Nov-24
Hardness	Hardness as CaCO3	14-Nov-24	15-Nov-24
Heterotrophic Plate Count	SM 9215C	14-Nov-24	14-Nov-24
Metals, ICP-MS	EPA 200.8 - ICP-MS	14-Nov-24	15-Nov-24
Total Coliform	MOE E3407	14-Nov-24	14-Nov-24
Total Dissolved Solids	SM 2540C - gravimetric, filtration	15-Nov-24	18-Nov-24
Turbidity	SM 2130B - Turbidity meter	14-Nov-24	14-Nov-24

Certificate of Analysis

Report Date: 19-Nov-2024

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

Order Date: 13-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

	Client ID:	TWC	-	-	-	-	-
	Sample Date:	13-Nov-24 16:00	-	-	-		
	Sample ID:	2446364-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	8	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND [1]	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-	-	-
General Inorganics							
Hardness	1 mg/L	408	-	-	-	-	-
Total Dissolved Solids	10 mg/L	524	-	-	-	-	-
Turbidity	0.1 NTU	1.0	-	-	-	-	-
Anions							
Chloride	1 mg/L	88	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Metals							
Calcium	0.1 mg/L	88.1	-	-	-	-	-
Magnesium	0.2 mg/L	45.6	-	-	-	-	-

Certificate of Analysis

Report Date: 19-Nov-2024

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

Order Date: 13-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Total Dissolved Solids	ND	10	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Calcium	ND	0.1	mg/L					
Magnesium	ND	0.2	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Heterotrophic Plate Count	ND	10	CFU/mL					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	87.2	1	mg/L	87.6			0.4	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Total Dissolved Solids	1480	10	mg/L	1450			2.1	10	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Calcium	8.0	0.1	mg/L	8.2			3.4	20	
Magnesium	2.2	0.2	mg/L	2.1			1.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	7	1	CFU/100mL	8			13.3	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	97.4	1	mg/L	87.6	98.5	70-124			
Nitrate as N	1.04	0.1	mg/L	ND	104	77-126			
Nitrite as N	1.03	0.05	mg/L	ND	103	82-115			
General Inorganics									
Total Dissolved Solids	92.0	10	mg/L	ND	92.0	75-125			
Metals									
Calcium	17500	0.1	mg/L	8240	93.0	80-120			
Magnesium	11500	0.2	mg/L	2110	94.1	80-120			

Qualifier Notes:

Sample Qualifiers :

1: Subcontracted analysis - Caduceon

Applies to Samples: TWC

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Attn: Andrius Paznekas

Client PO:
Project: 100554.003
Custody: 17583

Report Date: 27-Mar-2025
Order Date: 25-Mar-2025

Order #: 2513140

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

Paracel ID	Client ID
2513140-01	TWC-01
2513140-02	TWC-101

Approved By:

Mark Foto, M.Sc.
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
E. coli	MOE E3407	25-Mar-25	25-Mar-25
Fecal Coliform	SM 9222D	25-Mar-25	25-Mar-25
Heterotrophic Plate Count	SM 9215C	25-Mar-25	25-Mar-25
Total Coliform	MOE E3407	25-Mar-25	25-Mar-25

Certificate of Analysis

Report Date: 27-Mar-2025

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

Order Date: 25-Mar-2025

Client PO:

Project Description: 100554.003

	Client ID:	TWC-01	TWC-101	-	-		
	Sample Date:	25-Mar-25 10:26	25-Mar-25 10:36	-	-	-	-
	Sample ID:	2513140-01	2513140-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	ND	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND	ND	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	10	<10	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Fecal Coliforms	ND	1	CFU/100mL					
Heterotrophic Plate Count	ND	10	CFU/mL					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Fecal Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	10	10	CFU/mL	10			0.0	30	

Certificate of Analysis

Report Date: 27-Mar-2025

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

Order Date: 25-Mar-2025

Client PO:

Project Description: 100554.003

Qualifier Notes:

Sample Qualifiers :

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Attn: Samuel Esenwa

Client PO: Cedar Lakes
Project: 100554.003
Custody: 19757

Report Date: 15-Nov-2024
Order Date: 12-Nov-2024

Revised Report

Order #: 2446227

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

Paracel ID	Client ID
2446227-01	TWE

Approved By:

Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	13-Nov-24	13-Nov-24
E. coli	MOE E3407	13-Nov-24	13-Nov-24
Fecal Coliform	SM 9222D	13-Nov-24	13-Nov-24
Hardness	Hardness as CaCO3	14-Nov-24	15-Nov-24
Heterotrophic Plate Count	SM 9215C	13-Nov-24	13-Nov-24
Metals, ICP-MS	EPA 200.8 - ICP-MS	14-Nov-24	15-Nov-24
Total Coliform	MOE E3407	13-Nov-24	13-Nov-24
Total Dissolved Solids	SM 2540C - gravimetric, filtration	13-Nov-24	14-Nov-24
Turbidity	SM 2130B - Turbidity meter	14-Nov-24	14-Nov-24

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Order #: 2446227

Certificate of Analysis

Report Date: 15-Nov-2024

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

Order Date: 12-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

	Client ID:	TWE	-	-	-		
	Sample Date:	12-Nov-24 15:00	-	-	-	-	-
	Sample ID:	2446227-01	-	-	-		
	Matrix:	Drinking Water	-	-	-		
	MDL/Units						
Microbiological Parameters							
E. coli	1 CFU/100mL	ND	-	-	-	-	-
Total Coliforms	1 CFU/100mL	ND	-	-	-	-	-
Fecal Coliforms	1 CFU/100mL	ND [1]	-	-	-	-	-
Heterotrophic Plate Count	10 CFU/mL	<10	-	-	-	-	-
General Inorganics							
Hardness	1 mg/L	357	-	-	-	-	-
Total Dissolved Solids	10 mg/L	458	-	-	-	-	-
Turbidity	0.1 NTU	2.4	-	-	-	-	-
Anions							
Chloride	1 mg/L	88	-	-	-	-	-
Nitrate as N	0.1 mg/L	<0.1	-	-	-	-	-
Nitrite as N	0.05 mg/L	<0.05	-	-	-	-	-
Metals							
Calcium	0.1 mg/L	79.8	-	-	-	-	-
Magnesium	0.2 mg/L	38.4	-	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Total Dissolved Solids	ND	10	mg/L					
Turbidity	ND	0.1	NTU					
Metals								
Calcium	ND	0.1	mg/L					
Magnesium	ND	0.2	mg/L					
Microbiological Parameters								
E. coli	ND	1	CFU/100mL					
Total Coliforms	ND	1	CFU/100mL					
Heterotrophic Plate Count	ND	10	CFU/mL					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	89.3	1	mg/L	88.3			1.1	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Total Dissolved Solids	90.0	10	mg/L	88.0			2.3	10	
Turbidity	ND	0.1	NTU	ND			NC	10	
Metals									
Calcium	8.0	0.1	mg/L	8.2			3.4	20	
Magnesium	2.2	0.2	mg/L	2.1			1.8	20	
Microbiological Parameters									
E. coli	ND	1	CFU/100mL	ND			NC	30	
Total Coliforms	ND	1	CFU/100mL	ND			NC	30	
Heterotrophic Plate Count	ND	10	CFU/mL	ND			NC	30	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	98.5	1	mg/L	88.3	102	70-124			
Nitrate as N	1.08	0.1	mg/L	ND	108	77-126			
Nitrite as N	1.07	0.05	mg/L	ND	107	82-115			
General Inorganics									
Total Dissolved Solids	100	10	mg/L	ND	100	75-125			
Metals									
Calcium	17500	0.1	mg/L	8240	93.0	80-120			
Magnesium	11500	0.2	mg/L	2110	94.1	80-120			

Qualifier Notes:

Sample Qualifiers :

1: Subcontracted analysis - Caduceon

Applies to Samples: TWE

Sample Data Revisions:

None

Work Order Revisions / Comments:

Revision 1 - This report includes an additional Fecal Coliform qualifier identifying that the analysis was subcontracted.

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Attn: Jason Karis-Allen

Client PO:
Project: 100554.003
Custody: 19922

Report Date: 26-Jun-2024
Order Date: 20-Jun-2024

Order #: 2425424

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

Paracel ID	Client ID
2425424-01	MW-1
2425424-02	MW-2
2425424-03	MW-3

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ammonia, as N	EPA 351.2 - Auto Colour	24-Jun-24	24-Jun-24
Anions	EPA 300.1 - IC	24-Jun-24	24-Jun-24
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	21-Jun-24	25-Jun-24

Certificate of Analysis

Report Date: 26-Jun-2024

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

Order Date: 20-Jun-2024

Client PO:

Project Description: 100554.003

	Client ID:	MW-1	MW-2	MW-3	-		
	Sample Date:	20-Jun-24 10:45	20-Jun-24 10:00	20-Jun-24 09:15	-	-	-
	Sample ID:	2425424-01	2425424-02	2425424-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
General Inorganics							
Ammonia as N	0.01 mg/L	0.02	0.16	0.04	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.7	3.0	1.0	-	-	-
Anions							
Nitrate as N	0.1 mg/L	2.8	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-	-	-

Certificate of Analysis

Report Date: 26-Jun-2024

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

Order Date: 20-Jun-2024

Client PO:

Project Description: 100554.003

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Ammonia as N	ND	0.01	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	0.78	0.1	mg/L	0.76			2.2	20	
Nitrite as N	ND	0.05	mg/L	ND			NC	20	
General Inorganics									
Ammonia as N	0.038	0.01	mg/L	0.038			0.5	18	
Total Kjeldahl Nitrogen	1.71	0.1	mg/L	1.74			2.0	16	

Certificate of Analysis

Report Date: 26-Jun-2024

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

Order Date: 20-Jun-2024

Client PO:

Project Description: 100554.003

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	1.80	0.1	mg/L	0.76	104	77-126			
Nitrite as N	0.987	0.05	mg/L	ND	98.7	82-115			
General Inorganics									
Ammonia as N	1.03	0.01	mg/L	0.038	99.6	81-124			
Total Kjeldahl Nitrogen	2.70	0.1	mg/L	1.74	95.3	81-126			

Certificate of Analysis

Report Date: 26-Jun-2024

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

Order Date: 20-Jun-2024

Client PO:

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO: Cedar Lakes
Project: 100554.003
Custody: 74794

Report Date: 19-Nov-2024
Order Date: 14-Nov-2024

Order #: 2446478

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

Paracel ID	Client ID
2446478-01	MW1
2446478-02	MW2
2446478-03	MW3

Approved By:

Mark Foto, M.Sc.
Lab Supervisor

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Ammonia, as N	EPA 351.2 - Auto Colour	15-Nov-24	15-Nov-24
Anions	EPA 300.1 - IC	15-Nov-24	15-Nov-24
Total Kjeldahl Nitrogen	EPA 351.2 - Auto Colour, digestion	15-Nov-24	18-Nov-24

Certificate of Analysis

Report Date: 19-Nov-2024

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

Order Date: 14-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

	Client ID:	MW1	MW2	MW3	-		
	Sample Date:	14-Nov-24 14:00	14-Nov-24 12:00	14-Nov-24 13:00	-	-	-
	Sample ID:	2446478-01	2446478-02	2446478-03	-		
	Matrix:	Ground Water	Ground Water	Ground Water	-		
	MDL/Units						
General Inorganics							
Ammonia as N	0.01 mg/L	0.03	0.11	0.01	-	-	-
Total Kjeldahl Nitrogen	0.1 mg/L	0.5	1.6	0.5	-	-	-
Anions							
Nitrate as N	0.1 mg/L	3.5	<0.1	<0.1	-	-	-
Nitrite as N	0.05 mg/L	<0.05	<0.05	<0.05	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Nitrate as N	ND	0.1	mg/L					
Nitrite as N	ND	0.05	mg/L					
General Inorganics								
Ammonia as N	ND	0.01	mg/L					
Total Kjeldahl Nitrogen	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	11.5	0.1	mg/L	11.5			0.0	20	
Nitrite as N	0.060	0.05	mg/L	0.058			2.2	20	
General Inorganics									
Ammonia as N	0.015	0.01	mg/L	0.014			10.6	18	
Total Kjeldahl Nitrogen	ND	0.1	mg/L	ND			NC	16	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Nitrate as N	12.4	0.1	mg/L	11.5	89.5	77-126			
Nitrite as N	1.04	0.05	mg/L	0.058	97.9	82-115			
General Inorganics									
Ammonia as N	1.02	0.01	mg/L	0.014	101	81-124			
Total Kjeldahl Nitrogen	1.08	0.1	mg/L	ND	108	81-126			

Certificate of Analysis

Report Date: 19-Nov-2024

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

Order Date: 14-Nov-2024

Client PO: **Cedar Lakes**

Project Description: 100554.003

Qualifier Notes:

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

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Certificate of Analysis

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

Client PO:
Project: 100554.003
Custody: 18900

Report Date: 26-Mar-2025
Order Date: 24-Mar-2025

Order #: 2513084

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

Paracel ID	Client ID
2513084-01	1700 Cedarlakes
2513084-02	1738 Cedarlakes

Approved By:

Mark Foto

Mark Foto, M.Sc.
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC	25-Mar-25	25-Mar-25

Certificate of Analysis

Report Date: 26-Mar-2025

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

Order Date: 24-Mar-2025

Client PO:

Project Description: 100554.003

	Client ID:	1700 Cedarlakes	1738 Cedarlakes	-	-		
	Sample Date:	24-Mar-25 10:00	24-Mar-25 10:30	-	-	-	-
	Sample ID:	2513084-01	2513084-02	-	-		
	Matrix:	Drinking Water	Drinking Water	-	-		
	MDL/Units						
Anions							
Chloride	1 mg/L	235	242	-	-	-	-
Nitrate as N	0.1 mg/L	1.9	<0.1	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	1	mg/L					
Nitrate as N	ND	0.1	mg/L					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	245	1	mg/L	242			1.3	20	
Nitrate as N	ND	0.1	mg/L	ND			NC	20	

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	252	1	mg/L	242	100	70-124			
Nitrate as N	0.97	0.1	mg/L	ND	97.2	77-126			

Qualifier Notes:

Login Qualifiers :

Container(s) - Labeled improperly/insufficient information - Containers missing the sample collection time; chain of custody reads AM; client confirmed collection time as 10:00.
Applies to Samples: 1700 Cedarlakes
Container(s) - Labeled improperly/insufficient information - Containers missing the sample collection time; chain of custody reads AM; client confirmed collection time as 10:30.
Applies to Samples: 1738 Cedarlakes

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

APPENDIX E

Nitrate Dilution Calculations

Nitrate Dilution Calculation Worksheet - Cedar Lakes Phase 3-4

Nitrate Loading

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

Number of lots with untreated septic systems =	71	lots
Nitrate loading from untreated septic system =	40	grams/lot/day
Total annual nitrate loading from untreated systems =	1,036,600	grams/year
Total Annual Nitrate Loading from all Systems =	**1,036,600**	**grams/year**

Dilution Volumes

Infiltration Factors

Topography factor =	0.2	
Soil factor =	0.4	
Cover factor =	0.165	
Combined infiltration factor =	0.765	

Precipitation Infiltration

Annual water surplus =	0.380	metres/year
Annual infiltration (Water Surplus x Infiltration Factor) =	0.291	metres/year

Infiltration Area and Infiltration Volumes

Area available for infiltration (Site Area - Hard Surface Area) = *Assumes 7 metre wide x 2,300 m long interal roadways, 300m2 for each lot house+driveway and removal of lands previously incorporated into dilution assessments (Cedar Lakes Phases 1-2)*	270,885	square metres
Total Annual Volume of Infiltration (Infiltration x Area) =	78,746	cubic metres/year
Annual Flow from Residential Lots (assuming 1000 L/day/lot) =	25,915	cubic metres/year
Total Annual Volume Available for Dilution =	**104,661**	**cubic metres/year**

Dilution Calculation

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

$$\mathbf{C_{Nitrate} = \frac{1036600\ grams/year}{104661\ cubic\ metres/year} = 9.90\ mg/L}$$

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Ottawa Intl A WATER BUDGET MEANS FOR THE PERIOD 1939-2020 DC20492

LAT.... 45.32 WATER HOLDING CAPACITY... 75 MM HEAT INDEX... 36.69
LONG... 75.67 LOWER ZONE..... 45 MM A..... 1.079

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	-10.6	62	12	14	0	0	0	25	83	74	295
28- 2	-9.0	56	10	17	1	1	0	26	112	74	351
31- 3	-2.8	66	31	78	5	5	0	103	69	75	416
30- 4	5.7	73	68	74	31	31	0	111	0	75	490
31- 5	13.1	76	76	0	80	80	0	14	0	56	566
30- 6	18.3	85	85	0	116	107	-9	5	0	30	651
31- 7	20.9	88	88	0	136	103	-33	3	0	11	739
31- 8	19.6	84	84	0	118	84	-34	1	0	11	823
30- 9	14.8	82	82	0	75	65	-10	4	0	24	906
31-10	8.3	77	77	0	37	36	-1	14	0	52	77
30-11	1.3	76	59	8	10	10	0	38	9	71	154
31-12	-6.9	79	27	14	1	1	0	36	47	74	233
AVE	6.0 TTL	904	699	205	610	523	-87	380			

Ottawa Intl A STANDARD DEVIATIONS FOR THE PERIOD 1939-2020 DC20492

DATE	TEMP (C)	PCPN	RAIN	MELT	PE	AE	DEF	SURP	SNOW	SOIL	ACC P
31- 1	2.9	26	15	17	1	1	0	29	44	3	59
28- 2	2.6	26	14	26	1	1	0	35	59	3	63
31- 3	2.6	28	22	49	5	5	0	55	87	0	71
30- 4	1.8	32	33	88	9	9	0	89	2	2	80
31- 5	1.8	34	34	2	12	12	0	24	0	22	94
30- 6	1.2	38	38	0	8	18	18	16	0	29	105
31- 7	1.2	45	45	0	8	31	33	16	0	22	117
31- 8	1.3	37	37	0	8	29	31	4	0	21	126
30- 9	1.5	39	39	0	8	16	16	15	0	29	132
31-10	1.5	37	37	1	7	7	2	21	0	27	37
30-11	1.8	27	27	8	4	4	0	32	13	12	45
31-12	3.0	30	22	14	1	1	0	30	34	4	55

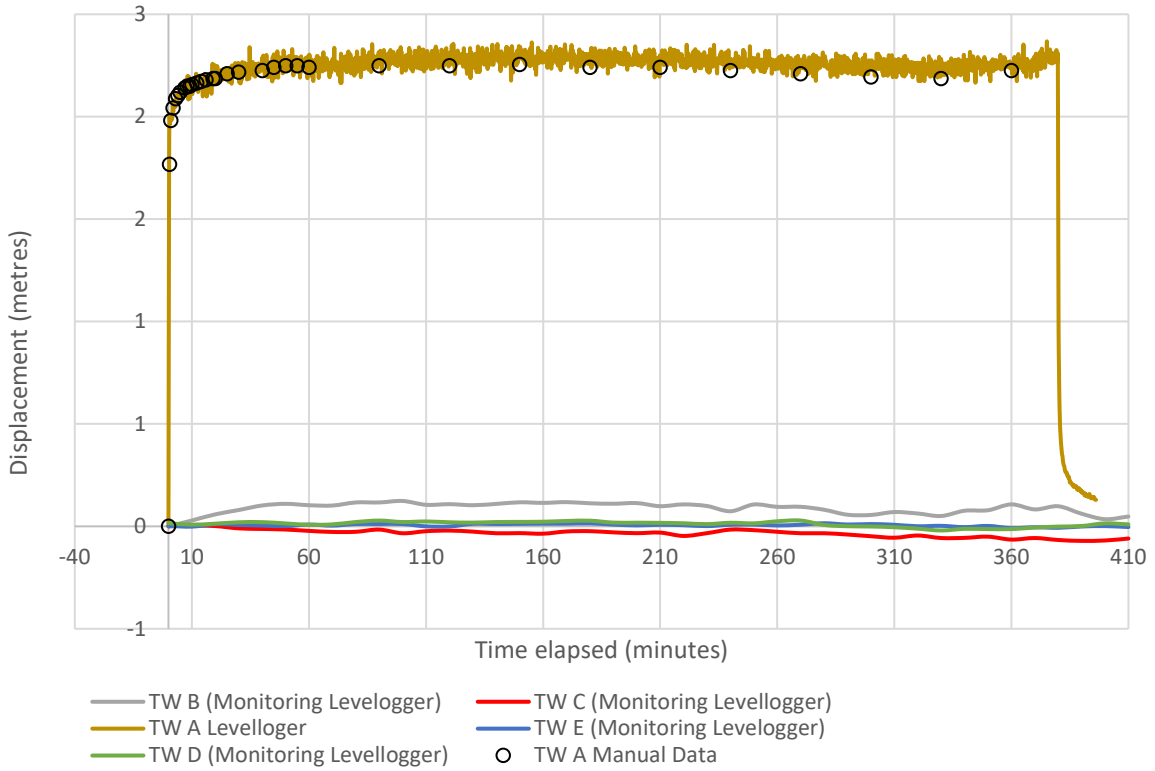
APPENDIX F

Pumping Test Graphs and Analysis

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW A): Drawdown and Recovery



Water Levels TW A

Static : 5.43 m below top of casing

TOC = 0.51 m above ground surface

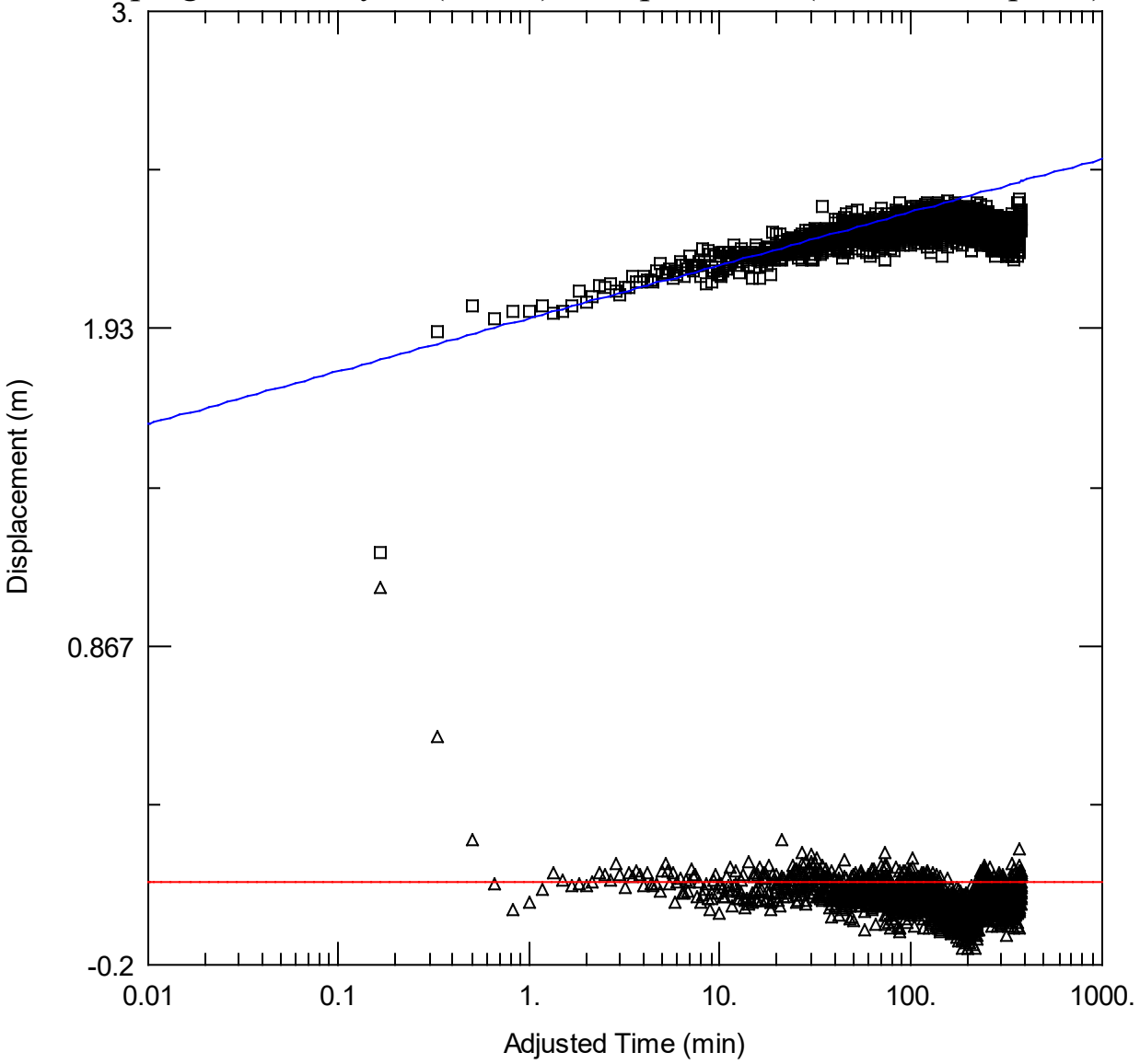
End of pump test (6-hours): 7.65 m below top of casing

Following recovery (2 hours): 5.52 m below top of casing

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW A): Cooper-Jacob (Confined Aquifer)

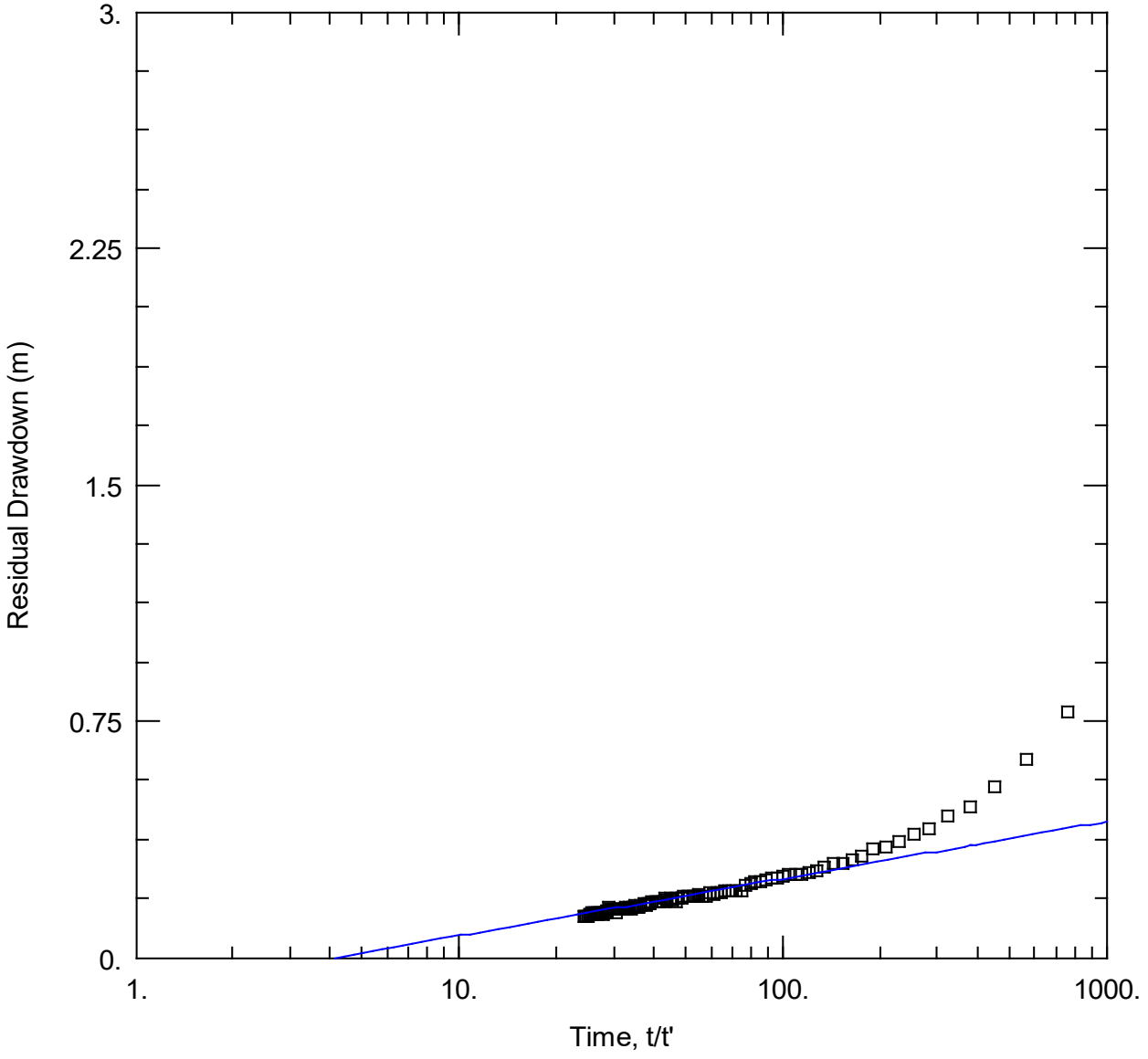


Estimated Transmissivity: 86 m^2/day or 2 x 10^{-5} m^2/s
Estimated Storativity: NA

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW A	P-Test Date: Oct. 31, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW A): Theis Recovery (Confined Aquifer)

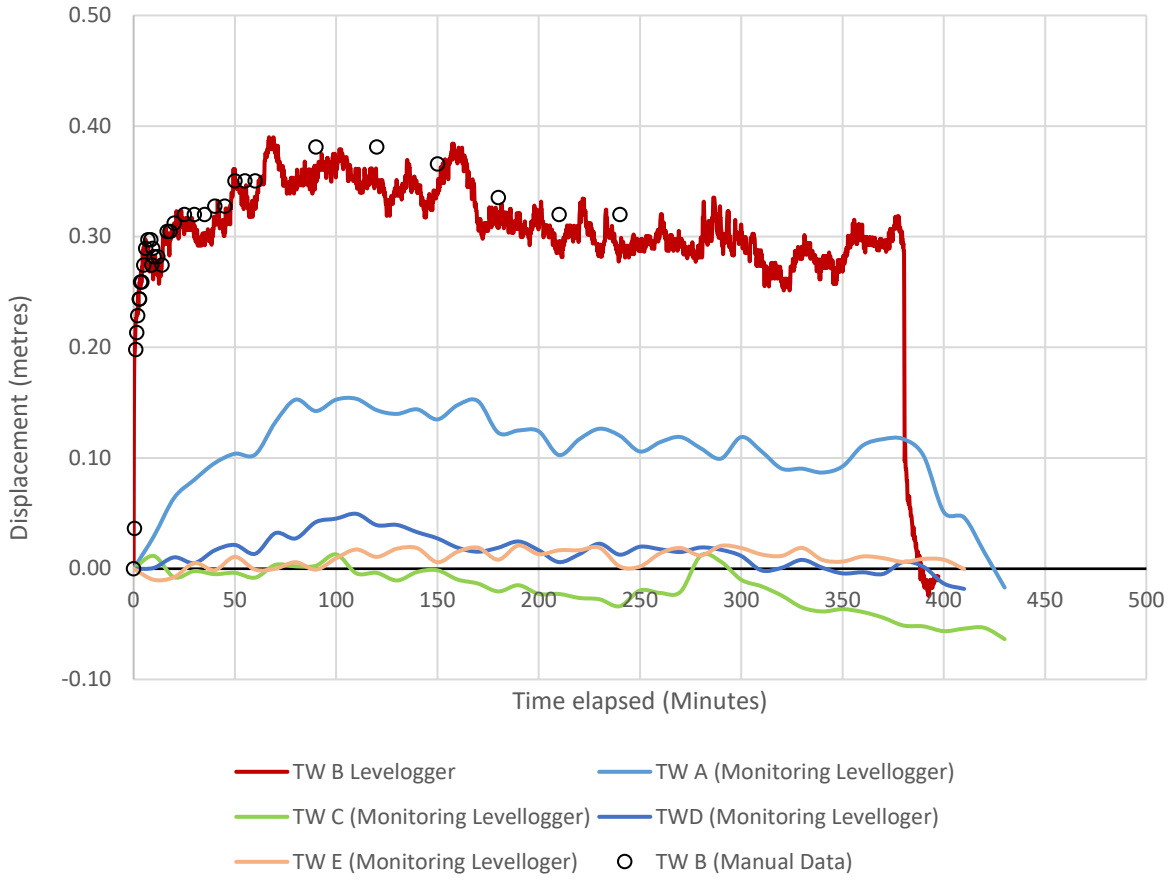


Estimated Transmissivity: 85 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW B): Drawdown and Recovery



Water Levels TW B

Static : 6.98 m below top of casing

TOC = 0.56 m above ground surface

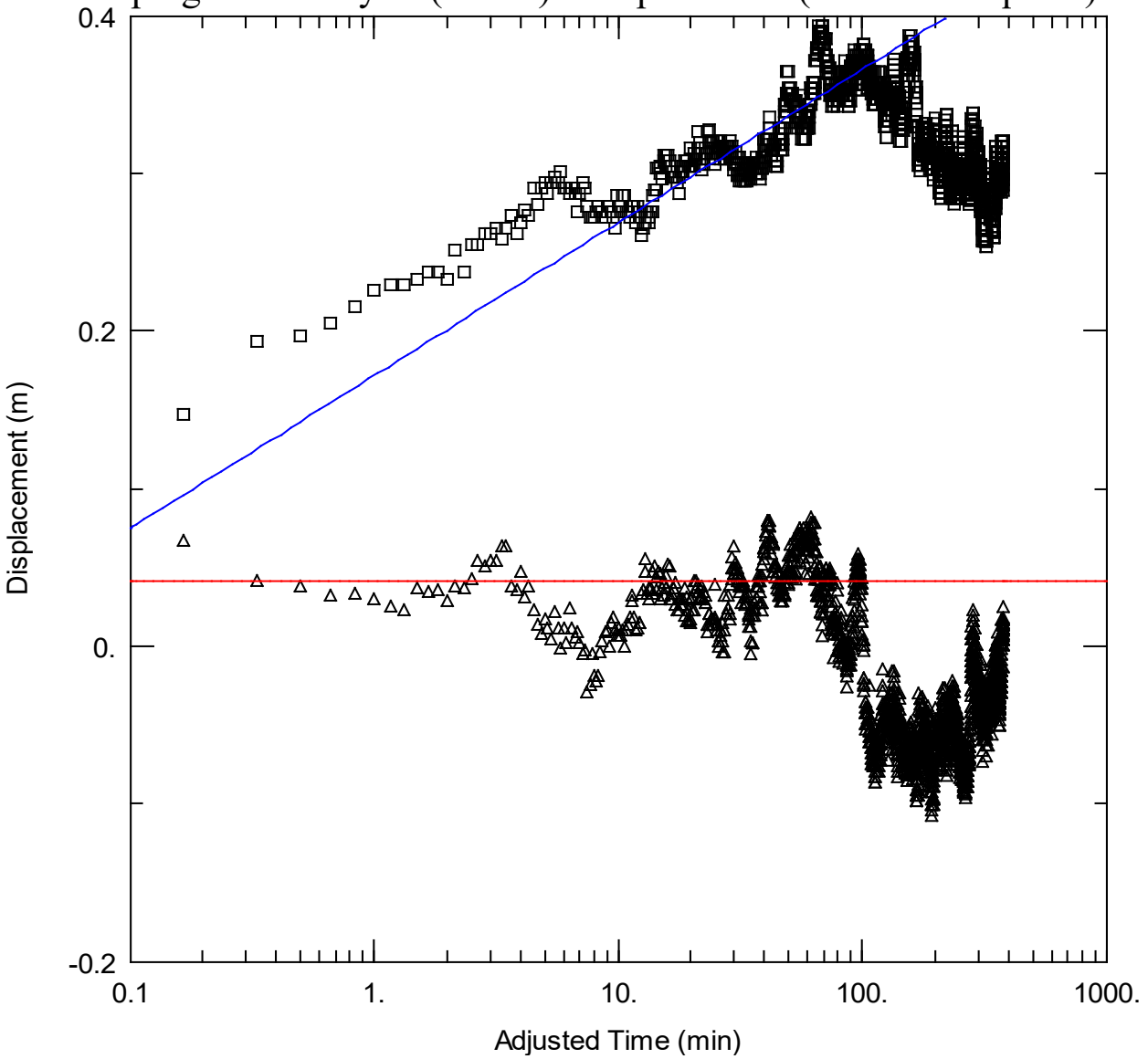
End of pump test (6-hours): 7.32 m below top of casing

Following recovery (2 hours): 7.00 m below top of casing

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 47 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW B): Cooper-Jacob (Confined Aquifer)



Estimated Transmissivity: 157 m^2/day or 3 x 10^{-5} m^2/s
Estimated Storativity: NA

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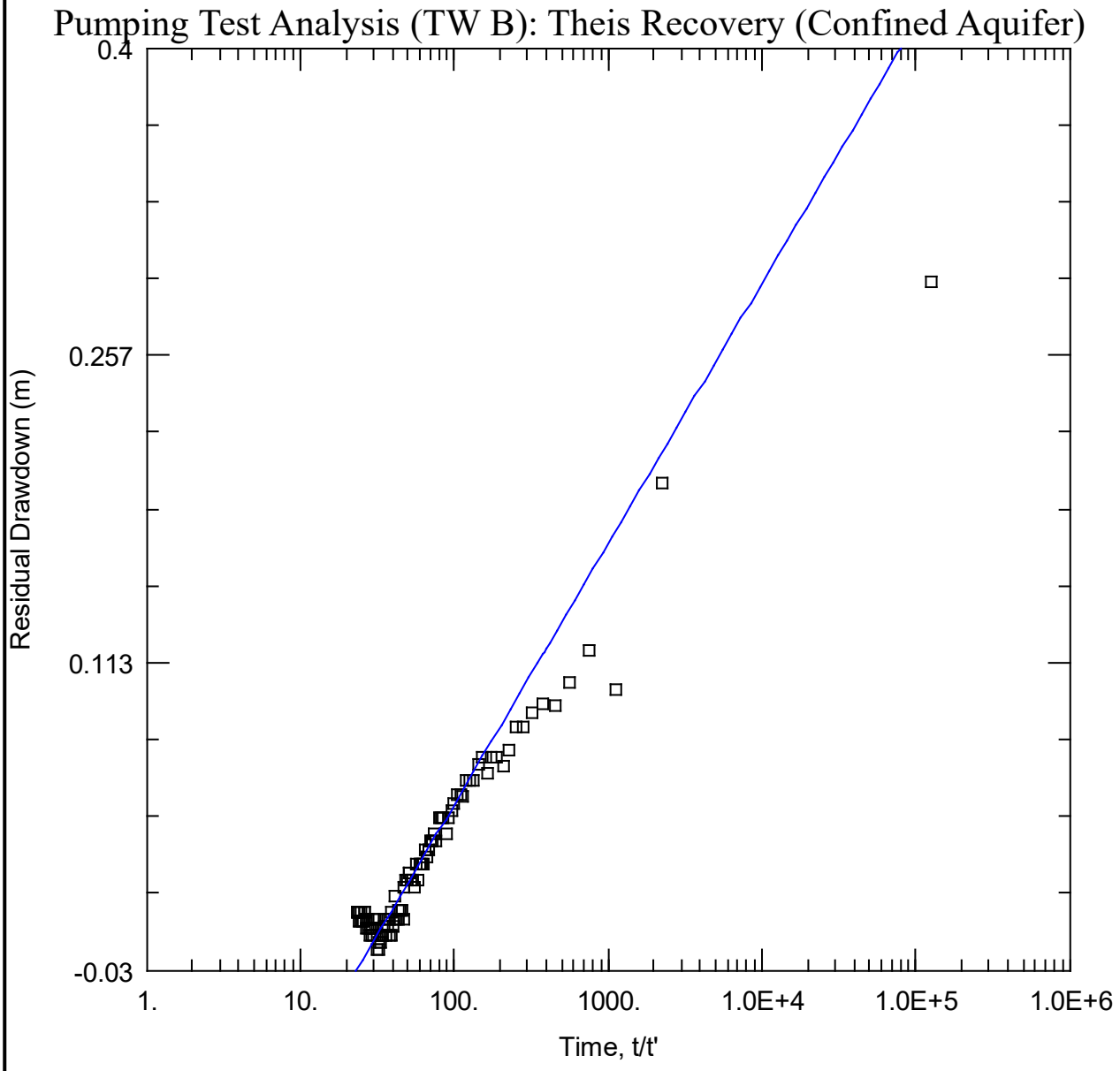
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW B	P-Test Date: Nov. 2, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 47 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

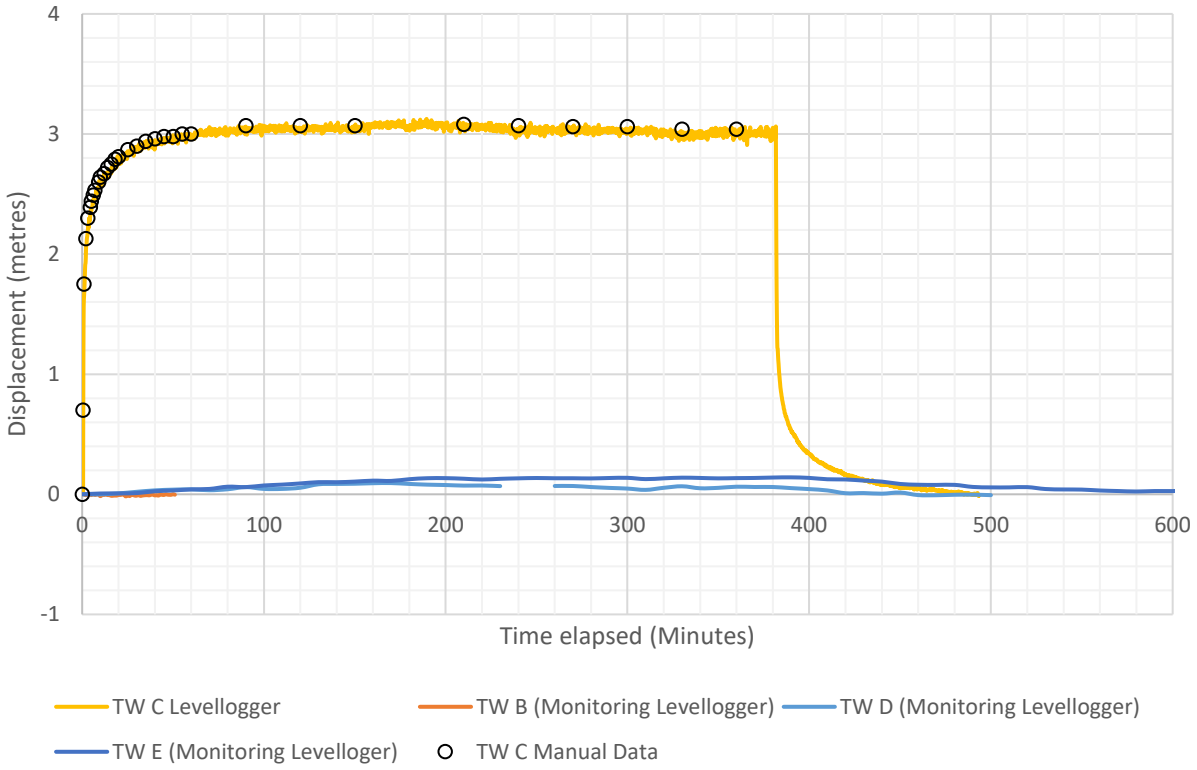


Estimated Transmissivity: 126 m^2/day or 3 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Data (TW C): Drawdown and Recovery



Water Levels TW C

Static : 9.23 m below top of casing

TOC = 0.83 m above ground surface

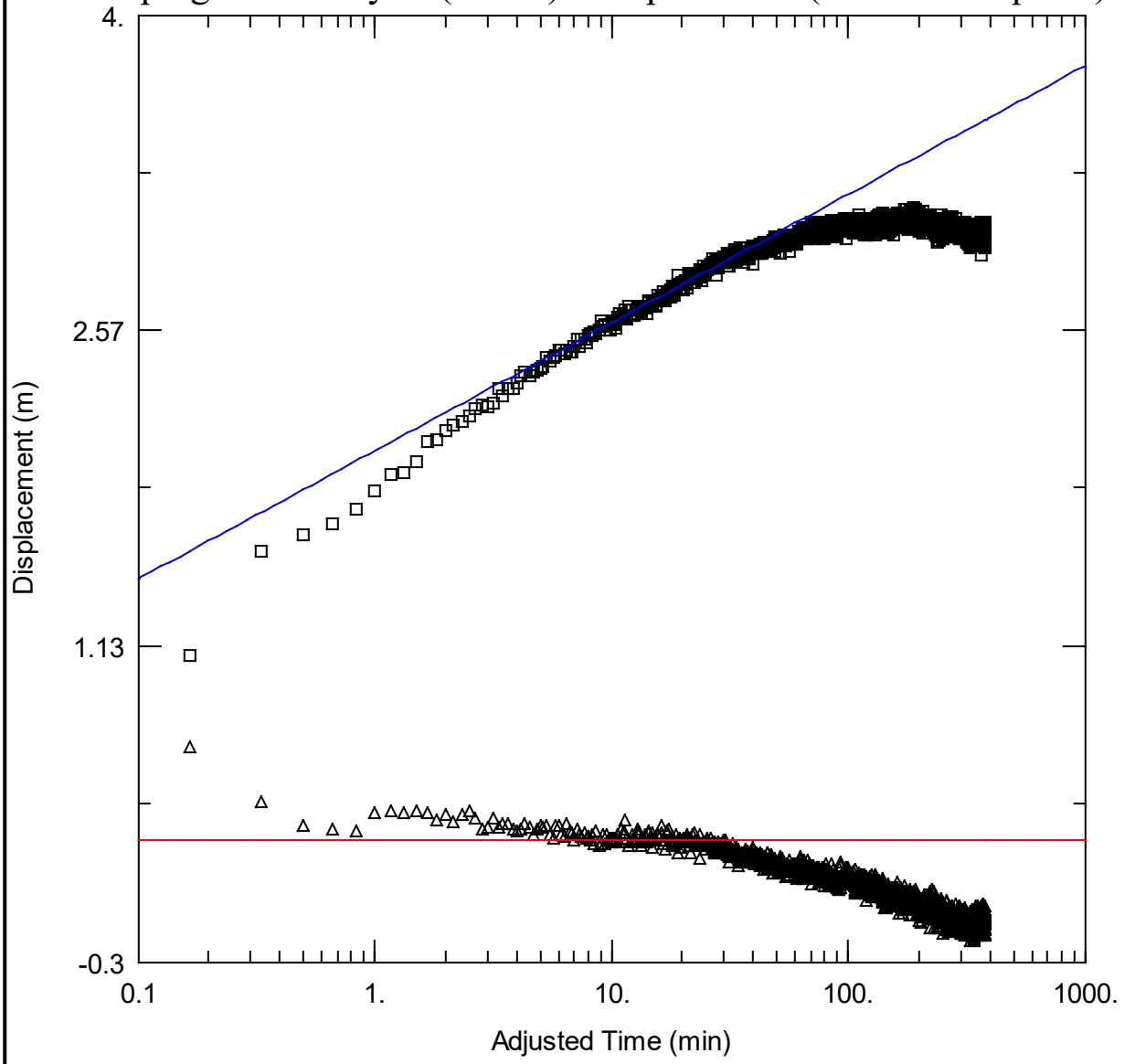
End of pump test (6-hours): 12.27 m below top of casing

Following recovery (2 hours): 9.37 m below top of casing

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW C): Cooper-Jacob (Confined Aquifer)

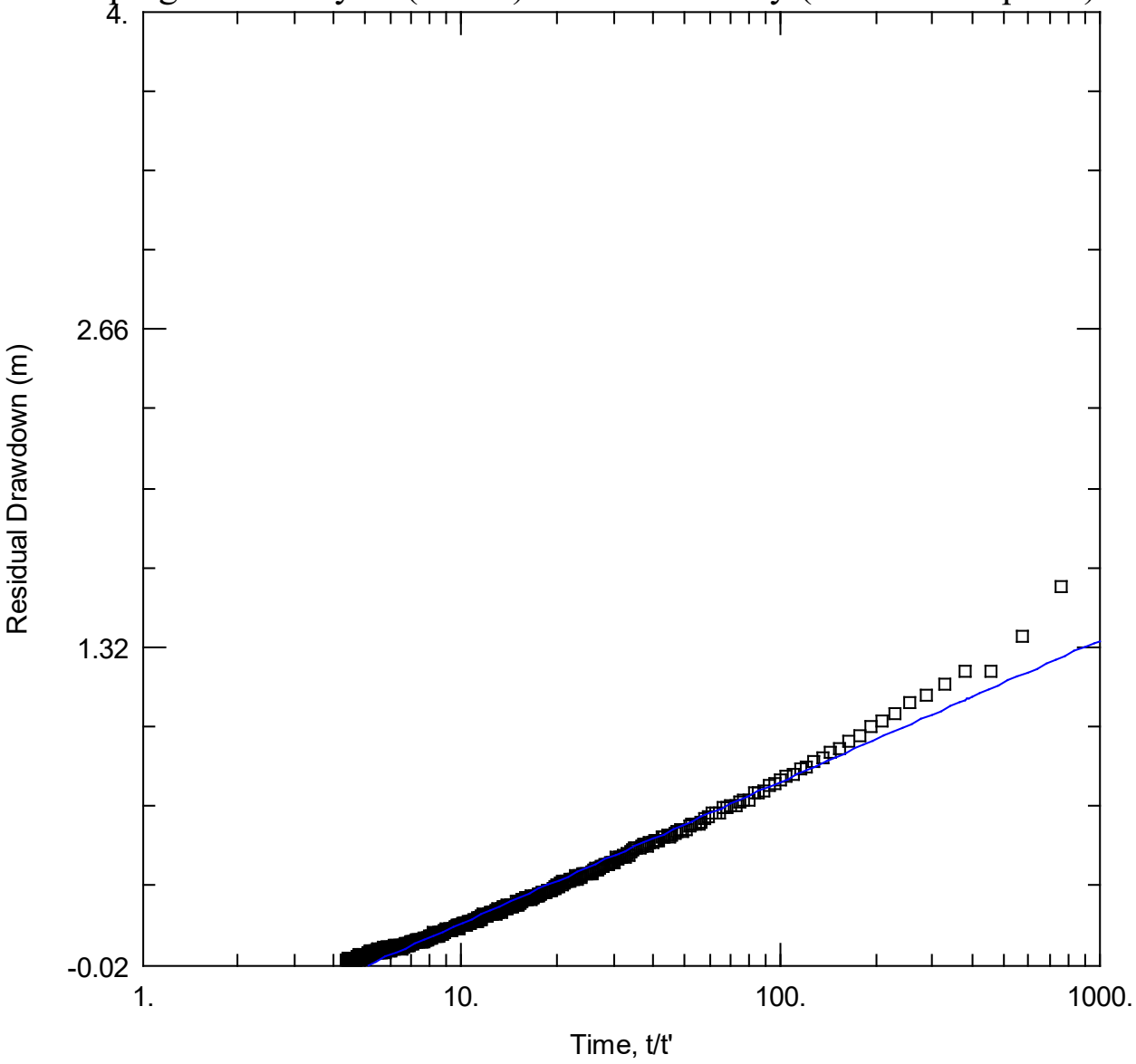


Estimated Transmissivity: 26 m^2/day or 8 x 10^{-6} m^2/s
Estimated Storativity: NA

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: SM	Pumping Well: TW C	P-Test Date: Oct. 30, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov 30, 2023
Aquifer Thickness: 40 m	Discharge: Constant 57 L/min	Duration: 6.5 hours

Pumping Test Analysis (TW C): Theis Recovery (Confined Aquifer)

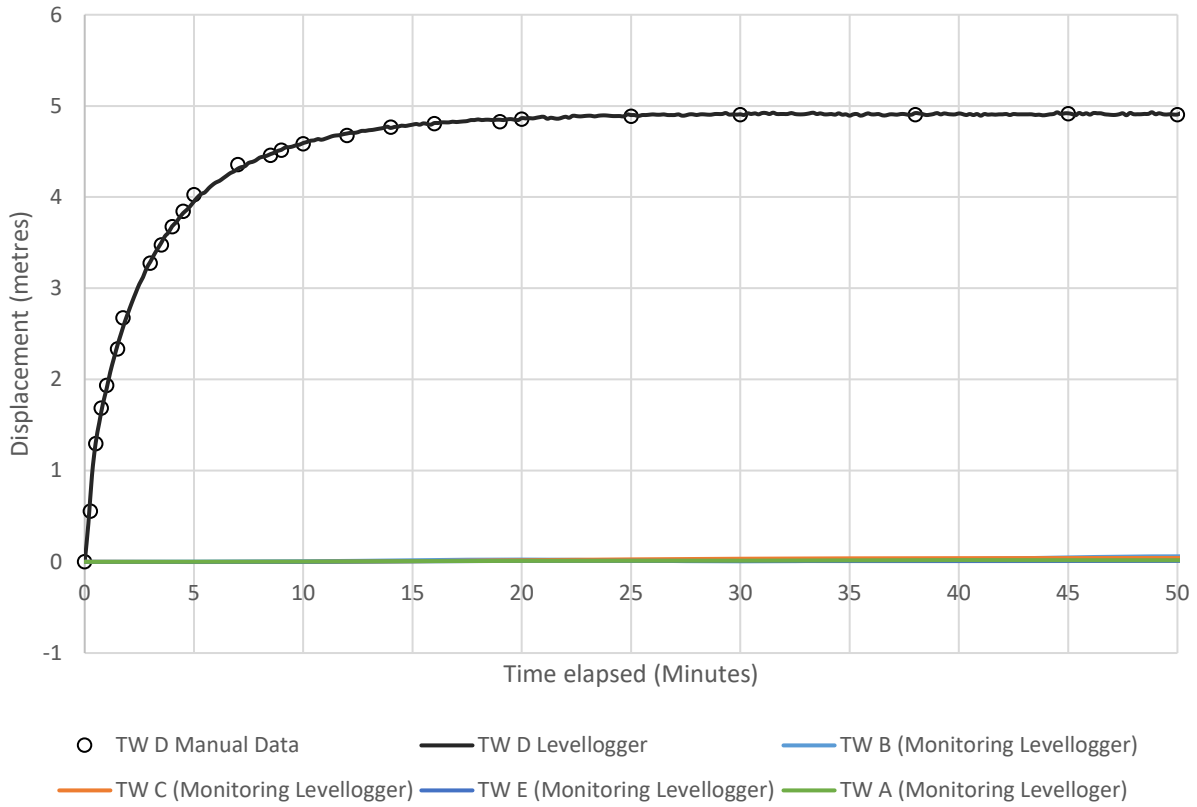


Estimated Transmissivity: 26 m^2/day or 8 x 10^{-6} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 44 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Data (TW D): Drawdown and Recovery



Water Levels TW D

Static : 4.265 m below top of casing

TOC = 0.42 m above ground surface

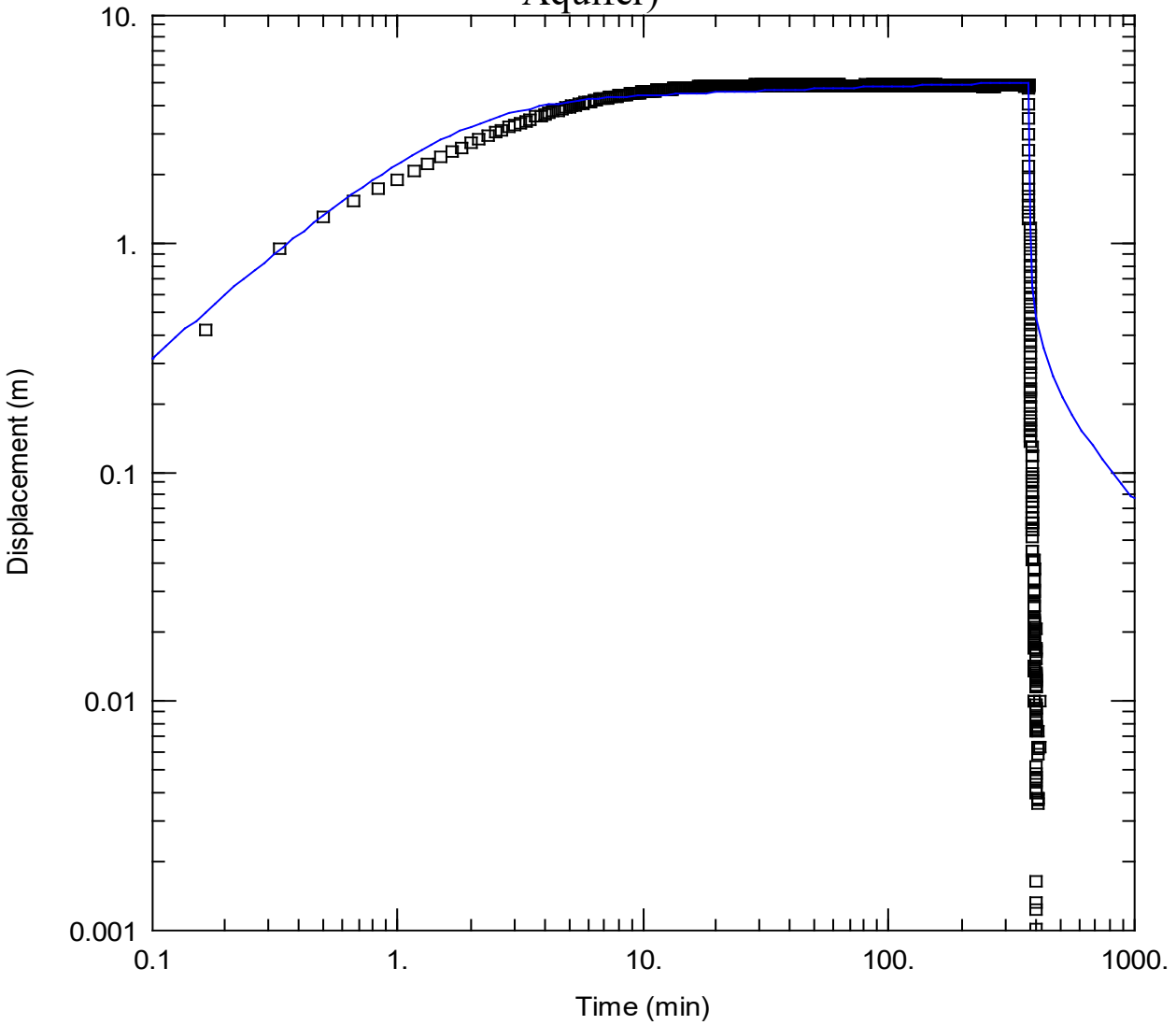
End of pump test (6-hours): 9.12 m below top of casing

Following recovery (2 hours): 4.39 m below top of casing

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Papadopoulos-Cooper	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 50 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Analysis (TW D): Papadopoulos- Cooper (Confined Aquifer)

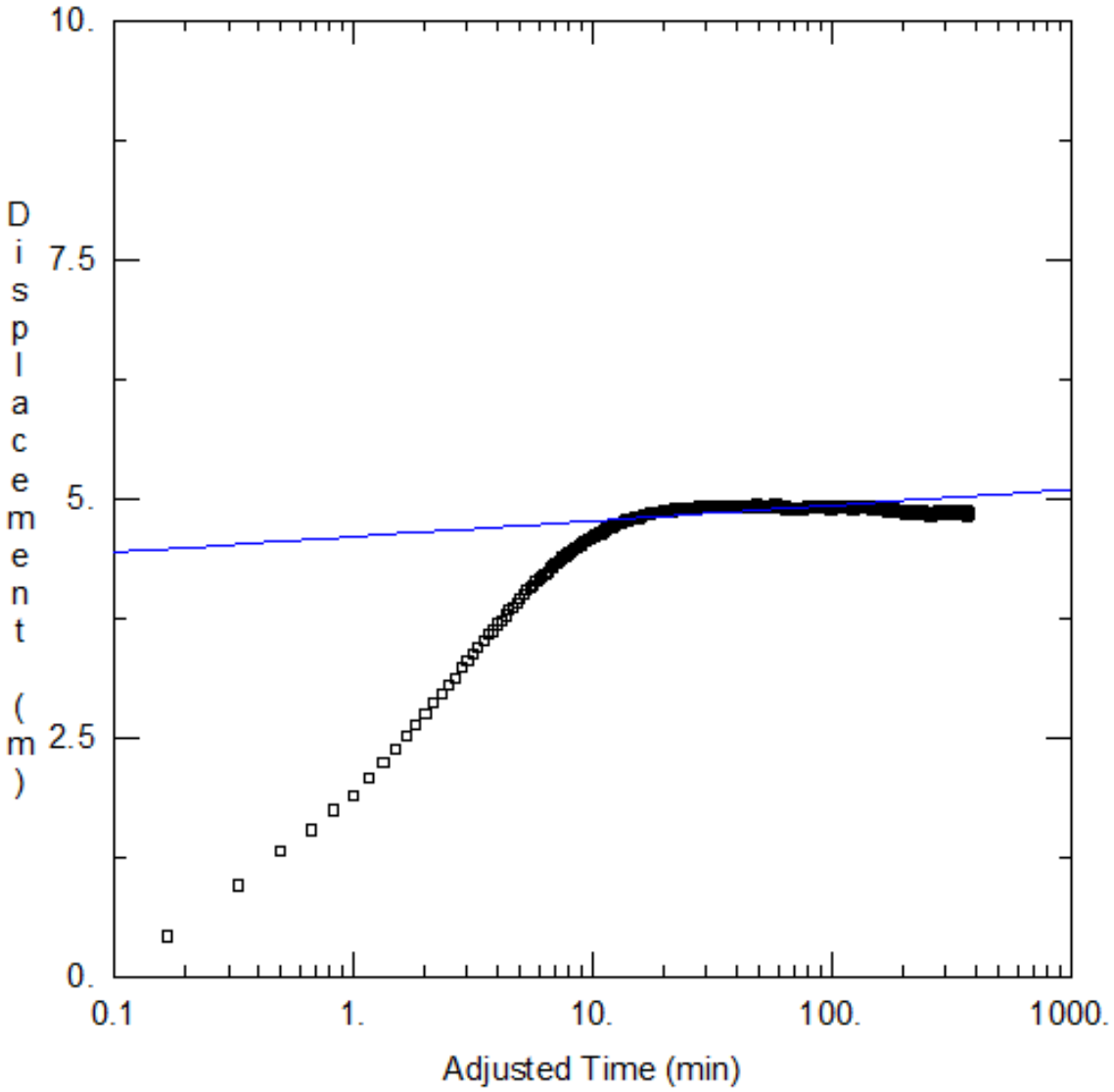


Estimated Transmissivity: 41 m^2/day or 5 x 10^{-4} m^2/s
Estimated Storativity: NA

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Papadopoulos-Cooper	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 50 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Analysis (TW D): Cooper Jacob (Confined Aquifer)

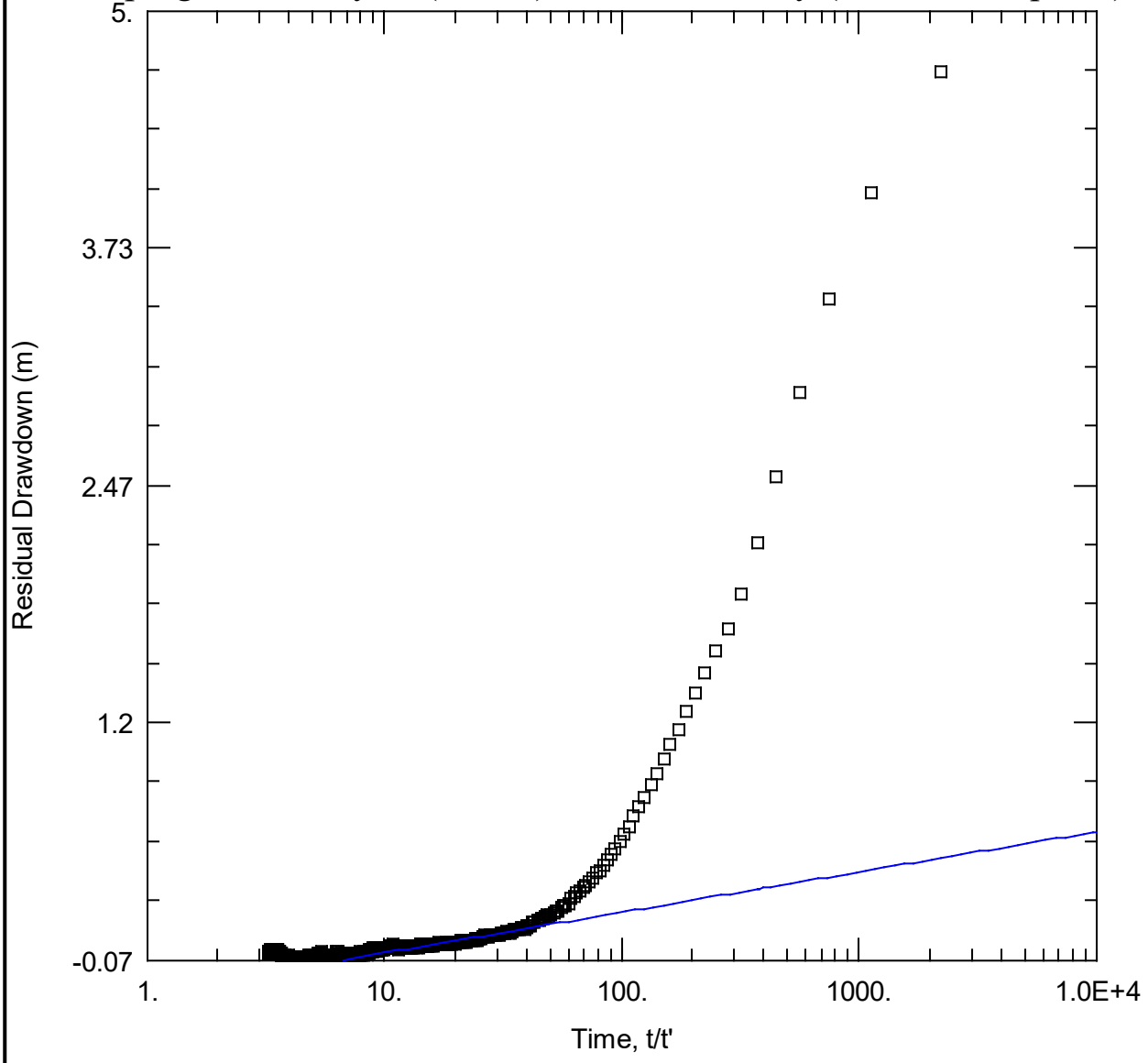


Estimated Transmissivity: 90 m^2/day or 1 x 10^{-3} m^2/s
Estimated Storativity: NA

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: EW	Pumping Well: TW D	P-Test Date: Oct. 25, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 50 m	Discharge: Constant 67 L/min	Duration: 6.25 hours

Pumping Test Analysis (TW D): Theis Recovery (Confined Aquifer)

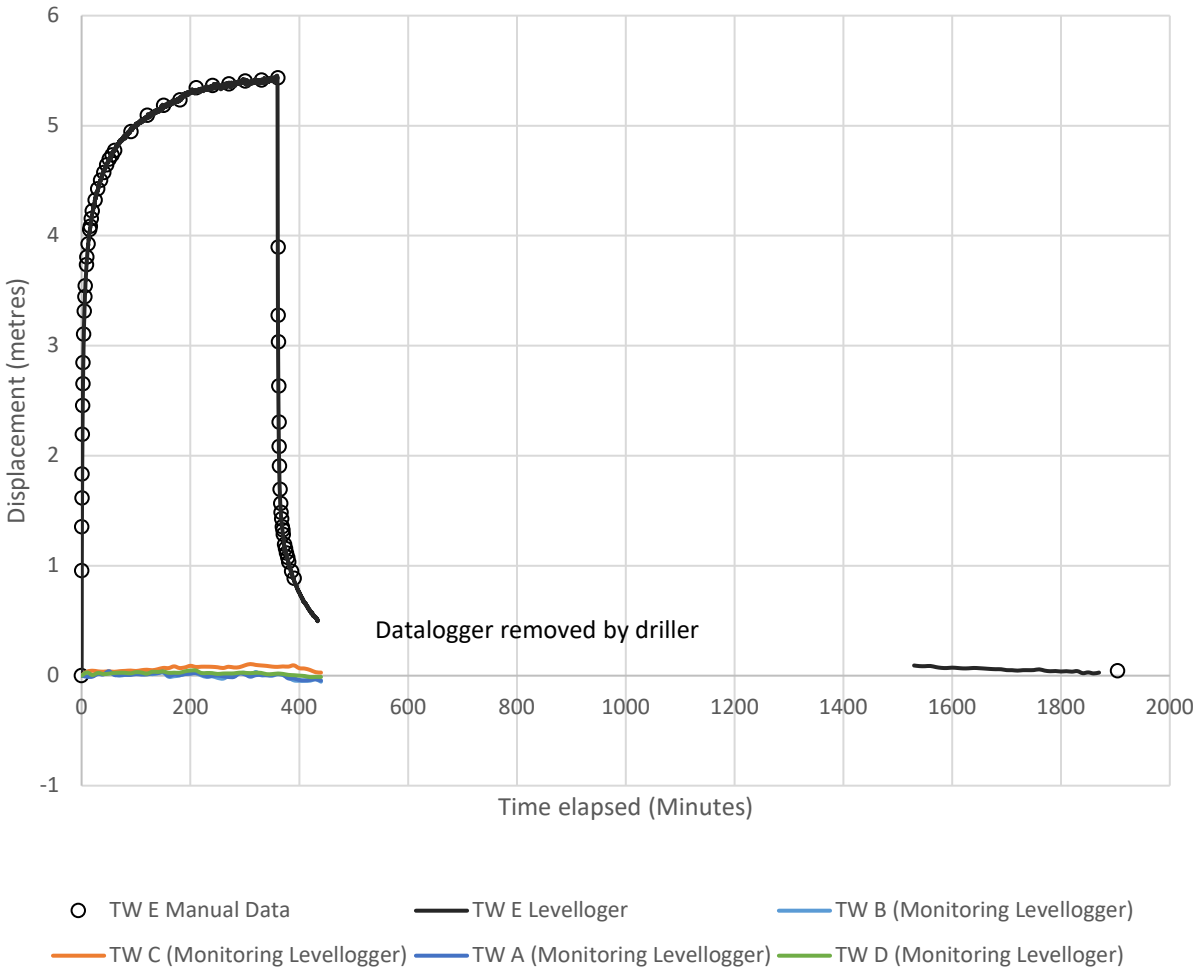


Estimated Transmissivity: 70 m^2/day or 2 x 10^{-5} m^2/s

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Manual Measurements	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

Pumping Test Data (TW E): Drawdown and Recovery



Water Levels TW-5
Static : 5.315 m below top of casing
TOC = 0.43 m above ground surface
End of pump test (6-hours): 10.73 m below top of casing
Following recovery (2 hours): 6.20 m below top of casing

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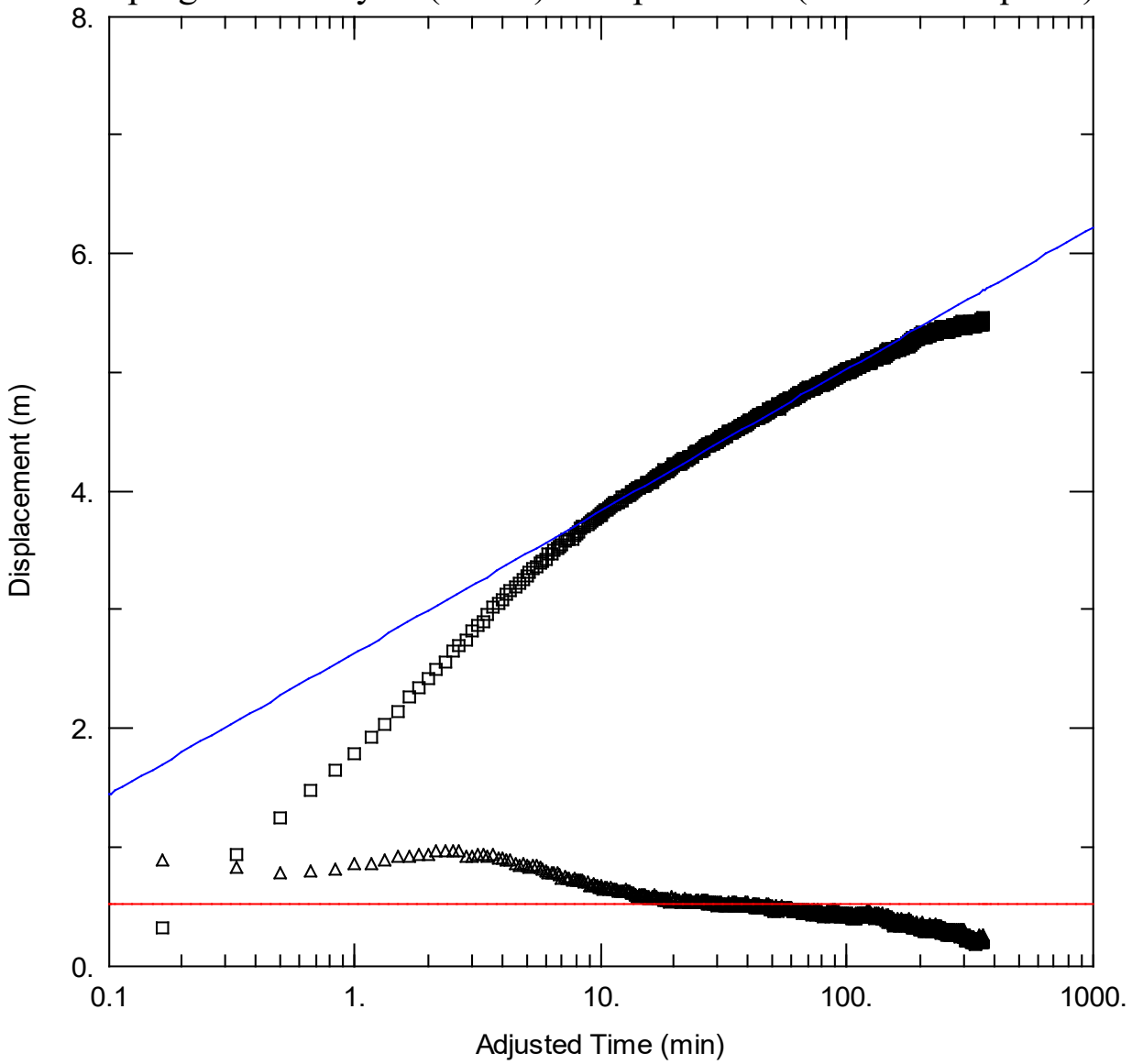
Pumping Test Analysis Report	
Project: Hydrogeological Investigation	
Project Number: 100554.003	
Client: ARK Engineering and Development	

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Cooper-Jacob	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

Pumping Test Analysis (TW E): Cooper-Jacob (Confined Aquifer)



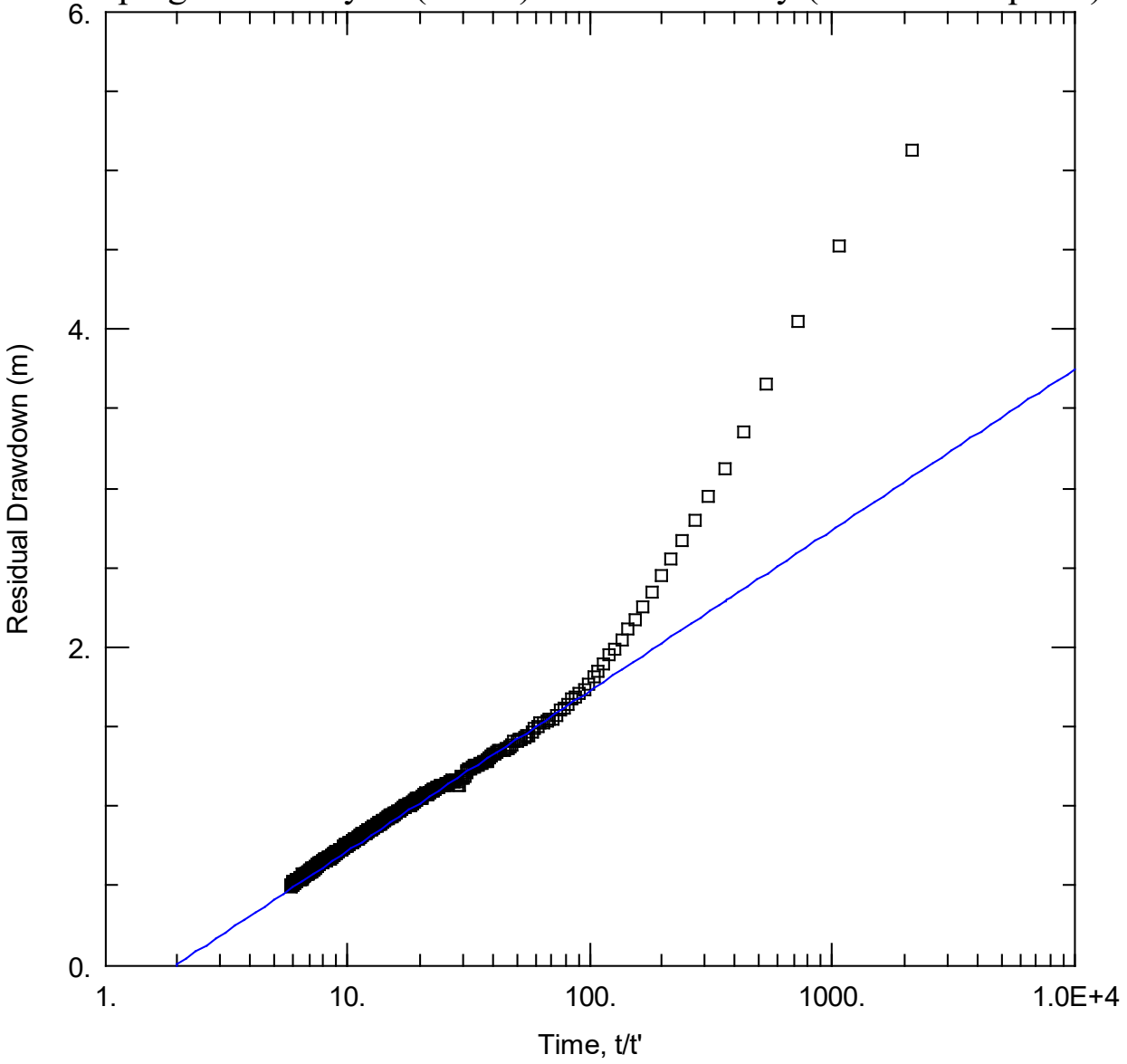
Estimated Transmissivity: 13 m^2/day or 3 x 10^{-6} m^2/s

Estimated Storativity: NA

GEMTEC Consulting Engineers and Scientists	Pumping Test Analysis Report
	Project: Hydrogeological Investigation
	Project Number: 100554.003
	Client: ARK Engineering and Development

Location: 1600 Stagecoach Road, Greely, Ontario		
Test Conducted by: BR	Pumping Well: TW E	P-Test Date: Nov. 7, 2023
Analysis Performed by: SE	Method: Theis (Recovery)	Analysis Date: Nov. 30, 2023
Aquifer Thickness: 55 m	Discharge: Constant 57 L/min	Duration: 6 hours

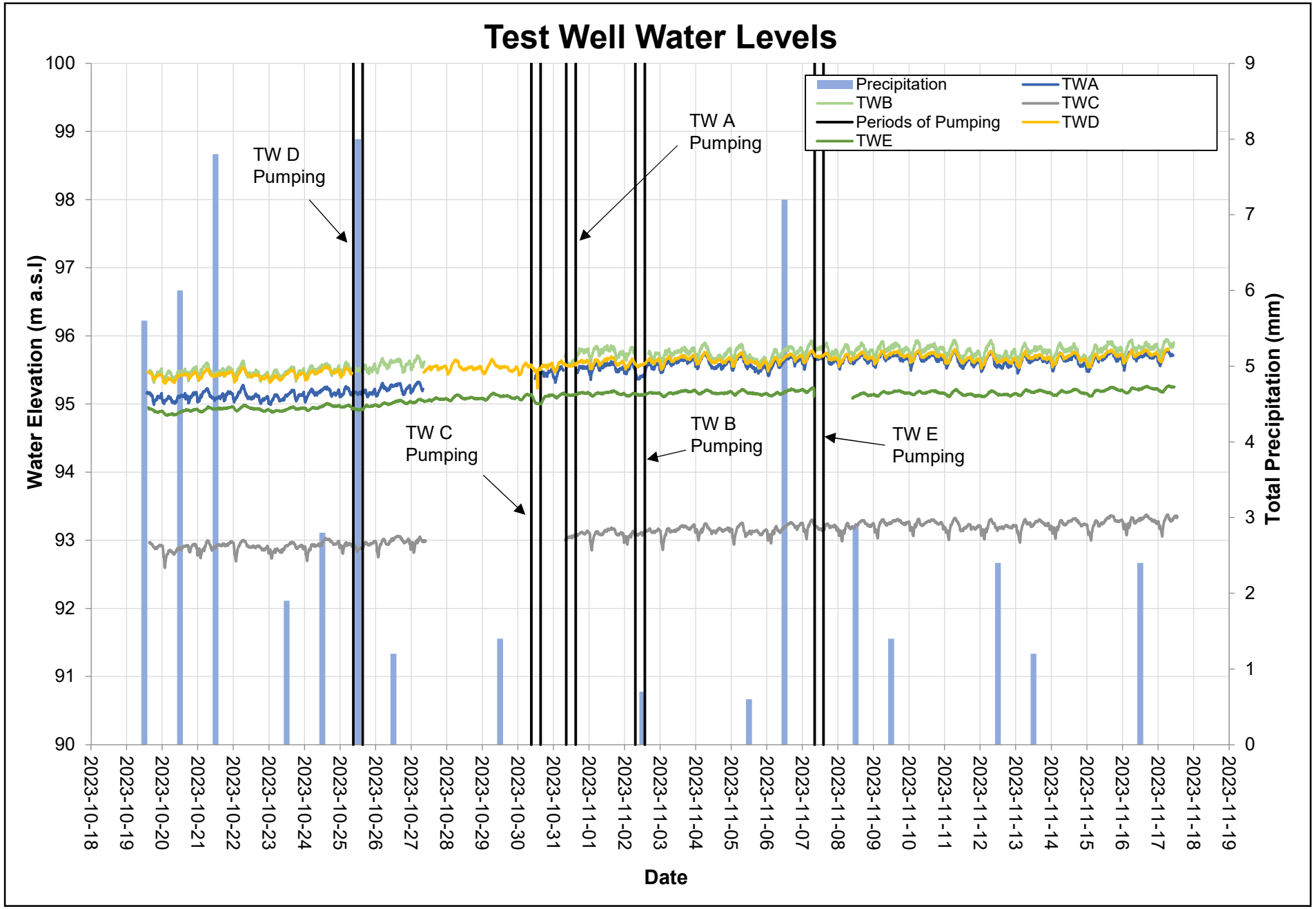
Pumping Test Analysis (TW E): Theis Recovery (Confined Aquifer)



Estimated Transmissivity: 15 m^2/day or 3 x 10^{-6} m^2/s

APPENDIX G

Long-Term Water Level Monitoring Graphs

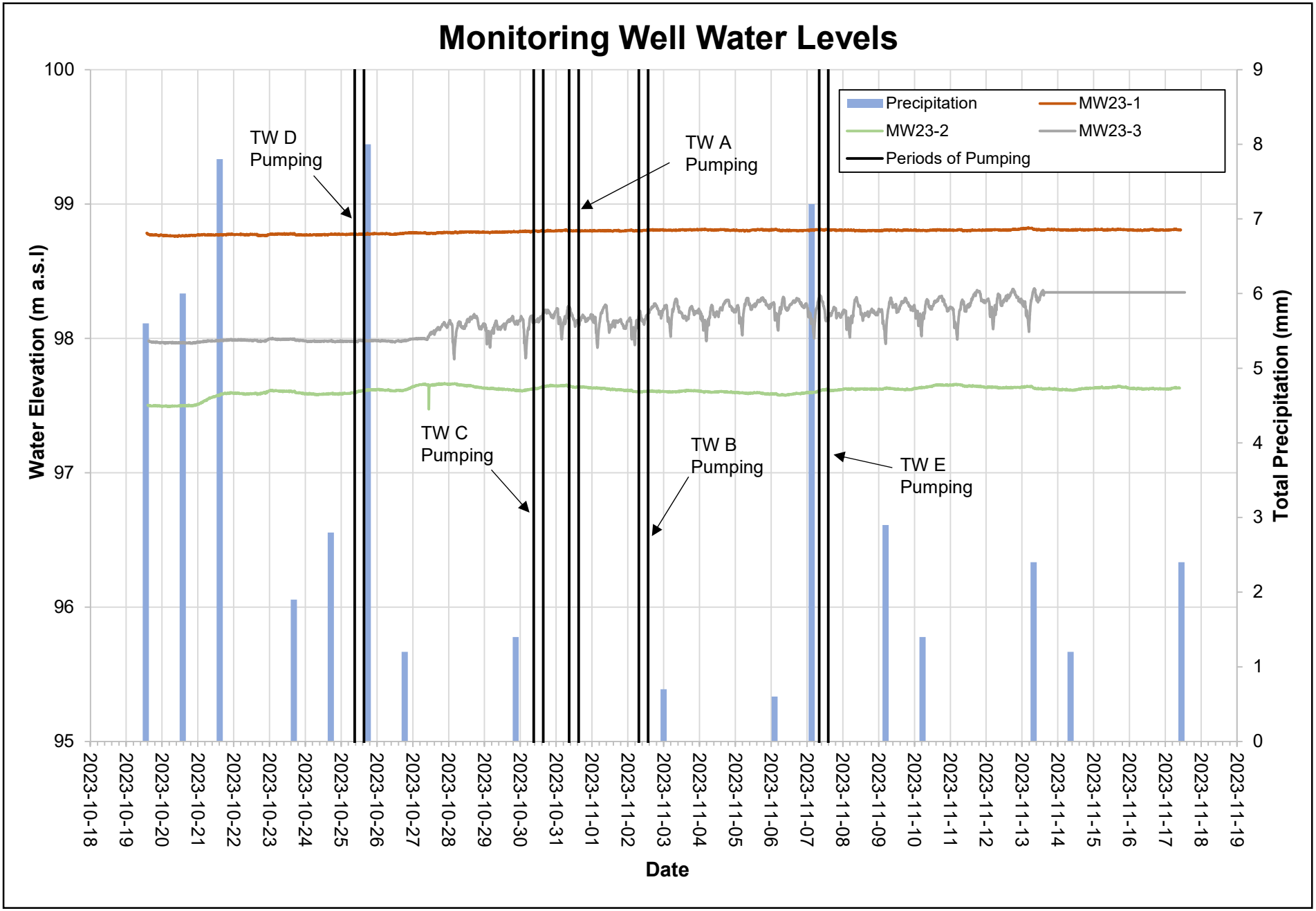


Note: Gaps in time series represent period in which monitoring loggers were removed from wells to accommodate for pumping tests and/or sampling.

Project: 100554.003

Date: March 2025

GEMTEC
Consulting Engineers and Scientists



Project: 100554.003
Date: March 2025

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Consulting Engineers and Scientists

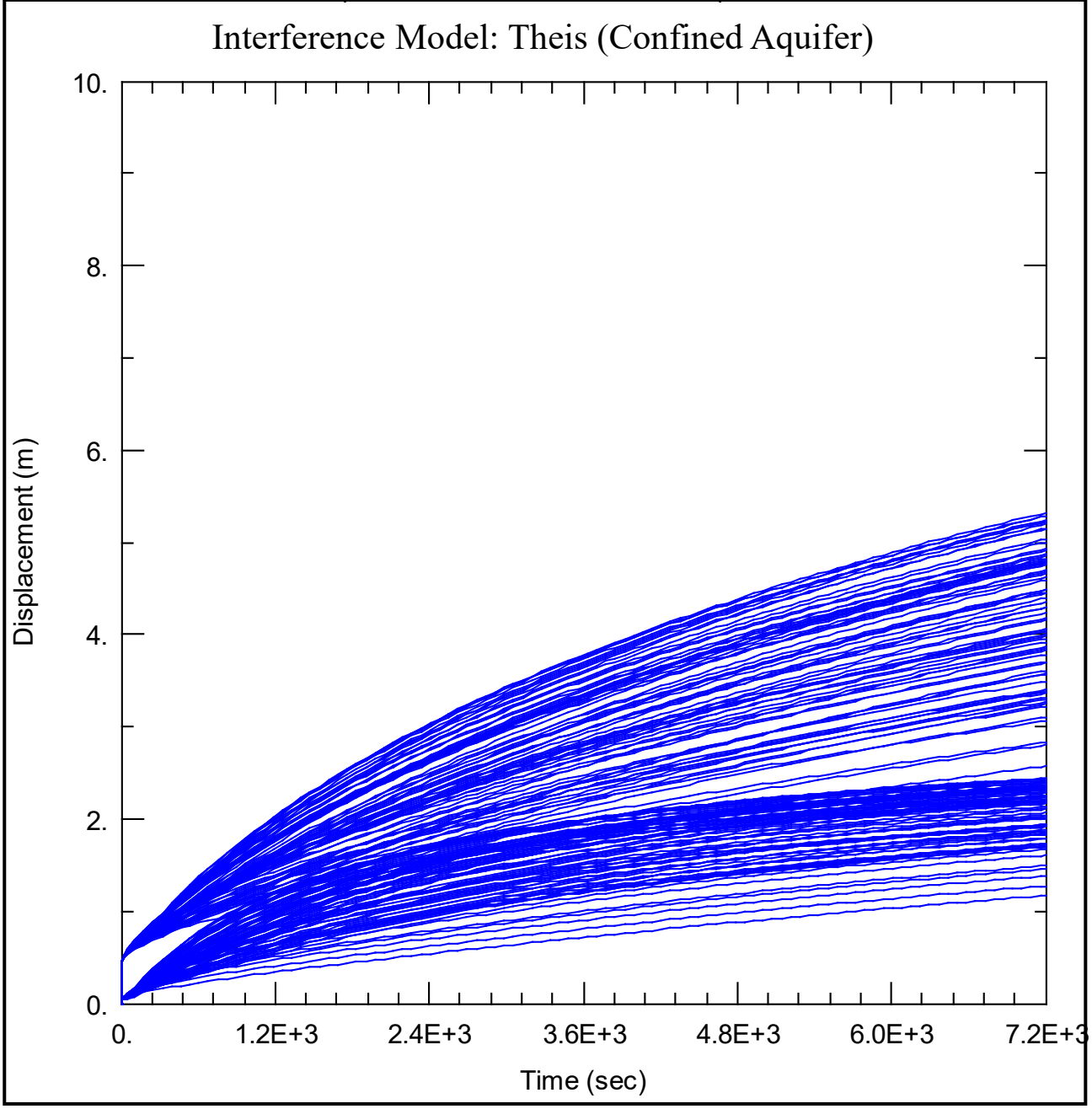
APPENDIX H

Well Interference Simulation

Report to: ARK Engineering and Development
Project: 100554.003 (May 2, 2025)

GEMTEC
Consulting Engineers and Scientists

Pumping Test Analysis Report		
Project: Hydrogeological Investigation		
Project Number: 100554.003		
Client: ARK Engineering and Development		
Location: 1600 Stagecoach Road, Greely, Ontario		
Model Created by: SE	No. of Pumping Wells: 71	Duration: 2 hours
Aquifer Thickness: 55 m	Software: Aqtesolv	Pumping Rate: 18.9 L/min
Transmissivity: 49.3 m^2/day	Storativity: 5 x 10^{-5}	



APPENDIX I

LSI Calculations

Langelier Saturation Index Calculation

Project: 100554.003
Location: 1600 Stagecoach Road
Sample ID: TW B - 6hr

Inputs

pH =	7.9	
Total Dissolved Solids =	900	
Calcium (as $CaCO_3$) =	120	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	352	
Temperature (^oC) =	10	Assumed average groundwater temperature

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

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

And:

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

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

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

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

Output:

A =	0.20
B =	2.38
C =	1.68
D =	2.55
pH_s =	7.65
LSI =	**0.25**

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

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Langelier Saturation Index Calculation

Project: 100554.003
Location: 1600 Stagecoach Road
Sample ID: TW D - 6hr

Inputs

pH =	8	
Total Dissolved Solids =	588	
Calcium (as $CaCO_3$) =	84.9	Note: Ca (as CaCO3) = 2.5 x Ca
Alkalinity (as $CaCO_3$) =	268	
Temperature (^oC) =	10	Assumed average groundwater temperature

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 =	0.18
B =	2.38
C =	1.53
D =	2.43
pH_s =	7.90
LSI =	**0.10**

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

APPENDIX J

Pre-Consultation Summary

Work Plan Review

Subject: Work Plan Review for Proposed Hydrogeological and Terrain Analysis, Proposed Residential Subdivision, Cedar Lakes Phases 3-6, 1600 Stagecoach Road, Ottawa (Greely), Ontario, prepared by GEMTEC, August 1, 2023.

Date: September 12, 2023

Reviewed Background Reports:

- Paterson Group, April 1, 2011, Terrain Analysis and Hydrogeological Study, Proposed Residential Subdivision, Part of Lot 8, Concession 3, Geographic Township of Osgoode, Ottawa (Greely), Ontario
- South Nation Conservation, December 16, 2015, Re: Hydrogeological Study Performance Report("Report"), Proposed Phase 2 Development, Cedar Lakes Subdivision, Ottawa (Greely), Ontario, Prepared by Patterson Group Inc., September 4, 2015 and Cedar Lakes Subdivision – Hydrogeological Study Performance Report, Response to SNC comments ("Response Letter"), Prepared by ARK Engineering and Development, November 13, 2015.
- Ontario Municipal Board, June 17, 2016, Case NO(S) PL101449, PL140495

Attendees

Jeffrey Ostafichuk (JO)	City of Ottawa
Kevin Hall	City of Ottawa
Andrius Paznekas (AP)	GEMTEC
Daniel Payer	ARK Engineering
Rob Kell (RK)	Dillon
Angella Graham (AG)	Dillon
Matt McCurdy (MM)	Dillon
Minoo Yazdanpanah (MY)	Dillon

Notes

Item	Discussion
	Introduction of Attendees
	Hydrogeological Investigation
1.	Five drilled groundwater test wells will be utilized for the hydrogeological investigation (to satisfy the Ministry of the Environment, Conservation and Parks (MECP) Procedure D-5-5 requirements for sites up to 40 hectares). The test wells include three existing wells (TW-A, TW-B, and TW-C), and two proposed test wells (TW-D and TW-E). It should be noted that these test wells have been renamed to avoid confusion with other wells in the area. • TW-A and TW-C are existing from previous investigations. These two wells do not have 40 m of the well casings; however, sleeves will be installed to 40 m to meet the targeted casing depth. • TW-B is installed in the City's Park and has a 40-meter casing. • TW-D and TW-E are proposed wells that will be drilled and cased to 40 m depth as part of this study. Test well construction will be supervised and documented by

Item	Discussion
	GEMTEC field staff, which will include lithological logging, test well construction, well grout inspection, and well chlorination. • TW-A and TW-C will be chlorinated during extension. TW-B will be chlorinated 24-48 hours before the pump test. Residual chlorine levels will be monitored before water quality sample collection. • The integrity of each existing test well will be assessed before use and replacement / new wells used, if necessary. • Test wells will be adequately distributed across the area for proper characterization and analysis.
2.	As noted above, the TW-A and TW-C casing will be extended to 40 metres with 4-inch casing. • Whether TW-A and TW-C will be used in the future development depends on pending lot planning confirmation. If designated for development, input on the suitable pump for the 4-inch well can be provided. The proposed TW-D and TW-E are planned for a potential development site where they can be used as supply wells. If these wells are unsuitable for future development, abandonment will be considered.
3.	MECP Water Well Records in the vicinity of the site will be reviewed. This includes records in Cedar Lakes Phases 1 and 2 to assess whether the well construction and casing length recommendations were followed.
4.	Water well surveys and sampling will be conducted at nearby private residences to assess the characteristics of water available in the vicinity of the subject site and comply with MECP Procedure D-5-5 and well construction recommendations. • Dillon recommends that private well survey letters be distributed to all neighbours, rather than pre-selecting only five wells. The letters would ideally be distributed using registered mail, creating a reference of the attempted correspondence if property owners later suggest they were not contacted. The City prefers to have this type of record, as most future complaints come through them. • It is also recommended that when selecting wells for the survey, those with a depth of 40 meters or more (targeted aquifer) are distinguished from shallower wells, so as to address potential interference. • GEMTEC proposed giving all adjacent homes the opportunity to participate in the well survey questionnaire, with a first-come, first-serve approach for sampling. If this approach is taken, rationale must be provided for why it is adequate, and that nearby property owners are satisfied with their level of involvement.
5.	The six hour constant flow rate pump tests will be conducted on each of the five test wells, including water level measurements and water sampling (two samples per pump test) in each of the groundwater test wells. • Samples will be submitted to an accredited laboratory for 'subdivision package' parameters, after three and six hours of pumping, and 'trace metal' analyses after six hours of pumping. Field parameters and free and total chlorine will be monitored in

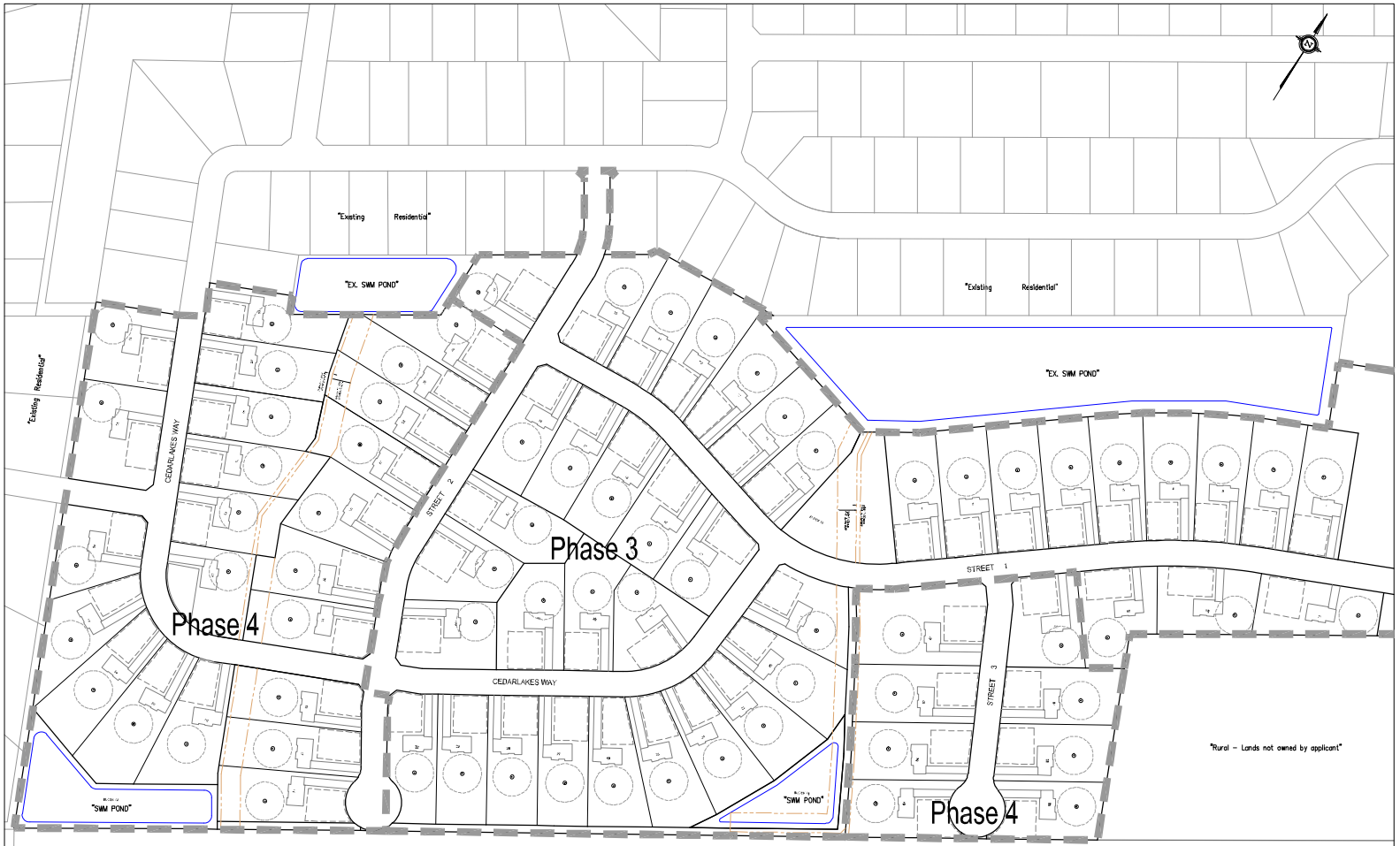
Item	Discussion
	the field during the pump tests. Analytical results will be compared to applicable criteria (ODWS). • All the test wells will be instrumented with water level data loggers, and a barologger will be used onsite. • Pre and post pump test groundwater level monitoring should be completed at each test well during static conditions. • Observation data will also be collected from nearby overburden monitoring wells during each pump test. • The pumping rate flow will be dependent on each individual well. GEMTEC will try to maximize the rate to facilitate the larger hydraulic response but generally use a target maximum rate of 80 L/minute (20 US Gal/min).
5.1.	Radon has been identified as an issue in the area and testing of radon is recommended. The investigation should take into account the recent information/suggestions provided by the City (Tessa Di'Iorio).
5.2.	Pump test water level data will be analyzed to estimate the transmissivity and storativity of the groundwater supply aquifer, including drawdown and recovery graphs of each well pump test. Interference effects between wells within the proposed residential subdivision will be modelled.
5.3.	Long term water level monitoring will be conducted in at least two test wells to monitor potential interference between the proposed development and daily water use within Phases 1 and 2 of Cedar Lakes, which is operating at a denser lot distribution than the proposed Phases 3-6. • GEMTEC has proposed that long-term monitoring will span from a few weeks to couple of months, as seasonal variations generally do not impact interference between the wells. • Dillon recommends longer-term monitoring over several seasons (as per Section 8.2.5 of the guidance document), and if an alternative approach is taken (e.g., reducing the monitoring period), strong rationale must be provided for why that data is adequate.
	Terrain and Septic Impact Assessment
6.	Information from previous site investigations (e.g., Paterson, 2011) will be used for assessing soil conditions, as wells as supplemented with the drilling of 3 overburden monitoring wells. • Dillon suggests conducting an additional test pitting or drilling program in previously unexplored areas, particularly in the southwestern region of the site. If a more limited dataset is used for characterizing the site, strong rationale must be provided why that is adequate.
7.	Overburden monitoring wells will be strategically placed to aid in monitoring shallow groundwater quality (e.g., elevated levels of nitrates) in the shallow groundwater, and the hydraulic connection of the overburden aquifer with the bedrock aquifer during pumping tests of nearby test wells (all monitoring wells).
7.1.	For monitoring background nitrate levels across the site, GEMTEC suggests that conducting one

Item	Discussion
	round of overburden nitrate sampling will be adequate, unless elevated levels are detected (i.e., greater than the 2.5 mg/L specified in the guidance document). • Dillon suggests that monitoring to assess nitrate levels be conducted over a longer period, and that if a more limited approach is taken, strong rationale must be provided (e.g., reference to other representative data, how seasonality may impact results, etc.). Alternatively, sampling could be conducted during conditions that roughly correspond with seasonal variations in moisture content, such as following significant rain events and dry periods. • The monitoring program should also consider potential impacts on neighbouring wells with shallower casings. This might include collecting strategic nitrate samples from specific water supply wells during the private well survey/sampling.
8.	Infiltration rates will be assessed by conducting infiltration testing using a Guelph Permeameter at six locations. • Samples will collected at each location for grain size analysis; however, enough grain size samples will be collected to adequately characterize all the various soil types present across the site.
8.1.	As part of the Impact Risk Assessment for the proposed on-site sewage systems, a water balance is typically required for the site. • It was suggested that a water balance is not required given the reduced number of lots and increase in pervious area; however, Dillon suggests that a water balance still be conducted given the vulnerable underlying aquifer, and historical high nitrate levels at the site. If a water balance is not completed, corresponding rationale for any assumptions or findings must be provided. It should also be noted that a water balance will be required as part of the stormwater management assessment and report. • It was also previously noted that the site is located within the Shields Creek Subwatershed Study Area, which would require the site to maintain recharge rates after development and necessitate a water balance to demonstrate this would be the case; however, it appears that the site actually lies just outside this area and is therefore not subject to those requirements. That being said, and as noted above, rationale must still be provided for not completing a water balance at the site. • Regarding whether stormwater pond area can be included in as a recharge area for nitrate loading calculations; the conventional approach (and the guidance document) suggests that this area should be excluded. Dillon recommends adherence to this methodology. Given the larger lot sizes, it is unlikely to be a concern.
	Other Discussion Subjects
9.	Lot Fabric: • The concept plan showing the location of the septic and well for each lot will be provided.
10.	Cumulative Well Supply Impact Assessment: • It should be noted that evaluating the impact not only on the targeted aquifer but also on shallow wells is important.

Item	Discussion
11.	Watercourse and Wetland: • Dillon specified the necessary setback distance from wetlands and watercourses when planning lot fabrication. Also, they confirmed that the setback area cannot be utilized for lot fabric or septic systems. • It was then noted that watercourses run from north to south and have been artificially constructed for Phase 1 and 2. Historically, there were no natural watercourses on the site. There is a registered municipal easement with a 15-meter maintenance corridor indicated on the title. There are no wetlands present on the site.
12.	Existing PTTW: • An existing PTTW (license 7184-BZ5SAE) for groundwater and surface water dewatering was noted, which included 1,500,000 liters/day, dated March 25, 2021 to March 26, 2026 at two locations on the site. • GEMTEC confirmed that the existing PTTW is for the construction of the ponds. There is no ongoing water taking and the permits are for construction purposes.

APPENDIX K

Conceptual Lot Development Plan
(ARK Engineering)



ARK Engineering and Development
2691 Old Highway 17
Rockland ON Canada
K4K 1K7
Tel: (613) 858-6443

Responsibility / Copyright Reserved

The location of underground utilities and structures are not necessarily shown on the contract drawings, and/or where shown. The accuracy of the position of such utilities and structures is not guaranteed. The Contractor shall verify and be responsible to determine the exact location of all such utilities and structures and assumes all liability for any damage to them.

Legend

POND WATER LIMIT

PROPOSED WELL LOCATION (7.6 15m MINIMUM OF STEEL CASING AS PER GEMTECH'S HYDROGEOLOGICAL INVESTIGATION RECOMMENDATIONS, DATED XXX, 2025)

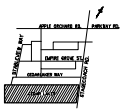
15.0m MINIMUM RADIUS SEPARATION DISTANCE FROM DRAINAGE EASEMENTS

AREA OF THE SEPTIC ENVELOPE (800m² MIN.) AS PER SECTION 4.2.7 – POLICY 9

General Notes

1) ALL SEPTIC SYSTEMS MUST BE LOCATED IN THE FRONT OF PROPERTY

Key Plan



Revision

4	SUBMITTED FOR APPROVAL	MAR 13/25

Seal

Client / Project

6980848 CANADA CORPORATION

CEDAR LAKES SUBDIVISION

Drawing Name

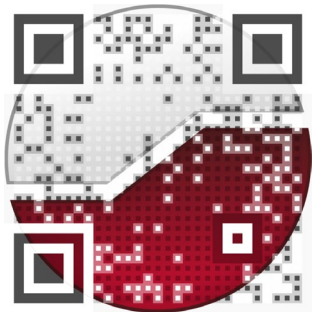
LOT DEVELOPMENT PLAN

Scale

1:1500 0 15 45 75m

Revision	Sheet	Drawing No.
REV-0	1 of 1	LD-1

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnementale
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité