HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

- O'Connor Bros. Corp. -

1370 King Street, Manchester
Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog, Ontario

December 30, 2020

Reference No.: R15-635

Prepared for

O'Connor Bros. Corp.

GRACE & ASSOCIATES INC.
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HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

- O'CONNOR BROS. CORP. -

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

1.0 INTRODUCTION

This hydrogeological assessment report has been prepared on behalf of Mr. Sean O'Connor of O'Connor Bros. Corp. (hereinafter referred to as O'Connor) proponent of the proposed development of the subject property located at Part Lot 13, Concession 4, Former Township of Reach, Township of Scugog, Regional Municipality of Durham, Ontario (Refer to Figure 1, Location Map).

The proposed development involves the creation of an nine (9) lot residential subdivision with access to King Street. The total development area is 2.973 hectares (7.35 acres). The proposed residential lots range in size from 0.31 to 0.40 hectares (0.77 to 0.99 acres) and will be privately serviced for water and sewage disposal (Refer to Figure 2, Proposed Development).

The proposed development is currently zoned Future Development (FD) Zone. The subject property was created by consent application LD 100/2018 (consent to sever a 2.972 hectare vacant non-farm related rural residential parcel of land, retaining a 93.33 hectare agricultural parcel of land).

This report has been prepared in accordance with the MoEE *Hydrogeological Technical Information Requirements for Land Development Applications* (MoEE, 1995) for review by the Township of Scugog Planning Department. This report presents (i) the findings of the hydrogeological investigation, (ii) an assessment of the area groundwater resources, (iii) the results of pumping tests conducted on three on-site wells, (iv) the water quality analyses results of groundwater samples collected during the pumping tests, and (v) conclusions and recommendations for the proposed residential development.

2.0 WORK PROGRAM

The hydrogeological assessment consisted of a soil and shallow groundwater investigation and a hydrogeological investigation to assess water quality and quantity for the proposed development. The following work program has been completed:

1. *Compilation and review of local and regional geological and hydrogeological resources;*

2. *Excavation of two (2) test pits and advancement of seven (7) boreholes to explore shallow subsurface soil and groundwater conditions across the site and the monitoring of static water levels in test pit standpipes and borehole monitoring wells;*

3. *Laboratory analysis of seven (7) representative soil samples for grain size distribution, moisture content; estimating percolation rate and T-time for tile bed sizing and design requirements;*

4. *A door-to-door survey of neighbouring wells to document well owner's comments on quality and quantity and to collect water samples for nitrate and microbiological testing;*

5. *Collection of shallow groundwater samples from the on-site test pit standpipes and monitoring wells for nitrate concentrations in the shallow receiving zone;*

6. *A 6 hour constant rate pumping test conducted on three (3) on-site drilled wells;*

7. *Water quality analyses of samples collected from the pumped wells in accordance with the MECP Hydrogeological Technical Information Requirements for Land Development Applications;*

8. *Preparation of this report to present the factual data collected and provide conclusions and recommendations for the proposed private servicing for the residential lot development.*

3.0 PHYSICAL SETTING

3.1 Geology

Bedrock Geology: The study area is underlain by fine- to coarse-grained, fossiliferous, commonly nodular, argillaceous limestone of the Collingwood Member of the black, organic-rich, fissile, very fine-grained limestone of the Lindsay Formation (OGS, 2011).

Physiography: The physiography of the study area is reflected in the landforms which were formed during glacial periods of the Pleistocene Epoch, 23,000 to 10,000 years before present. The Ontario Geological Survey Miscellaneous Release Data 228, identifies the development area is underlain by physiographic unit 34 Schomberg Clay Plains (Refer to Figure 3, Physiography).

Surficial Geology: The Ontario Geological Survey Miscellaneous Release Data 128, identifies the development area is underlain predominately by glaciolacustrine deposits consisting of silt and clay (massive to laminated or rhythmically bedded, basin deposits). Surficial deposits underlying the area are greater than 15 metres in thickness as reported in Aggregate Inventory Paper 95 (OGS, 1986).

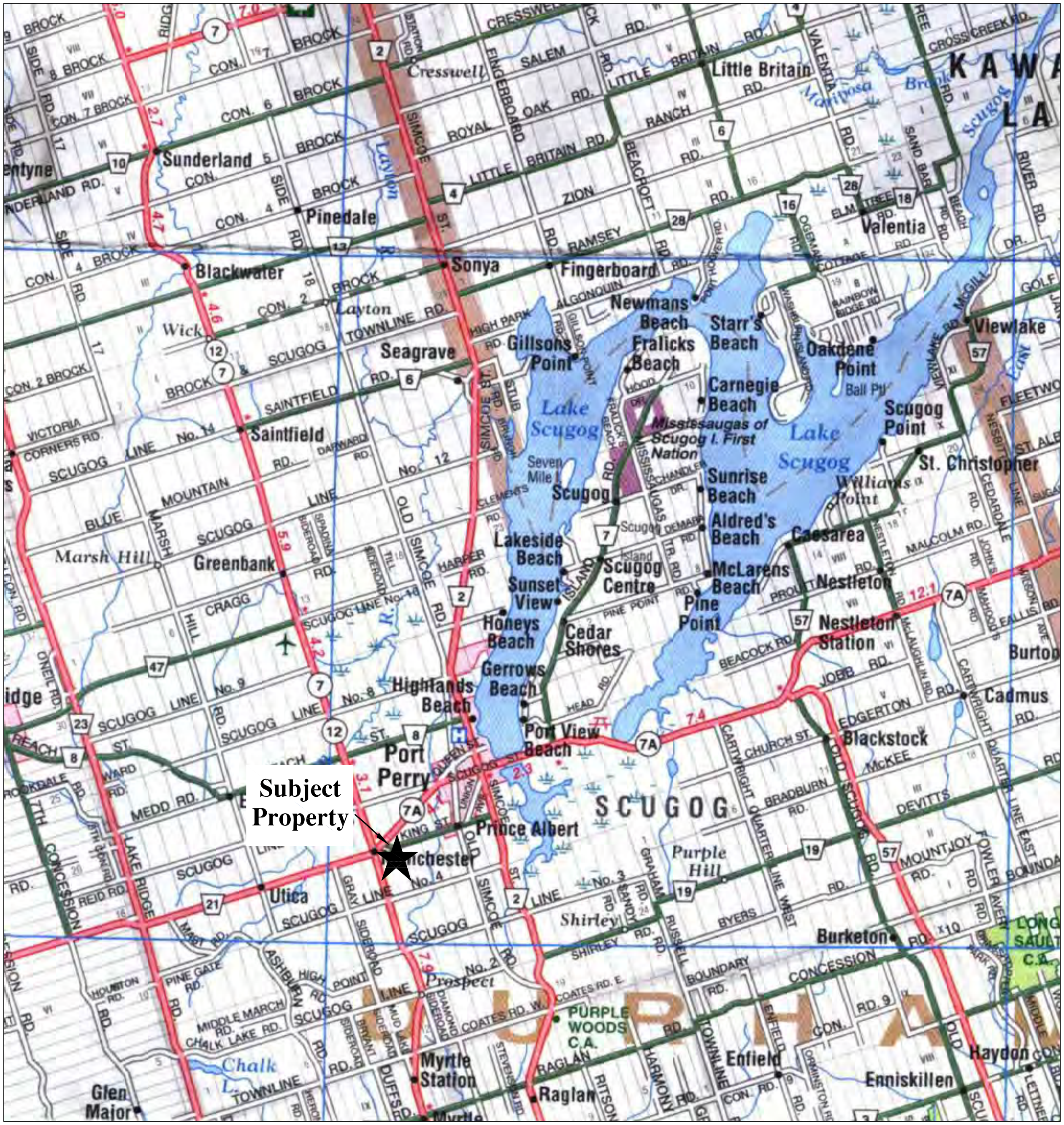
Topography: The topographical relief of the study area ranges from 275.20 metres at the northwest corner of the site to 283.98 metres at the southeast corner of the property (Refer to Appendix A).

3.2 Hydrogeology

Hydrogeologic conditions were inferred from topographic and surficial geology maps and Ministry of the Environment, Conservation and Parks (MECP) water well records. Since the water table tends to form a subdued replica of the surface topography, local shallow groundwater flow direction is inferred to be westerly-northwesterly to an unnamed watercourse at the west property boundary with northwesterly discharge to the Nonquon River then eventual northeasterly discharge to Lake Scugog.

3.3 Watercourses and Lakes

No watercourses are located on the subject property.



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

★ Subject Property

Base Map: Rand McNally, Ontario Provincial Road Atlas.

TITLE

LOCATION MAP

CLIENT

O'Connor Bros. Corp.

GRACE & ASSOCIATES INC.
Geological & Environmental Consultants

DRAWN

R15-635

DATE

December, 2020

FIGURE NO.

1



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

- Property Boundary
- Proposed Severance Lot
- Existing Drilled Well

N

Scale: 1:1,500

0 30 60 m

Property boundary, lot dimensions, and topography obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.
Proposed Severance obtained from Clark Consulting Services Draft Plan of Subdivision, dated February 2020.

Building footprints obtained from public sector Information made available under The Regional Municipality of Durham's Open Data Licence.

TITLE

PROPOSED
DEVELOPMENT

CLIENT

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Geological & Environmental Consultants

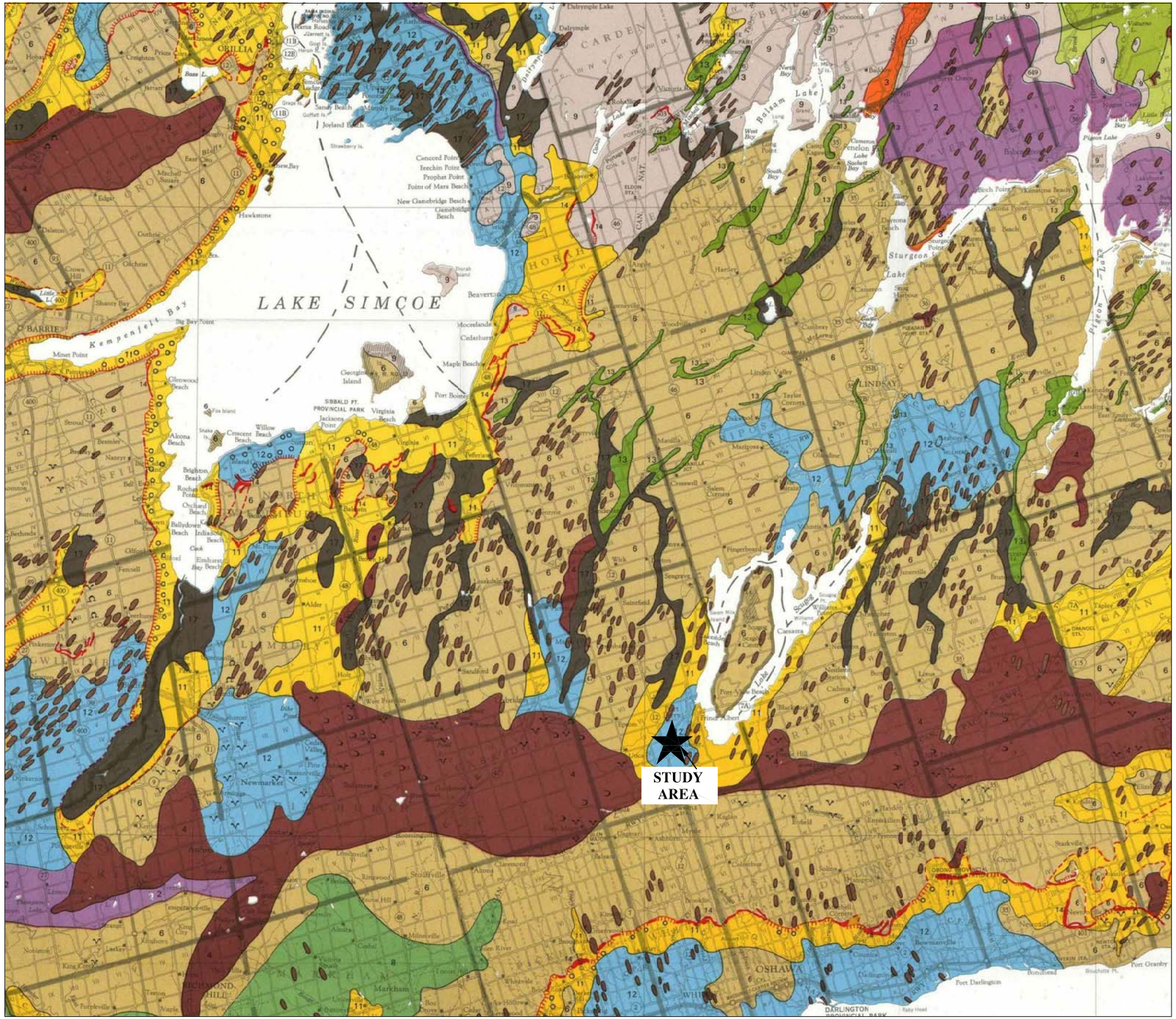
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DATE
December, 2020

FIGURE NO.
2

Hydrogeological Assessment
Proposed 8 Lot Subdivision

Part Lot 13, Concession 4
Former Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario



LEGEND

1 ESCARPMENTS
2 TILL MORAINES
3 SPILLWAYS
4 KAME MORAINES
5 TILL PLAINS (UNDRUMLINIZED)
6 TILL PLAINS (DRUMLINIZED)
7 DRUMLINS
8 BEVELLED TILL PLAINS
9 LIMESTONE PLAINS
10 SHALE PLAINS
11 SAND PLAINS
12 CLAY PLAINS
13 ESKERS
14 BEACHES AND SHORECLIFFS
15 SHALLOW TILL AND ROCK RIDGES
16 BARE ROCK RIDGES AND SHALLOW TILL
17 PEAT AND MUCK

SYMBOLS
18 BOULDER PAVEMENT
19 SAND DUNES
20 DISSECTED TERRAIN
21 MUD FLOW SCARS

Source: Map 2226 Physiography of the South Central Portion of Southern Ontario, L.J. Chapman and D.F. Putnam. 1984.

TITLE

PHYSIOGRAPHY

CLIENT

O'Connor Bros. Corp.

GRACE & ASSOCIATES INC.
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R15-635	3
DATE	
December, 2020	

4.0 SUBSURFACE INVESTIGATION

Grace & Associates Inc. explored shallow soil and groundwater conditions by conducting a phased approach with (i) a preliminary test pit program, (ii) the advancement of seven (7) boreholes and the installation of seven (7) monitoring wells, and (iii) the drilling of three wells.

Soil samples were collected the test pit and borehole programs for site characterization and laboratory analyses. Groundwater samples were collected between 2015 to 2019 from the test pit monitors and monitoring wells for submission to laboratory for nitrate analysis to identify groundwater concentrations and to determine trends post on-site agricultural practices.

Wells were primarily used for conducting aquifer pumping tests in 2019 after favourable nitrate concentrations in the groundwater were reached.

The test pits and boreholes were systematically logged and representative soil samples were collected for laboratory analysis (Refer to Appendix B, Logs and Grain Size Distribution Curves).

Figure 4 presents the locations of the monitoring wells.

4.1 Test Pit Excavations

On-site shallow soil conditions were explored on September 15, 2015 by excavating two (2) test pits to depths ranging from 2.30 to 2.72 metres below grade by Winn Excavating using a Yanmar VIO27 rubber tired backhoe under the supervision of Grace & Associates Inc. The test pits were systematically logged and representative soil samples were collected for laboratory analysis. All test pits were dry upon completion.

Each test pit was equipped with a slotted PVC standpipe to monitor the shallow groundwater flow zone. Due to challenging site conditions, excavation of test pits was terminated after two test pits in favour of advancement of boreholes.

4.2 Borehole Drilling

On-site soil and groundwater conditions were explored on November 23, 2015 by drilling seven (7) boreholes to depths ranging from 2.95 to 4.60 metres below grade by Strata Soil Sampling Inc. under the supervision of Grace & Associates Inc. Drilling was completed using a Geoprobe 7822DTdirect push machine. Monitoring wells with locked plugs were installed in all boreholes for the collection of representative groundwater samples.

4.3 Percolation Rates

Soil conditions were found to be generally uniform across the site (Refer to Appendix B, Logs). A silty sand, medium to dark brown topsoil, ranging in thickness from 0.3 to 0.45 metres, is underlain by (i) moderately compact, mottled greenish-grey tan, silt and sand, and (ii) coarse sand with little silt and gravel starting at about 2 metres below grade. Moist to saturated soils were encountered in all boreholes at depths below 1.5 metres below grade.

Table 1 presents a description and the hydraulic conductivity of the soils analyzed.



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

- Property Boundary
- Proposed Severance Lot
- A⊢⊣A' Geological Cross-Section *(Refer to Figure 6, Geological Cross Section)*

Borehole/Groundwater Monitor Location
Borehole ID — Monitor ID
Water Level (mASL) — Grade (mASL)

Drilled Well (Monitor)
Well ID
Water Level (mASL) — Grade (mASL)

Test Pit Location
Test Pit ID
Water Level (mASL) — Grade (mASL)

Water level measurements in test pit standpipes, borehole monitoring wells, and test wells obtained on March 18, 2020.

N

Scale: 1:1,500
0 30 60 m

Aerial Photograph source: Esri, DigitalGlobe, and the GIS User Community, dated August 23, 2016.
Property boundary and lot dimensions obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.
Proposed Severance obtained from Clark Consulting Services Draft Plan of Subdivision, dated February 2020.

TITLE

MONITORING LOCATIONS

CLIENT

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Geological & Environmental Consultants

DRAWN	FIGURE NO.
R15-635	4
DATE	
December, 2020	

TABLE 1
GRAIN SIZE DISTRIBUTION ANALYSES RESULTS

Location	Sample No.	Depth (mbg)	Description	K value (cm/sec)	T-Time (min/cm)
TP-1	1	1	SILT, Trace Sand	2.3×10^{-5}	35
TP-2	2	1.5	SILT and SAND, Trace Gravel	5.4×10^{-5}	15
BH-2	1	1.1	SILT, Trace Sand, Trace Gravel	3.3×10^{-5}	35
BH-4	1	1.1	SILT, Trace Sand, Trace Gravel	5.1×10^{-5}	35
BH-5	2	2.3	SILT, Trace Sand, Trace Gravel	3.7×10^{-5}	35
BH-6	1	1.2	SILT, Little Sand, Trace Gravel	3.5×10^{-5}	25
BH-7	1	1.1	SILT and SAND, Trace Gravel	1.4×10^{-4}	15

Percolation rates (T-times) used for the leaching bed design were estimated by matching the grain size distribution curves with type curves in the *Ontario Building Code and Guide for Sewage Systems, June 1997*, as periodically updated. T-times for tested soil samples ranged between 15 and 35 min/cm across the site as presented in Table 1, Grain Size Distribution Analyses Results.

Percolation rates at other locations may vary from those estimated at test pit locations. Soil structure, as well as the grain size can significantly influence percolation rates due to density, layering, fissuring and biological activity.

4.4 Shallow Groundwater Flow Direction

Slotted standpipes and groundwater monitors were installed in each test pit and borehole respectively to monitor the shallow water table. Monitoring was conducted from December 10, 2015 to September 16, 2020 to determine seasonally variations within the shallow water table. Selected static water levels are presented in Table 2, Static Water Level Monitoring.

The calculated average static water levels in all monitors during the 2015 to 2020 monitoring period ranged from 0.76 (MW-2) to 1.70 (TP-2) metres below grade with an average of all monitors of 1.27 metres below grade.

Shallow water table levels were reported to be highest in early spring 2017 and early winter 2018 and the lowest in late spring 2018. Seasonal fluctuations across the site range from 2.59 metres in monitor MW-7 to 0.99 metres in monitor MW-2, with an average seasonal groundwater fluctuation across the site of about 2.12 metres.

In general, the water table is a subdued replica of the local topography, with the depth to the shallow water table being greatest at the east property boundary and the shallowest at the west property boundary. Based on the topography and the monitored static water levels, the shallow groundwater flow direction on the site is west-north-westerly (Refer to Figure 4, Monitoring Locations).

TABLE 2
STATIC WATER LEVEL MONITORING

	Monitoring Date																		
	12-10-2015	07-06-2016	12-28-2016	05-04-2017	12-05-2017	12-07-2017	05-29-2018	05-31-2018	11-28-2018	06-14-2019	09-25-2019	11-17-2019	11-21-2019	03-18-2020	09-16-2020	AVERAGE	MAX	MIN	DIFFERENCE
Monitor ID	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**(mbg)**	**SL (mbg)**	**SL (mbg)**	**SL (mbg)**	**SL (mbg)**
MW-1	1.23	1.84	1.49	0.75	1.06	1.09	1.22	1.29	0.92	0.98	2.54	1.12	0.94	0.90	2.83	**1.35**	**2.83**	**0.75**	**2.08**
MW-2	0.64	1.03	0.48	0.53	0.57	0.51	0.80	0.78	0.51	0.60	1.30	0.63	0.49	0.66	1.47	**0.73**	**1.47**	**0.48**	**0.99**
MW-3	1.02	1.36	0.67	0.68	0.84	0.87	1.03	1.16	0.52	0.91	2.25	0.81	0.68	0.78	2.72	**1.09**	**2.72**	**0.52**	**2.20**
MW-4	1.01	1.61	0.95	0.93	0.93	0.95	0.96	0.68	0.85	1.00	2.76	0.98	0.87	0.93	3.25	**1.24**	**3.25**	**0.68**	**2.57**
MW-5	0.84	1.45	0.68	0.71	0.84	0.81	1.10	1.06	0.71	0.89	2.84	0.75	0.67	0.74	3.24	**1.16**	**3.24**	**0.67**	**2.57**
MW-6	1.06	1.62	0.88	0.84	0.87	0.95	1.32	1.33	0.79	0.92	2.27	0.93	0.79	0.88	2.77	**1.21**	**2.77**	**0.79**	**1.98**
MW-7	1.24	1.93	2.06	0.70	1.03	1.11	1.34	1.28	0.48	0.82	2.77	1.00	0.89	0.65	3.07	**1.36**	**3.07**	**0.48**	**2.59**
TP-1	1.10	1.87	0.95	0.80	0.88	0.84	1.11	1.12	-0.01	-	1.91	1.02	-	0.85	1.84	**1.10**	**1.91**	**-0.01**	**1.92**
TP-2	1.92	Dry	1.66	1.00	0.51	0.69	1.80	1.87	1.05	1.38	Dry	1.96	-	1.11	2.65	**1.47**	**2.65**	**0.51**	**2.14**
Average	**1.12**	**1.59**	**1.09**	**0.77**	**0.84**	**0.87**	**1.19**	**1.17**	**0.65**	**0.94**	**2.33**	**1.02**	**0.76**	**0.83**	**2.65**	**1.19**	**2.66**	**0.54**	**2.12**
Max	**1.92**	**1.93**	**2.06**	**1.00**	**1.06**	**1.11**	**1.80**	**1.87**	**1.05**	**1.38**	**2.84**	**1.96**	**0.94**	**1.11**	**3.25**	**1.47**	**3.25**	**0.79**	**2.59**
Min	**0.64**	**1.03**	**0.48**	**0.53**	**0.51**	**0.51**	**0.80**	**0.68**	**-0.01**	**0.60**	**1.30**	**0.63**	**0.49**	**0.65**	**1.47**	**0.73**	**1.47**	**-0.01**	**0.99**

Note:
Monitoring locations presented on Figure 4

5.0 HYDROGEOLOGY

General information regarding local hydrogeologic conditions was obtained from (i) a review of the published MECP water well records, (ii) on-site pumping test investigations, (iii) collection and analysis of water samples to characterize groundwater quality, and (iv) published reports and maps on surficial geology, physiography, and regional groundwater resources.

MECP water well records within 500 metres of the site are presented in Appendix C. Wells were located based on their UTM coordinates provided on the records. Selected well data is summarized in Table 3, and well locations are presented on Figure 5, Water Well Locations.

5.1 Water Well Summary

Seventy-five (75) water well records were identified within 500 metres of the proposed residential development, which include final status classification of:

- 49 records: well supply;
- 14 records: monitoring and test hole/observation wells/test hole;
- 6 records: abandoned-other/quality/supply;
- 5 records: unknown; and,
- 1 record: dewatering

The well supply records presented in Table 3 include water use for domestic (40), commercial (5) public (2), livestock (1), and irrigation purposes. All wells obtain water from the overburden aquifer at an average depth of 36.4 metres, with yields ranging between 7.6 and 113.6 L/min. Static water levels range in the overburden aquifer between 0.3 and 18.1 metres with an average of 4.2 metres below grade. The stratigraphic units underlying the subject property are presented in Figure 6, Geological Cross Sections.

The three (3) on-site drilled wells obtain water from a sand (TW-2 and TW-3) and gravel (TW-1) overburden aquifer at an average depth of 52 metres (TW-2 and TW-3). The water found depth was not completed in the TW-1 well record; however, an inferred depth of 35.7 metres (using comparable water found equal to well depth) indicates a shallower gravelly overburden aquifer. The recommended pumping rate for all three wells is 34.1 L/min. Static water levels ranged from 3.4 to 4.3 metres below grade.

Well ID 7190315 located at 1320 King Street (east of site) was drilled in 2012 and found water at 59 metres below grade with a recommended pumping rate of 30.3 L/min.

Based on the MECP well data, it is anticipated that a new well drilled on the proposed lots should obtain adequate potable water supplies at a depth of about 35 to 60 metres below grade. The three (3) wells drilled for this assessment reported water found at depths ranging from 50 to 54 metres below grade with a recommended pumping rate of 34.1 L/min.

TABLE 3
WATER WELL SUMMARY

Number of Wells	Drilled	42	86%
	Dug/Bored	7	14%
	Data N/A	0	0%
	Total	49	100%
Aquifer Sources	Overburden	47	96%
	Bedrock	0	0%
	Dry	0	0%
	Data N/A	2	4%

Recommended Pumping Rate	Average	34.4 L/min	(7.6 igpm)
	Range	7.6 - 113.6 L/min	(1.7 - 25 igpm)
Depth Water Encountered	Average	36.4 m	(119.4 ft)
	Range	1.8 - 100 m	(16.1 - 328.1 ft)
Static Water Level	Average	4.2 m	(13.8 ft)
	Range	0.3 - 18.1 m	(1.0 - 59.4 ft)

NOTE: Data from MECP well records
N/A Data not available.

5.2 Water Quality Results

Groundwater samples were collected for nitrate and nitrite analysis from the on-site groundwater monitors during the 2015 to 2019 monitoring period, in addition to off-site samples collected during the door-to door well survey for nitrates, nitrites, and bacteriological parameters.

Nitrate concentrations in the three new test wells are presented in Section 10.1.

5.2.1 On-Site Nitrate Monitoring

Groundwater samples were collected from December 10, 2015 to September 16, 2020 from groundwater monitors MW-1, 2, 3, 4, 5, 6, and 7 for laboratory analysis of nitrate. Groundwater samples collected from the test pit standpipes on May 4 and July 19, 2017 reported nitrate concentrations of 6.70 to <0.05 mg/L (TP-1) and 2.89 to 9.81 mg/L (TP-2) respectively. Appendix F includes a table and chart of the nitrate monitoring, in addition to the Laboratory Certificates of Analyses. A summary of the results is presented in Table 4.

Nitrate concentrations reported in the samples between 2015 and 2020 ranged between a high of 17.1 mg/L to a low of 0.14 mg/L, with an average and geometric mean nitrate concentration across the proposed development site of 5.02 mg/L and 3.64 mg/L respectively.

The highest nitrate concentrations were recorded in July 2016 with an average of 9.45 mg/L and ranging from 3.11 mg/L (MW-3) to 17.1 mg/L (MW-1). The lowest nitrate concentrations were recorded in November 2019 with an average of 2.33 mg/L and a range of 0.15 mg/L (MW-5) to 6.17 mg/L (MW-2). Groundwater monitors MW-3, 4, 5, 6, and 7 reported a nitrate concentration between 0.15mg/L to 2.30 mg/L in November 2019. An average nitrate concentration of 4.10 mg/L was reported in September 2020 for monitors MW-1, 2, 3, and 4. All values reported in 2019 and 2020 are less than the maximum acceptable concentration of 10 mg/L in the (ODWS).

TABLE 4
2015-2020 ON-SITE NITRATE SAMPLING RESULTS

Map ID	Nitrate (N) mg/L			
	Geometric Mean	Average	Minimum	Maximum
MW-1	6.93	8.11	2.54	17.1
MW-2	4.67	6.48	0.14	8.06
MW-3	1.49	1.75	0.49	3.11
MW-4	3.60	4.13	1.13	8.22
MW-5	2.66	3.57	0.15	5.66
MW-6	4.34	4.95	1.98	8.24
MW-7	3.34	5.21	0.35	10.5

Long term monitoring over the past 5 years has clearly demonstrated a significant decrease in the nitrate concentrations for the proposed development. While fluctuations have occurred based on seasonal sampling and site conditions, the average nitrate concentration of the lowest values recorded within each of the monitors is 1.02 mg/L nitrate.

Decreasing nitrate concentrations are representative in part due to the discontinuation of historical agricultural practices on the subject property.

The proposed development area is not hydrogeologically sensitive and is underlain with silty sand with trace gravel.

5.2.2 Off-Site Monitoring

Groundwater samples were collected on August 16, 2018 from neighbouring dwelling wells located at 1251 and 1261 King Street for bacteriological, nitrate, and nitrite testing, during the door-to-door well survey (Refer to Appendix D). Well locations are presented on Figure 5, Water Well Locations and details of the well is presented in Appendix C, MECP Water Well Records.

The samples met the Ontario Drinking Water Standards (ODWS) for total coliform, Escherichia coli (E.coli), nitrate, and nitrite at the time of sample collection for both samples, with the exception of elevated total coliform counts at 1261 King Street.

The property owner, Mr. Billy Knight, was contacted by telephone to report the elevated bacteriological counts and given direction on disinfection and resampling protocols. Further to the request of the property owner, the laboratory was contacted to confirm the bacteriological counts.

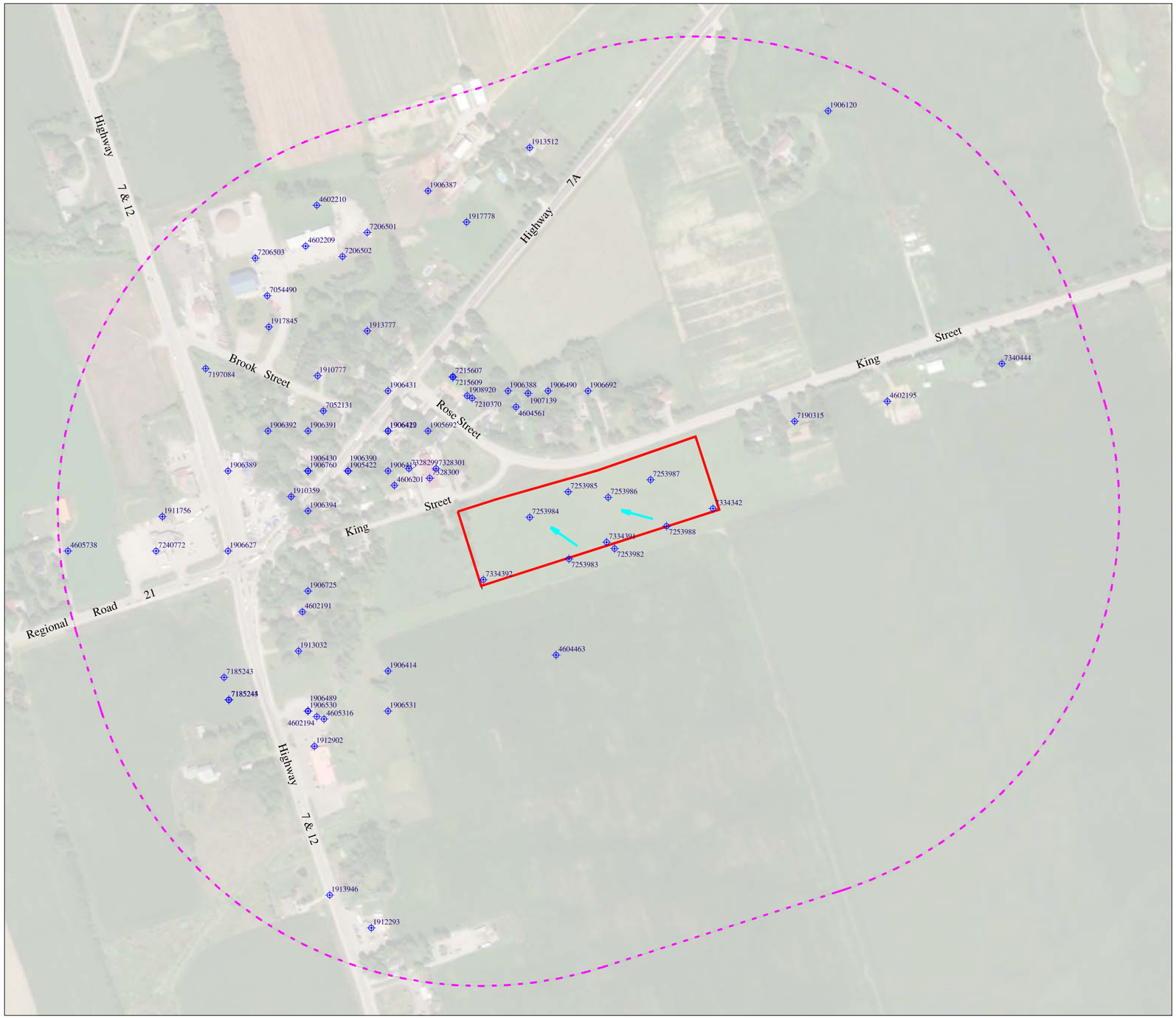
Follow-up emails were subsequently sent to the property owner providing written notification of the sampling results with a copy of the Ministry's *"Disinfection Instruction Sheet"* for guidance and following correspondence from lab confirming total coliform counts.

Table 5 presents the results of the bacteriological and nitrate analyses of the neighbouring dwelling wells.

TABLE 5
OFF-SITE NITRATE AND BACTERIOLOGICAL SAMPLING RESULTS

Map ID	Nitrate (N) mg/L	Nitrite (N) mg/L	Total Coliform cts/100mL	E.coli cts/100mL
Res. 1251	0.33	<0.05	ND	ND
Res. 1261	<0.05	<0.05	72*	ND

Note:
ND. Not Detected
* Result confirmed with lab following request from property owner.



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

- Property Boundary
- 500 metre Property Buffer
- Well ID — *MOECC Well Location
- Inferred Shallow Groundwater Flow Direction

**Well locations positioned using UTM coordinates provided in the Ministry of the Environment, Conservation and Parks Water Well Information System (WWIS) last updated April 30, 2020, © Queen's Printer.*

N

Scale: 1:5,500

0 100 200 m

Aerial Photograph source: Esri, DigitalGlobe, and the GIS User Community, dated August 23, 2016.
Property boundary obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.
Building footprints obtained from public sector Information made available under The Regional Municipality of Durham's Open Data Licence.

TITLE

WATER WELL LOCATIONS

CLIENT

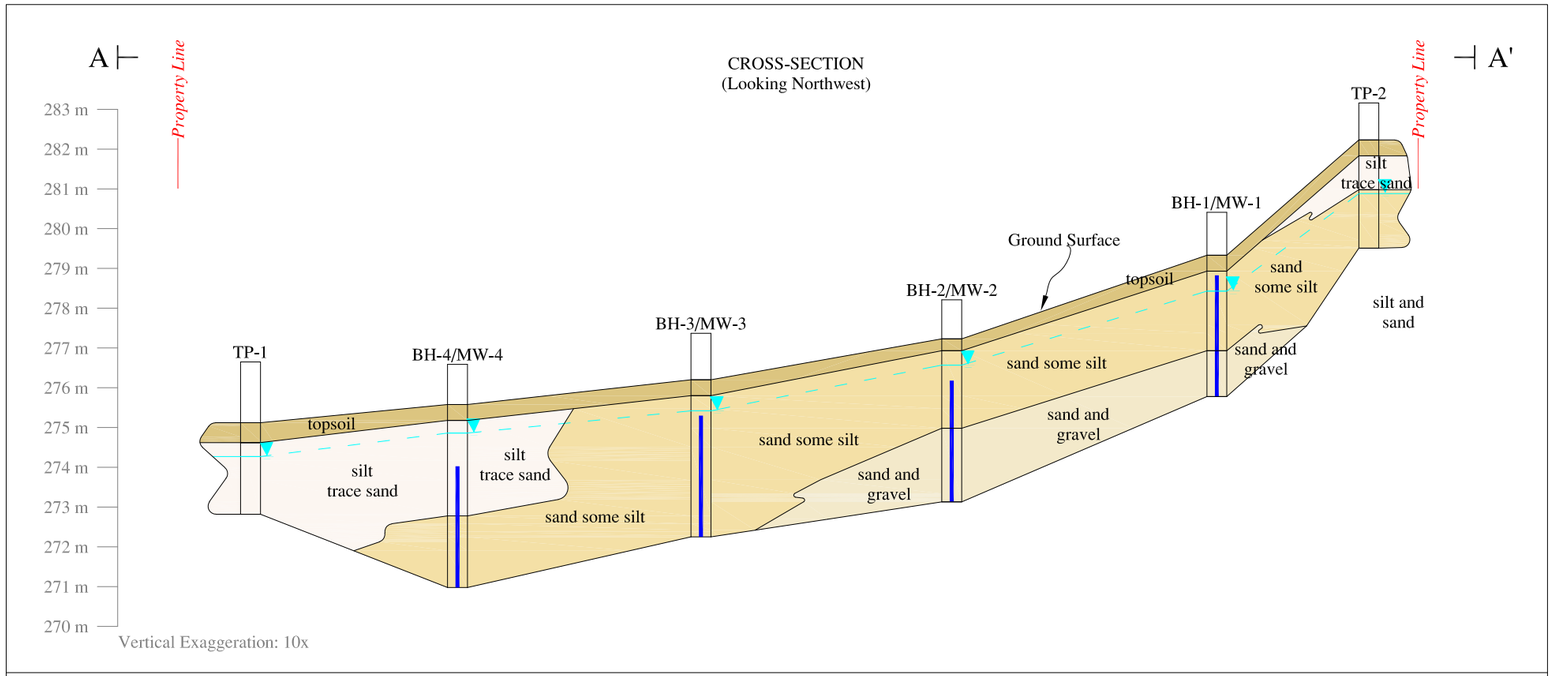
O'Connor Bros. Corp.

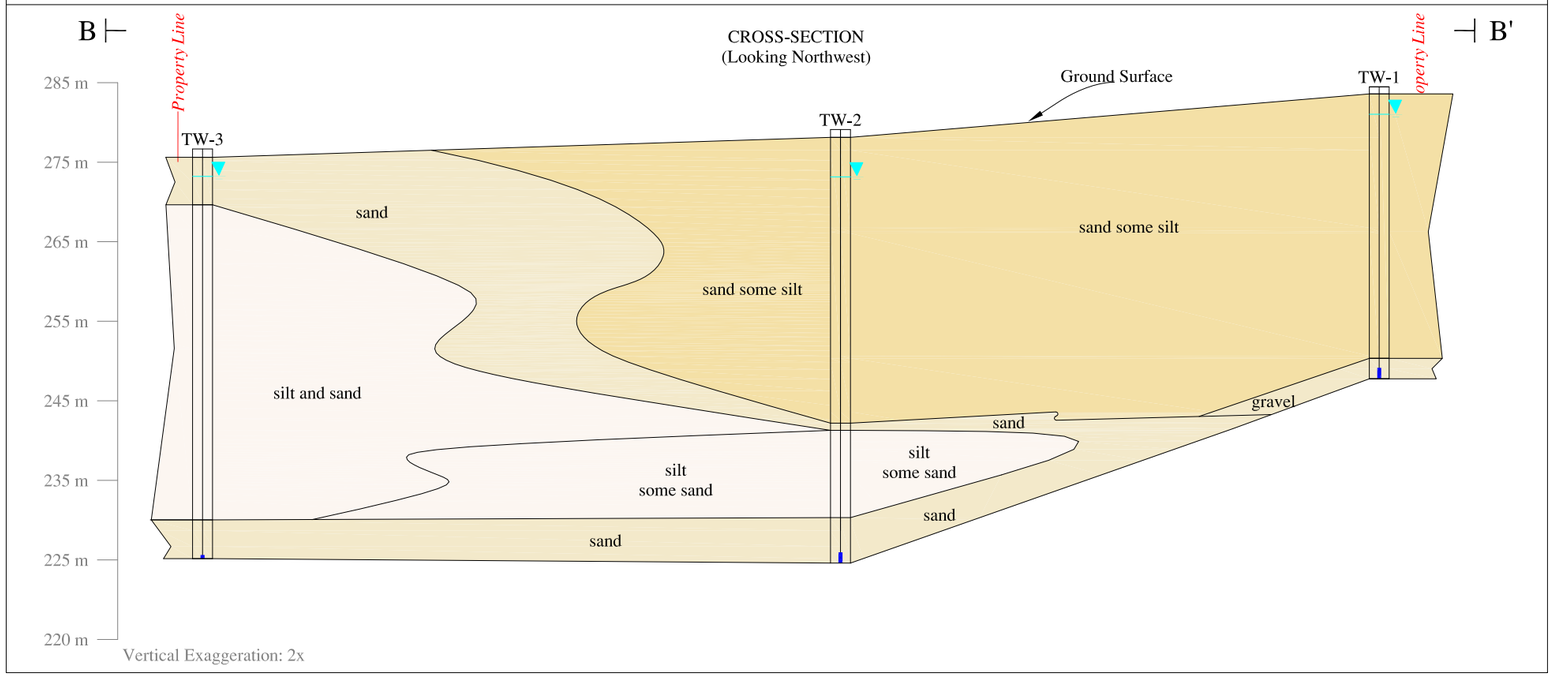
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FIGURE NO.
5





HYDROGEOLOGICAL ASSESSMENT RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

Static Water Level
(Data collected on March 18, 2020)

Well Screen
(Slot No.10 borehole; Slot No. 14 well)

Notes:

1. Stratigraphy logged by Grace & Associates Inc. on September 15, 2015 (test pits) and November 23, 2015 (boreholes).
2. Well data obtained from MECP well records (TW-1, TW-2, and TW-3), Roger Boadway Ltd., 2015.
3. Elevations obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.

Scale: 1:1,500
0 30 60 m

TITLE
GEOLOGICAL
CROSS SECTION

CLIENT
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DATE
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FIGURE NO.
6

6.0 REASONABLE USE CONCEPT

MOEE Procedure D-5-4 Technical Guideline for Individual On-site Sewage Systems: Water Quality Impact Risk Assessment reflects the Ministry's experience with development utilising individual on-site sewage systems, and emphasises the need to minimise the potential for adverse groundwater impacts resulting from their use.

For most developments, the Ontario Ministry of the Environment policy requires that sewage systems must meet the MoE's *Guideline B-7: Incorporation of the Reasonable Use Concept into MOEE Groundwater Management Activities* and *Guideline B-7-1 Determination of Contaminant Limits and Attenuation Zones* with regard to nitrate, which is a critical health-related contaminant. The policy requires that effluent be sufficiently attenuated, such that nitrate (N) concentrations at the down-gradient property boundary, are less than 10 mg/L.

A nitrate loading impact assessment was conducted for the proposed residential development based on shallow groundwater analysis to confirm current background nitrate concentrations, the soil conditions observed during the subsurface soil investigation, and published surficial geology maps of the subject property.

6.1 Mass Balance Nitrate Calculation

According to MOEE Procedure D-5-4 (1996), a risk assessment is required to assess the impact of individual on-site systems to concentrations of nitrate-nitrogen in groundwater. The Predictive Assessment method was completed using a Mass Balance Equation to calculate nitrogen attenuation for the proposed development using the following inputs and presented in Table 6.

- The proposed 2.973 hectares hectare waterfront development involves the creation of a nine (9) lot residential subdivision, with lots ranging in size from 0.31 to 0.40 hectares, which are significantly larger than existing residential lots within the hamlet of Manchester.

- Climatic station in Burketon McLaughlin reported an average 30-year precipitation normal of about 921 mm/yr.

- Calculated annual water surplus of about 336 mm/yr based on annual potential evapotranspiration of about 584 mm/yr;

- The water surplus is divided between run-off and infiltration, and the amount of infiltration is estimated by multiplying the surplus by an infiltration factor of 0.8 (values of 0.3, 0.4 and 0.1) for topography, soil type and cover).

- average background nitrate concentration of 1.02 mg/L within the shallow flow zone based on the minimum nitrate concentrations reported within the test pit monitors; and,

- Climatic station in Burketon McLaughlin reported an average 30-year precipitation normal The water surplus is divided between run-off and infiltration, and the amount of infiltration is estimated by multiplying the surplus by an infiltration factor of 0.8 (values of 0.3, 0.4 and 0.1) for topography, soil type and cover).

TABLE 6
NITRATE IMPACT ASSESSMENT

Input	Value	Source
WATER SURPLUS		
S1:Average Total Annual Precipitation (mm/yr)	920.6	Station: Burketon McLaughlin *Environment Canada 1981 to 2010 Canadian Climate Normals*
S2:Average Annual Potential Evapotranspiration (mm/yr)	584.2	Converted units from inches (23") *Atlas of Canada (1974)*
S3: Water Surplus (mm/yr)	336.4	Calculation: S3 = S1 - S2
S: Water Surplus (mm/day)	0.92	Converted units from S3
INFILTRATION FACTOR		
Topography (flat) Soil (open sandy loam) Cover (cultivated land)	0.3 0.4 0.1	Table 2 :Infiltration Factors *MOEE Hydrogeological Technical Information Requirements for Land Development Applications (1995)*
AVAILABLE DILUTION		
A: Site Area (m^2)	29,730	2019 Lot Grading Plan *Coe Fisher Cameron, OLS*
S: Water Surplus (mm/day)	0.92	Converted units from S3 (above)
I: Infiltration Factor	0.8	Calculated Total of all factors (above)
Qi: Available Dilution (m^3/day)	21.92	Calculation: Qi = A x S x I
NITRATE ASSESSMENT		
Qe1: Number of Lots	9	Figure 2 Proposed Development Plan
Qe2: Sewage Effluent Input Rate (L/lot/day)	1000	According to Procedure D-5-4
Qe: Volume of Sewage Effluent (L/lot/day)	9000	Calculation: Qe1 x Qe2
Ce: Concentration Nitrate in Effluent (g/lot/day)	40	According to Procedure D-5-4
Ci: Concentration of Nitrate in dilution water (mg/L)	0.1	
Concentration of Nitrate at property boundary (mg/L)	9.07	Calculation: Qt = Qe x Ce + Qi x Ci
Ct1:Background Nitrate Input (mg/L)	0.55	Groundwater monitoring values reported
Total Attenuated Concentration of Nitrate at property boundary (mg/L)	9.62	Calculation: Ct = Qt + Ct1

- The impermeable surfaces have been considered under the post-development scenario through stormwater best management practices as prepared by Dobri Engineering Ltd. The stormwater management plan provides for the collection from all impervious surfaces and provides suitable infiltration galleries on-site. For instance, all runoff from the building roof areas will be directed to individual infiltration trenches, in addition to the installation of infiltration trenches throughout the boulevard areas to capture and treat run-off from the paved areas. In addition, surface run-off that is not infiltrated within the trenches constructed on each lot or along the roadways, will be collected along a swale located at the downgradient property boundary to allow for additional infiltration. Dobri Engineering Ltd. referenced TRCA's LID manual for estimating runoff reductions from impervious surfaces via rooftop downspout disconnection and enhanced grasses swales in the road ditches, which are proposed at the O'Connor subdivision site as part of the overall SWM plan. The annual conversion of runoff volume to infiltration from rooftop downspout disconnection and enhanced grassed swales are 513 m^3 and 465 m^3, respectively, on an annual basis. This infiltration provides an additional 2.7 m^3/day.

- Nitrate concentrations reported in the drilled wells were reported to range from 1.93 mg/L (TW-1) and <0.05 mg/L (TW-2 and TW-3) for an average of 0.55 mg/L in the supply aquifer. Nitrate monitoring over the past five years has reported a significant reduction in nitrate concentrations with the lowest values recorded within the monitors ranging from <0.05 mg/L to 2.81 mg/L, with an average nitrate concentration across the proposed development site of 1.02 mg/L. The sampling indicates a continued decreasing trend as a result of the discontinued agricultural practices on the subject property, resulting in a reduced nitrate concentration within the shallow flow zone over time.

The nitrate loading from the proposed residential lots at the downgradient boundary is calculated to have a theoretical concentration of about 9.6 mg/L. Based on the nitrate loading impact calculations, the subject property is capable of supporting the proposed creation of nine (9) new residential lots.

It is recommended that the sewage disposal systems be placed at the front of the property to allow for gravity flow from the dwellings. There are no proposed wells located downgradient of the sewage disposal systems for the proposed development.

7.0 SEWAGE DISPOSAL SYSTEM DESIGN CONSIDERATIONS

The following section provides conceptual design considerations for a Class 4 sewage disposal system to be constructed on each of the proposed lots. However, it is recommended that a qualified professional design a suitable sewage system based on site specific conditions and the dwelling to be constructed. The sewage system is to be designed in accordance with the *Ontario Building Code & Guide for Sewage Systems*, as periodically revised, and best construction practices.

According to the *Region of Durham Drilled Wells and Lot Sizing Policies* as Applied to Consents (Severances) and Draft Plans of Subdivisions, dated October 2010, subdivision applications will be assessed for the installation of a conventional Class 4 sewage disposal system. Each newly created vacant lot in a severance application or in a subdivision proposal must be suitable for the construction of a Class 4 conventional sewage system including a separate area for the replacement of a Class 4 conventional sewage system, and also adhere to any other applicable provincial policies and guidelines. These shall be considered as minimum standards for approval of subdivision and severance applications on private sewage systems.

The number of lots considered suitable for development on private services will be determined by the requirements of the MECP's Technical Guidelines for assessing the potential for groundwater impact in developments serviced by individual subsurface sewage systems, if applicable. The geo-technical assessment must be in accordance with the MECP *Procedure D-5-4, Technical Guideline for Individual On-Site sewage Systems: Water Quality Impact Assessment*, and the hydro-geological assessment must be in accordance with MECP *Procedure D-5-5, Technical Guideline for Private Wells: Water Supply Assessment*, as applicable and Durham Region's Lot Sizing Policy.

Each proposed lot must conform with Part 8 Sewage Systems under the Ontario Building Code as it relates to soil percolation time, depth to high groundwater table elevation, depth to impermeable soil, maximum slopes, drainage characteristics and horizontal clearances and Durham Region's Lot Sizing Policy. Proposed vacant lots shall be sized as follows:

TABLE 7
SEWAGE SYSTEM AREA ESTIMATES
(Prime and Reserve)

Soil Percolation Rate (T)	Loading Rate ($L/m^2/day$)	Daily Sewage Flow (Litres)	Sewage System Area (m^2) (m^2 x 2)
1<T<20	10	3,000	600
20<T<35	8	3,000	750
35<T<50	6	3,000	1,000
T>50	4	3,000	1,500

Based on the grain size distribution and hydrometer analysis of the soil samples obtained during the subsurface soil investigation, the T-Times of the prevailing soil for the proposed lots and sewage disposal systems range between 15 and 35 min/cm for the upper soil horizon. As such, the required sewage system area is estimate to range from 600 m^2 for Lots 1 and 2, 750 m^2 for Lot 3, and 1,000 m^2 (prime and reserve). The dwelling and sewage disposal area for each proposed lot is illustrated on Figure 7, Conceptual Private Servicing Layout. Depending on the final location of the sewage disposal system, Lot 1 will be an in-ground system, Lots 2 to 8 will be partially raised beds, while Lot 9 will be a fully raised disposal bed.

This conceptual layout is for illustration purposes only to demonstrate that each proposed lot has sufficient area to accommodate the dwelling, the prime and reserve sewage disposal system based on the prevailing soil percolation (T-time) and a drilled well with a 15 metre buffer from the sewage works.

The partially or fully raised sewage disposal systems constructed for the proposed development will require the setbacks to be increased by twice the height that the leaching bed is raised above the original grade in accordance with O.B.C. regulation 8.7.4.2(9). The minimum clearances for treatment units must conform to Ontario Building Code Table 8.2.1.6.A as follows:

Structure	1.5 m
Drilled well (water tight casing to 6 m)	15 m
Property Line	3 m

The minimum clearances for leaching bed distribution piping must conform to Ontario Building Code Table 8.2.1.6.B as follows:

Structure	5 m
Drilled well (water tight casing to 6 m)	15 m
Dug/Bored Well	30 m
Property Line	3 m

7.1 Class 4 Sewage Disposal System

Each lot will be individually serviced for sewage disposal. Figure 7, Conceptual Private Servicing Layout illustrates the conceptual lot layout for the proposed development, including dwellings, sewage system envelopes (prime and reserve ranging from 600 m^2 to 1,000 m^2) based on the T-time of soil conditions reported for each lot, and distances to drilled wells. Each new drilled well shall be constructed a minimum of 15 metres from any sewage system in accordance with Ontario Regulation 903.

7.2 Minimum Lot Requirements

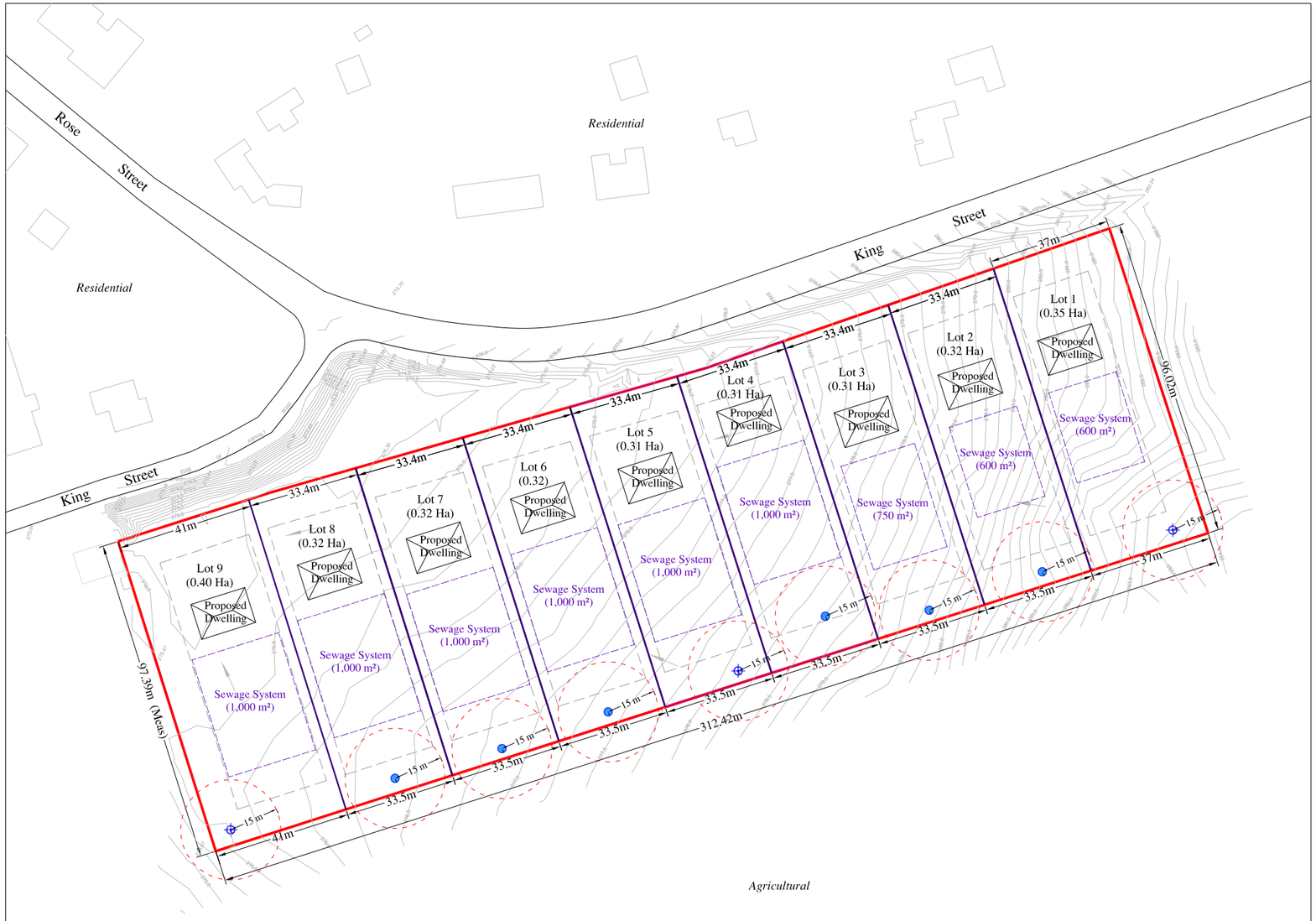
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Structure	1.5 m
Drilled well (water tight casing to 6 m)	15 m
Property Line	3 m

The minimum clearances for leaching bed distribution piping must conform to Ontario Building Code Table 8.2.1.6.B as follows:

Structure	5 m
Drilled well (water tight casing to 6 m)	15 m
Dug/Bored Well	30 m
Property Line	3 m

The distances presented above shall be increased by twice the height that the leaching bed is raised above the original grade in accordance with O.B.C. regulation 8.7.4.2(9) for all partially or fully raised sewage disposal systems constructed on the proposed lots. There is sufficient area on each of the proposed lots to facilitate all setback requirements.



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

- Property Boundary
- Proposed Severance Lot
- Proposed 186 m² dwelling
- Sewage System (Prime + Reserve)
- Existing Drilled Well
- Proposed Drilled Well

N

Scale: 1:1,500

0 30 60 m

Property boundary, lot dimensions, and topography obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.
Proposed Severance obtained from Clark Consulting Services Draft Plan of Subdivision, dated February 2020.

Building footprints obtained from public sector Information made available under The Regional Municipality of Durham's Open Data Licence.

TITLE

CONCEPTUAL
PRIVATE SERVICING LAYOUT

CLIENT

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Geological & Environmental Consultants

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DATE
December, 2020

FIGURE NO.
7

8.0 TEST PUMPING

The *MOEE Hydrogeological Technical Information Requirements for Land Development Applications* (1995) states (i) that the minimum daily per-person water requirement is 450 litres, (ii) that the minimum peak demand is 3.75 L/min per person and (iii) that the minimum peak requirement for a residence is 13.7 L/minute. The minimum peak requirement must be provided for 120 minutes each day (60 minutes in the morning and 60 minutes in the evening). Therefore, the water supply system typically needs to meet a short term demand of 1,125 L, twice daily (morning and evening). These higher usage periods would most often occur within a relatively short time frame of 1 to 2 hours.

The minimum criteria within *Technical Guideline for Private Wells: Water Supply Assessment (Procedure D-5-5)* is based on the per-person requirement of 450 litres per day. Peak demand occurs for a period of 120 minutes each day. This is equivalent to a peak demand rate of 3.75 litres/minute for each person. The basic minimum pumping test rate is this rate multiplied by the *"likely number of persons per well"* which, for a single family residence, shall be the number of bedrooms plus one. Unless it is otherwise established to MECP's satisfaction, a minimum of four bedrooms shall be used in the calculation.

As such, at a minimum pumping rate of 15 L/min, a single family residence will require 2,250 L/day to meet the 120 minute (2 hour) peak demand flow for a 4 bedroom dwelling with a theoretical occupancy of five (5) persons. In addition, the water takings were also compared to Part 8 of the Code and Guide for Sewage Systems, Ontario Building Code.

Test pumps were installed and operated by Progressive Electric & Plumbing Ltd. and the tests were supervised by Grace & Associates Inc. Test well details are provided on the Water Well Records presented in Appendix C and the pumping test data are presented in Appendix E.

8.1 Test Wells

The three on-site drilled wells, designated as TW-1, TW-2, and TW-3 were test pumped on October 9, October 3, and September 25, 2019 respectively. The test wells are located along the south development property boundary at proposed Lot 1 (TW-1), Lot 5 (TW-2), and Lot 9 (TW-3) with test well TW-1 located approximately 296 metres east of TW-3 (Refer to Figure 8, Pumping Test Well Locations).

Test wells TW-1, TW-2, and TW-3 terminate in a sandy overburden aquifer at depths of 25.0, 26.5, and 24.4 metres below grade, respectively. The stratigraphy of the test wells is illustrated on Figure 6, Geological Cross Section

The three (3) on-site drilled wells obtain water from a sandy (TW-1 and TW-2) and gravelly (TW-3) overburden aquifer at an average depth of 46.5 metres with a recommended pumping rate of 34.1 L/min.

Selected information for the pumped wells is presented in Table 7, Selected Data for Test Wells.



HYDROGEOLOGICAL ASSESSMENT
RESIDENTIAL SUBDIVISION

Part Lot 13, Concession 4
Geographic Township of Reach
Township of Scugog
Regional Municipality of Durham, Ontario

LEGEND

- Property Boundary
- Proposed Severance Lot
- Monitor ID — Groundwater Monitor
- Well ID — Test Well Location
- Test Pit ID — Test Pit Location

Scale: 1:1,500

0 30 60 m

Property boundary, lot dimensions, and topography obtained from Coe Fisher Cameron, OLS Lot Grading Plan, dated December 5, 2019, Reference # 18-17-050-04.
Proposed Severance obtained from Clark Consulting Services Draft Plan of Subdivision, dated February 2020.

Building footprints obtained from public sector Information made available under The Regional Municipality of Durham's Open Data Licence.

TITLE

PUMPING TEST
WELL LOCATIONS

CLIENT

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DRAWN	FIGURE NO.
R15-635	8
DATE	
December, 2020	

TABLE 8
SELECTED DATA FOR TEST WELLS

Test Well No.	Test Well ID	[1]Grade Elev (mASL)	Well Depth (m)	Aquifer Elevation (mASL)	[2]SWL (m BGL)	Pump Level (m BGL)	Casing Diam. (m)	Stick-up (m)	*Available Drawdown (m)
TW-1	7334342	283.58	36.66	257.92	7.66	35.08	0.16	0.89	27.42
TW-2	7334391	278.10	54.45	270.91	7.19	41.69	0.16	0.98	34.50
TW-3	7334392	275.62	51.46	270.94	4.68	41.63	0.16	1.04	36.95

Notes: 1 Grade Elevation obtained from Coe Fisher Cameron Lot Grading Plan dated December 5, 2019.
2 As measured on day of pumping test
ASL Above seal level BGL Below ground level SWL Static water level
*Available drawdown is the difference between the pump depth (during test) and the static water level

8.2 Monitored Wells

During the pumping tests, nearby wells were monitored for interference effects. The monitored wells are identified in Table 8, Monitored Wells During Pumping Test and the locations of the wells are presented in Figure 8, Pumping Test Well Locations.

TABLE 9
MONITORED WELLS DURING PUMPING TESTS

Test Well No.	Monitored Wells											
	TW-1	TW-2	TW-3	TP-1	TP-2	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7
TW-1	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TW-2	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TW-3	✓	✓	-	✓	✓	✓	✓	✓	✓	✓	✓	✓

9.0 PUMPING TEST ASSESSMENT

In accordance with MECP Procedure D-5-5, all three (3) test wells were subjected to pumping tests in order to assess the hydraulic performance of the well and aquifer. The tests included a minimum 6-hour constant rate pumping period followed by recovery. During the pumping tests, the remaining test wells were utilized as observation wells for calculating hydraulic coefficients and to determine the potential for mutual interference effects within the development. All pumping tests were conducted utilizing a temporary submersible pump equipped with a Precision water meter and M.A. Stewart & Sons Ltd. (MAS) brass lever-operated ball valve bench tested and installed by Progressive Electric & Plumbing Ltd. Automatic water level measurements (i.e., datalogger) were augmented by manual measurements.

Test wells TW-1, TW-2, and TW-3 were pumped continuously at rates of 50.0, 51.3, and 37.5 L/min for 360 minutes respectively on October 9, 2019, October 3, 2019, and September 25, 2019 respectively. The pumping rates were confirmed at intervals throughout the tests by filling a vessel of known capacity. The test pumping results are presented in Table 9, Summary of Pumping Test Data.

TABLE 10
SUMMARY OF PUMPING TEST DATA

Test Well No.	Pumping Rate (L/min)	Pumping Time (min)	Depth of Water-bearing zone (m BGL)	Pumping Level after 1 hour (m BTC)	Pumping Level at end of test (m BTC)
TW-1	50.0	360	35.7	19.26	21.92
TW-2	51.3	360	53.6	12.09	12.44
TW-3	37.5	360	50.3	6.95	7.14

Notes: BGL Below Grade Level
BTC Below Top of Casing

9.1 Test Well TW-1

TW-1 was subjected to pumping on October 9, 2019 at a constant rate of 49.98 L/min (11 igal/min) for 360 minutes, followed by recovery to approximately 100% of the original static water level, which occurred 495 minutes after cessation of pumping. Recovery to 95% occurred within 264 minutes. The total volume of water abstracted during the test was approximately 18,200 Litres (~4,000 igal), substantially exceeding the minimum daily domestic requirement for a typical four bedroom residence, based on 450 L/day/person. Figure 9 illustrates the response of TW-1 during pumping and recovery. Test pumping data are provided in Appendix E.

At the time of the test, the subject well had a total available drawdown of approximately 20.11 metres based on the difference between the driller's measured static water level (4.27 metres) and the recommended pump intake setting (24.38 metres). During the pumping test, the subject well exhibited a maximum drawdown of 13.37 metres at the end of the test, representing about 66% of the well's available drawdown.

Based on the late portion of the data, the test curve appears consistent with a "confined aquifer" condition. The observation wells did not respond to the pumping, therefore, do not provide useful drawdown data that can be utilized for test curve assessment.

A conventional Cooper-Jacob assessment of the pumped well data indicates that the near-well transmissivity (T) is estimated to be approximately 3.8 m^2/day, indicating a modest yield aquifer, sufficient for domestic-use purposes. Analysis of the recovery data provides a similar result, at 2.7 m^2/day. However, it should be noted that analysis of the pumped well data tends to underestimate transmissivity due to well losses. It is not possible to determine the storage coefficient from the above.

It is clear from the test data that TW-1 can supply the daily water demand of a typical residence and should be capable of meeting the morning and evening demand periods without the need for supplementary water storage.

The pumping rate of 49.98 L/min exceeds the minimum residential rate of 13.7 L/min stated in the *MECP Hydrogeological Technical Information Requirements for Land Development Applications (1995)*, and the pumped volume of about 18,200 litres exceeded the minimum daily residential requirement of 2,250 litres. TW-1 is considered capable of providing a sustainable domestic water supply.

9.2 Test Well TW-2

A pumping test of TW-2 was conducted on October 3, 2019. The test consisted of pumping at a constant rate of 51.3 L/min (11.2 igal/min) for 360 minutes. Recovery to 95% of the original static water level occurred within 170 minutes of cessation of pumping. The total volume of water abstracted during the test was approximately 18,500 Litres (~4,100 igal), substantially exceeding the minimum daily domestic requirement for a typical four bedroom residence, based on 450 L/day/person.

At the time of the test, the subject well had a total available drawdown of approximately 20.4 metres based on the difference between the driller's measured static water level (4 metres) and the recommended pump intake setting (24.4 metres). During the pumping test, the subject well exhibited a maximum drawdown of 4.27 metres at the end of the test, representing about 21% of the well's available drawdown.

Based on the late portion of the data, the test curve appears consistent with a "confined aquifer" condition. Observation well TW-3 (159 metres from the pumped well) responded to the pumping, exhibiting approximately 0.30 metres of drawdown.

A conventional Cooper-Jacob assessment of the pumped well data indicates that the near-well transmissivity (T) is estimated to be approximately 30 m^2/day, indicating a moderate to high yield aquifer, more than sufficient for domestic-use purposes. A Cooper-Jacob analysis of the observation well provides a somewhat higher result, at 42 m^2/day. Typically, analysis of observation well data for TW-3 are more representative of the aquifer. The corresponding storage coefficient is 1.1 X 10^{-4}, which is reasonable for the type of aquifer and the hydrogeological setting.

It is clear from the test data that TW-2 can supply the daily water demand of a typical residence and

should be capable of meeting the morning and evening demand periods without the need for supplementary water storage.

The pumping rate of 51.3 L/min exceeded the minimum residential rate of 13.7 L/min stated in the *MoE Hydrogeological Technical Information Requirements for Land Development Applications (1995)* and the pumped volume of about 5,790 litres litres during the test exceeded the minimum daily residential requirement of 18,500 litres. TW-2 is considered capable of providing a sustainable domestic water supply.

9.3 Test Well TW-3

TW-3 was subjected to pumping on September 25, 2019 at a constant rate of 37.5 L/min (8.3 igal/min) for 360 minutes, followed by recovery. Recovery to 95% occurred within 820 minutes. The total volume of water abstracted during the test was approximately 13,500 Litres (~3,000 igal), substantially exceeding the minimum daily domestic requirement for a typical four bedroom residence, based on 450 L/day/person.

At the time of the test, the subject well had a total available drawdown of approximately 21 metres based on the difference between the driller's measured static water level (3.4 metres) and the recommended pump intake setting (24.4 metres). During the pumping test, the subject well exhibited a maximum drawdown of 1.42 metres at the end of the test, representing about 66% of the well's available drawdown.

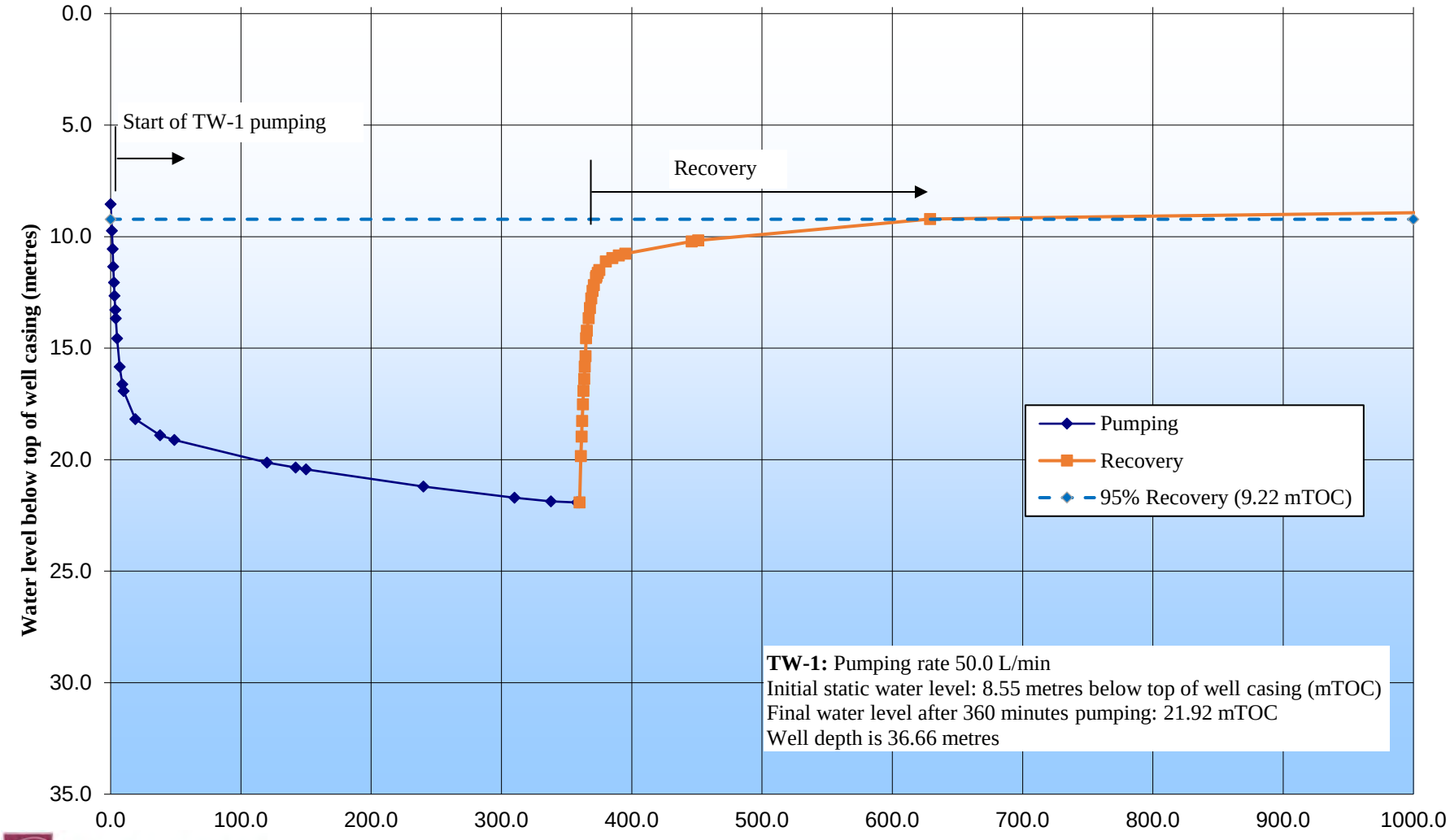
Based on the pumped well and observation well data, the test curves appears consistent with a "confined aquifer" condition. Observation well TW-2 (159 metres from the pumped well) responded to the pumping, exhibiting approximately 0.23 metres of drawdown.

A conventional Cooper-Jacob assessment of the pumped well data indicates that the near-well transmissivity (T) is estimated to be approximately 38 m^2/day, indicating a moderate to high yield aquifer, more than sufficient for domestic-use purposes. A Cooper-Jacob analysis of the observation well data from TW-2 provides a somewhat higher result, at 48 m^2/day, similar to that determined from testing TW-2. Typically, analysis of observation well data are more representative of the aquifer. The corresponding storage coefficient is 1 X 10^{-4}, which is consistent with the results for TW-2 and reasonable for the type of aquifer.

It is clear from the test data that TW-3 can supply the daily water demand of a typical residence and should be capable of meeting the morning and evening demand periods without the need for supplementary water storage.

The pumping rate of 37.5 L/min exceeds the minimum residential rate of 13.7 L/min stated in the *MoE Hydrogeological Technical Information Requirements for Land Development Applications (1995)*, and the pumped volume of 13,500 litres exceeded the minimum daily residential requirement of 2,250 litres. TW-3 is considered capable of providing a sustainable domestic water supply.

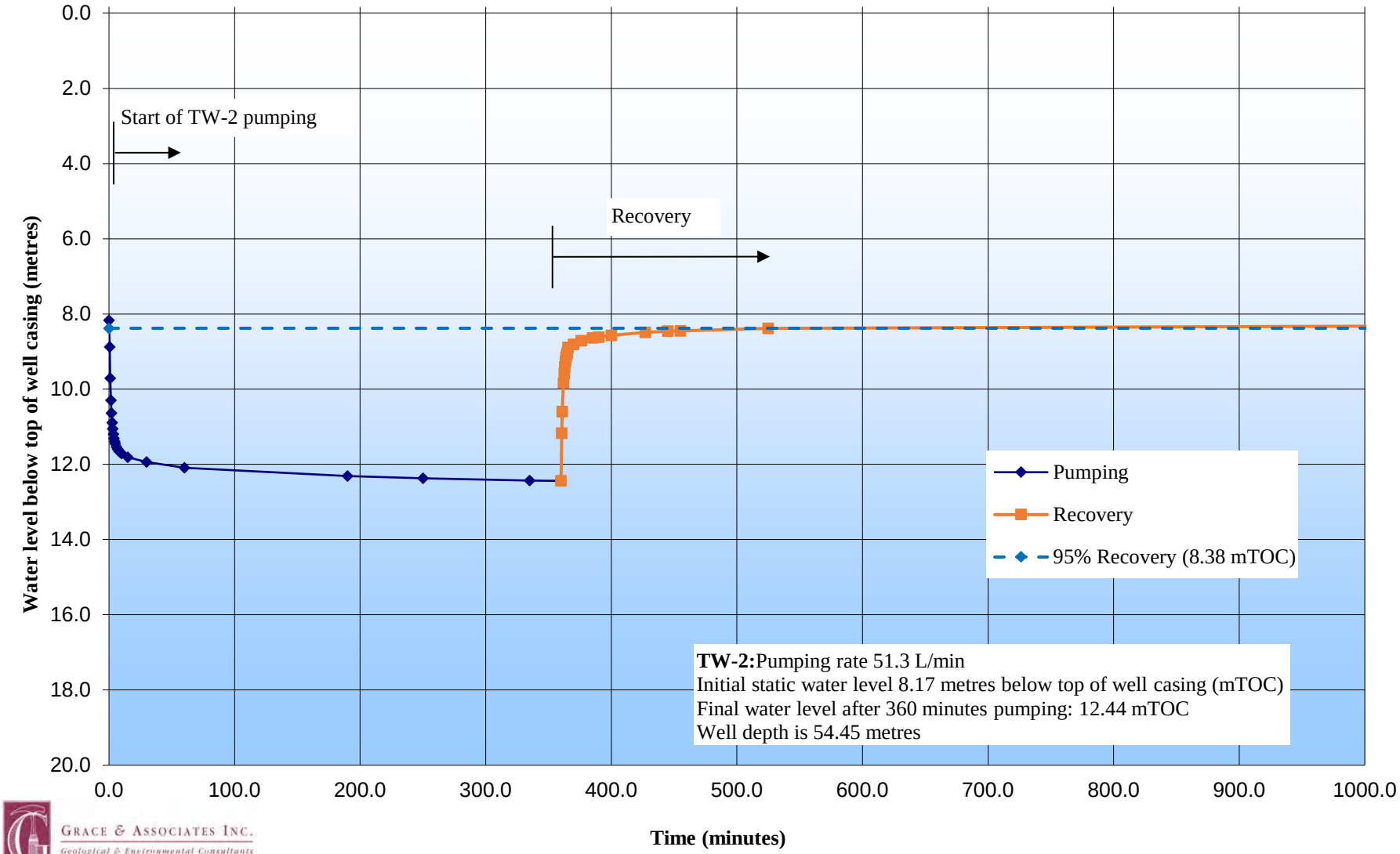
WATER LEVEL IN RESPONSE TO PUMPING RATE
TEST WELL TW-1 - O'CONNOR BROS. CORP.
6 HOUR PUMPING TEST ON OCTOBER 9, 2019



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Figure 9

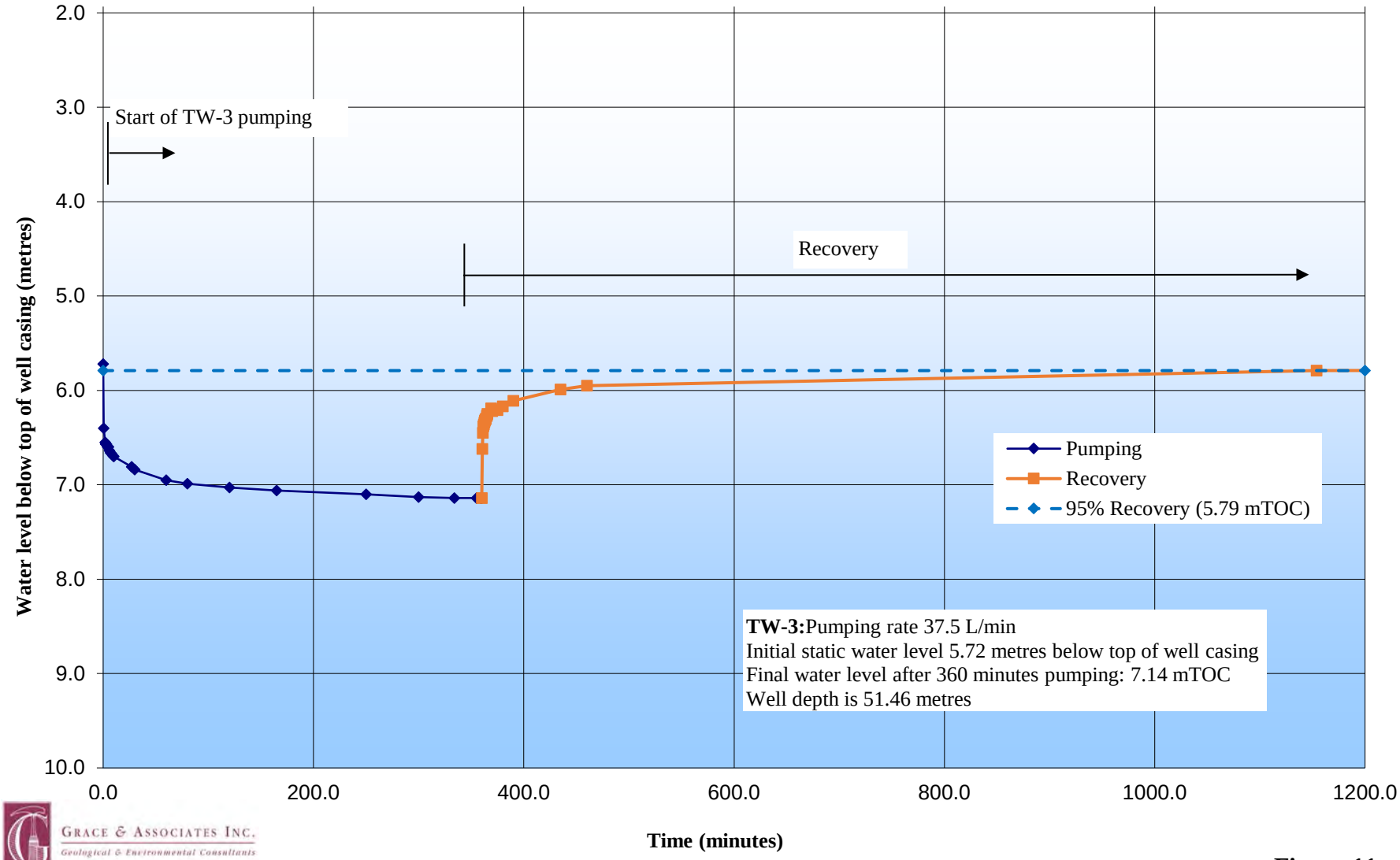
WATER LEVEL IN RESPONSE TO PUMPING RATE
TEST WELL TW-2 - O'CONNOR BROS. CORP.
6 HOUR PUMPING TEST ON OCTOBER 3, 2019



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Figure 10

WATER LEVEL IN RESPONSE TO PUMPING RATE
TEST WELL TW-3 - O'CONNOR BROS. CORP.
6 HOUR PUMPING TEST ON SEPTEMBER 25, 2019



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Figure 11

9.4 Tests Discussion

Review of the well logs indicates the test wells obtain water from two different aquifers. TW-1 intersects a coarse gravel aquifer above 34.1 metres (112 ft). In contrast, TW-2 and TW-3 intersect a sand aquifer below an average depth of approximately 47.7 metres (156.5 ft). While the two aquifers are not separated by a great thickness, a sequence of layered clay and silt appears to act as a significant confining layer for the sand aquifer in TW-2 and TW-3 versus the shallower gravel aquifer in TW-1. The pumping test data indicate that there is minimal (if any) hydraulic connection between the two aquifers. In this regard, pumping at TW-1 creates no discernable effect at either of TW-2 or TW-3, whereas pumping of TW-2 causes a small, but measurable drawdown at TW-3 (and vice-versa). During the pumping test of TW-3, the water level at TW-1 was observed to fluctuate minimally, although without correlation to the pumped well. The fluctuations in TW-1 are believed to be related to off-site water takings, suggesting that at least one other well in the area taps the aquifer.

All three drilled test wells exceeded the minimum daily residential requirement of 2,250 litres and are capable of providing adequate water supplies for the proposed residential development.

9.5 Interference

As discussed above, there was no discernable interference effect at either of TW-2 or TW-3 while pumping TW-1. However, a small, but discernable effect was measurable at TW-2 and TW-3 when the other was pumped. The observed effects were limited to a maximum of only 0.30 metres, when TW-2 was pumped continuously at 51.2 L/min, a much higher rate than would be experienced post-development. This is consistent with the comparatively high transmissivity of the aquifer tapped by TW-2 and TW-3. As such, interference effects are not expected to be problematic for this development.

It is recommended that pumps be located near the principal water-bearing zones. Location of sewage systems should be selected to ensure that separation distances from wells meet/exceed minimum standards.

9.6 Distance to Monitors

No drawdown was observed during the pumping tests in the on-site testpit standpipes and monitoring wells. The separation distances between test wells and monitored wells is presented in Table 10.

TABLE 11
DISTANCE BETWEEN MONITORING WELLS

Test Well No.	Monitored Wells Monitored Wells (Distance in metres)											
	TW-1	**TW-2**	**TW-3**	**TP-1**	**TP-2**	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**
TW-1	-	137	296	293	67	70	121	178	237	202	138	74
TW-2	137	-	159	165	150	115	62	62	107	66	4	63
TW-3	296	159	-	74	301	261	196	136	81	94	158	222

10.0 TEST PUMPING WATER QUALITY SAMPLING RESULTS

A water sample was collected from each of the test wells at hour 3 of the test and at the completion of pumping test and submitted to AGAT Laboratories for chemical analysis of sulphide and all parameters listed in Tables 1, 2 and 3 of *D-5-5 Private Wells: Water Supply Assessment*. Results are presented in Table 11, Pumping Tests Water Quality Sampling Results. Laboratory Certificate of Analyses are presented in Appendix F.

TABLE 12
PUMPING TESTS WATER QUALITY SAMPLING RESULTS

Date Sampled:	**TW-1** 10-09-2019 (3 hrs)	**TW-1** 10-09-2019 (6 hrs)	**TW-2** 10-03-2019 (3 hrs)	**TW-2** 10-03 2019 (6 hrs)	**TW-3** 09-25-2019 (3 hrs)	**TW-3** 09-25-2019 (6 hrs)	**Units**	**Ontario Drinking Water Standards**
Parameter:								
pH	7.55	7.62	7.57	7.73	7.95	7.92	-log(H^+)	6.5-8.5*
Alkalinity	193	191	150	150	172	179	mg/L	30-500
Conductivity	407	404	295	297	392	390	uS/cm	-
Nitrate (N)	1.93	1.39	<0.05	<0.05	<0.05	<0.05	mg/L	10
Nitrite (N)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/L	1
Sulphate	27.3	26.7	0.13	0.14	12.9	12.8	mg/L	500
Calcium	42.4	42.0	10.5	10.3	28.9	28.2	mg/L	-
Magnesium	22.4	22.2	3.99	3.90	19.1	19.0	mg/L	-
Sodium	9.47	9.47	**51.4**	**51.2**	14.2	14.2	mg/L	20**
Ammonia-N	0.12	0.11	0.27	0.27	0.14	0.13	mg/L	-
Total Dissolved Solids	258	250	152	156	164	178	mg/L	500
Total Hardness	**198**	**196**	**42.6**	**41.8**	**151**	**149**	mg/L	80-100
Colour	<5	<5	**20**	**19**	<5	<5	Colour Units	5
Turbidity (lab)	**41.2**	**8.0**	0.9	<0.5	2.0	1.5	NTU[1]	5
Turbidity (field)	22.3	**6.66**	2.34	0.88	0.64	0.50	NTU[1]	5
Dissolved Organic Carbon (DOC)	1.1	1.2	**8.4**	**7.7**	1.2	1.0	mg/L	5
Chloride	6.32	5.45	5.51	5.71	1.12	1.02	mg/L	250
Iron	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	mg/L	0.3
Manganese	0.013	0.011	0.017	0.017	0.024	0.023	mg/L	0.05
Sulphide	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/L	0.05
Total Coliform (TC)	ND	ND	**14**	**6**	ND	ND	CFU/100ml	ND
Escherichia coli (E.Coli)	ND	ND	ND	ND	**NDOGN**	**NDOGN**	CFU/100ml	ND
Fecal coliform	ND	ND	ND	ND	ND	ND	CFU/100ml	-

Notes:
* Desirable range
** Ministry of Health criteria
1 NTU - Nephelometric Turbidity Unit
ND Not Detectable
NDOGN No Data; Overgrown with non- target, refers to over-crowding microbial growth

Indicates level exceeds provincial objective (ODWS). *Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines*, Revised June 2006.

10.1 Water Quality Sampling Results

Water quality sampling conducted during the pumping tests indicate all tested parameters meet the Ontario Drinking Water Standards (ODWS) in TW-1, TW-2, and TW-3 with the exception of sodium (TW-2), total hardness, colour (TW-2), turbidity (TW-1), dissolved organic carbon (TW-2), total coliform (TW-2), and e.Coli (TW-3) above the Standards.

The water quality sampling results demonstrate differing chemical and microbiological conditions between the shallower aquifer at TW-1 and the deeper aquifer at TW-2 and TW-3. No significant differences in water quality are apparent between the samples obtained after 3 hours of pumping versus those at 6 hours, indicating stable groundwater conditions.

Nitrate concentrations reported in the drilled wells were reported to be 1.39 mg/L (TW-1) and <0.05 mg/L (TW-2, TW-3). All sampled parameters are within treatable limits in the tested wells.

10.1.1 Hardness and Sodium

The water hardness and sodium concentrations vary between test wells with a significant difference reported between TW-1 and TW-2. The data indicate that natural softening (ion exchange) is occurring at TW-2 and likely to a lesser extent at TW-3. This type of ion exchange is not uncommon in deeper aquifers such as the Thorncliffe Formation. The other common participant in ion exchange reaction is sodium, which occurred at a lower concentration at TW-1 in comparison to TW-2. While perhaps beneficial with respect to lowering hardness, the ion exchange results in an elevated sodium concentration at TW-2.

The water is considered soft in TW-2 with a concentration of 41.8 mg/L which is below the Operational Guideline of 80 to 100 mg/L. Hardness is an aesthetic parameter whereby, soft water may lead to the corrosion of water pipes and consequently, precipitation of metals in the distribution water. The TW-2 sample reported a sodium concentration of 51.2 mg/L. The ODWS for sodium is 200 mg/L; however, the Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L, so that this information can be disseminated to local physicians for their use with patients on sodium-restricted diets (ODWS, 2006). If water softeners are installed, users should be aware that the treated water contains increased sodium.

The water is considered to be hard in TW-1 and TW-3 with concentrations of 196 and 149 mg/L respectively, which exceed the ODWS of 80 to 100 mg/L; however, is below the upper limit of acceptability for most domestic purposes (500 mg/L). Hardness is an aesthetic parameter and elevated levels result in the formation of scale in kettles, hot water tanks and pipes. It requires large amounts of soap to produce lathering and may be responsible for undesirable tastes. Hardness is commonly resolved by treatment in a water softener.

The ODWS recommends that separate taps be installed to provide un-softened water for potable (drinking and cooking) uses. The sodium concentrations were 9.47, 51.2, and 14.2 respectively in TW-1, TW-2, and TW-3. The associated chloride concentrations in the groundwater are also low, typically occurring at 5.45, 5.71, and 1.0 mg/L, respectively, indicating that there is no significant salt content in both aquifers.

For all the test wells, the reported Total Dissolved Solids (TDS) concentrations occur within the

aesthetic limit of 500 mg/L. Given the potential desire to utilize a water softener, the following notification and warning shall be registered on title in accordance with Ministry of Environment Procedure D-5-5:

> *"If a water softening system is to be utilized to reduce hardness, a separate tap (which by-passes the softener) must be installed to supply unsoftened drinking water."*

10.1.2 Dissolved Organic Carbon and Colour

The ODWS for dissolved organic carbon (DOC) in drinking water is 5 mg/L. The reported DOC concentrations were 1.2 mg/L (TW-1), 7.7 mg/L (TW-2), and 1.0 mg/L (TW-3). The reported value at TW-2 exceeds the ODWS, although is within the acceptable D-5-5 treatability range (i.e., <10 mg/L). Colour is also elevated at TW-2, occurring at 19 TCU, exceeding both the ODWS (5 TCU) and the D-5-5 treatability limit of 7 TCU.

The reason for the higher DOC concentration and colour exceedance at TW-2 is not clear, as there are no other indicators of contamination in the data for this well or any known surficial sources. However, from our experience elsewhere in similar formations, we have noted that elevated DOC concentration and colour can be related to the presence of native organic matter in the aquifer.

Organic materials present in the elevated DOC and colour concentrations in TW-2 can in addition to the aesthetic problems (taste, odour, and colour), interfere with the effectiveness of the disinfection process and contribute to disinfection by-products (ie.trihalomethanes and chlorination). A water treatment expert should be consulted to select and install equipment to produce satisfactory water quality which may include coagulation/flocculation processes, high pressure membrane treatment, biological filtration, granulated activated charcoal, reverse osmosis, and distillation.

10.1.3 Other Water Quality Comments

Perhaps the clearest water quality difference between the two aquifers is illustrated by the total dissolved solids (TDS) concentrations. Water from TW-1 is mineralized, exhibiting a TDS concentration of 250 mg/L. In contrast, the reported TDS values for TW-2 and TW-3 are 156 mg/L and 178 mg/L. All wells are within the 500 mg/L ODWS and D-5-5 objective/limit for TDS.

All of the test wells exhibit minimal dissolved iron (i.e., below the laboratory's detection level). As such, treatment to reduce the iron content should not be required.

Manganese concentrations reported in the wells 0.011 mg/L (TW-1), 0.017 mg/L (TW-2), and 0.023 mg/L (TW-3) are within the ODWS aesthetic objective of 0.05 mg/L. None of the manganese concentrations appear sufficient to warrant treatment to reduce the concentrations.

The laboratory reported turbidity values at the end of the pumping test were 8 NTU (TW-1), <0.5 NTU (TW-2), and 1.5 NTU (TW-3), while the field measured turbidity values were 6.66 NTU (TW-1), 0.88 NTU (TW-2), and 0.50 NTU (TW-3). TW-1 exceeds the objective of 5 NTU for a private water supply in the absence of a bacteria issue. While an exceedance, the reported value was considerably lower than the initial value (41.2 NTU), indicating that TW-1 was likely developing as the test progressed. Observations during the pumping tests noted slightly cloudy with tiny particulates water in the turbidity testing vial prior to the 3 hour testing mark and a clear water with tiny bubbles

by the end of the test.

As the reported iron and manganese concentrations were low, it does not appear that the turbidity at TW-1 is related to the formation of iron-precipitates. In contrast, for TW-2 and TW-3, the reported turbidity values at the end of the pumping tests were acceptable, at <0.5 NTU and 1.5 NTU, respectively.

At the start of the pumping tests, a slight odour of sulphur and iron was detected at the discharge points of TW-2 and TW-3 respectively. All well samples collected for analysis of sulphide report concentrations below the detection level of 0.05 mg/L. Therefore, future issues with H_2S are not expected.

10.1.4 Bacteria

Bacteria samples were also obtained from all the test wells during the pumping tests. Prior to sampling, free chlorine concentrations were tested in the field to verify the absence of any chlorine residual. At the time of the pumping tests, the bacteria counts were acceptable for all wells.

The reported bacteria count data (total coliform and E coli) for TW-1 were "non-detected", indicating acceptable results. However, for TW-2, a low count of total coliform (6 CFU/100 ml) was reported with no E coli detected. As the limit for total coliform is <6 CFU/100 ml, the results for TW-2 were not acceptable. The laboratory data for TW-3 indicated that the samples were overgrown with background bacteria, preventing proper analyses. As such, the counts for TW-3 were also not acceptable.

All test wells were subsequently chlorinated on November 17, 2019 in preparation for resampling on December 11, 2019. Free chlorine concentrations were obtained immediately prior to sample collection to verify the absence of chlorine residual. The laboratory reported total coliform and E.coli counts were "non-detected" for all three wells. Laboratory Certificate of Analyses are presented in Appendix F.

The well and water distribution system should be chlorinated, flushed and a water sample submitted to the Health Unit for bacteriological testing before the water is used for potable purposes. If bacteriological contamination is detected, the results should be discussed with the Health Unit. Chlorination instructions and other general information on water wells are available from the Ministry of the Environment and/or the Health Unit. Health-related questions regarding water quality should be directed to a physician or to the Medical Officer of Health.

Should water treatment be desired, it is recommended that a water quality expert be retained to provide the homeowner with a proposed water treatment system that is suitable to address the water quality issues.

11.0 CONCLUSIONS

This hydrogeological assessment report has been prepared on behalf of O'Connor Bros. Corp., proponent for the proposed 9 lot residential development located on the subject property at Part Lot 13, Concession 4, Former Township of Reach, Township of Scugog, Regional Municipality of Durham, Ontario.

The proposed development involves the creation of an nine (9) lot residential subdivision with access to King Street. The total development area is 2.973 hectares (7.35 acres). The proposed residential lots range in size from 0.31 to 0.40 hectares (0.77 to 0.99 acres) and will be privately serviced for water and sewage disposal.

The proposed development is currently zoned Future Development (FD) Zone. The subject property was created by consent application LD 100/2018 (consent to sever a 2.972 hectare vacant non-farm related rural residential parcel of land, retaining a 93.33 hectare agricultural parcel of land).

Based on the hydrogeological and soils assessment conducted on the subject property, the following conclusions are presented:

1. Shallow soil and groundwater conditions by excavating two test pits, each equipeed with a slotted standpipe and the advancement of seven boreholes, each equipped with a monitoring well, to depths between 2.30 and 4.60 metres below grade across the property. Soil conditions were found to be generally uniform consisting of a 0.3 to 0.45 metres thick silty sand, medium to dark brown topsoil underlain by (i) moderately compact, mottled greenish-grey tan, silt and sand, and (ii) coarse sand with little silt and gravel starting at about 2 metres below grade. Moist to saturated soils were encountered in all boreholes at depths below 1.5 metres below grade.

2. Percolation rates (T-time) for tested soil samples ranged between 20 and 35 min/cm across the site, with T-times generally about 35 min/cm. Coarser material, containing an increased sand content, was observed in Lot 1 and Lot 3 with T-times of 20 min/cm. Generally, the soil conditions beneath the site are representative of a silt of the Schomberg Clay Plains.

3. Seasonal fluctuations across the site range from 1.66 metres in test pit TP-1 to 0.16 metres in monitor MW-4, with an average seasonal groundwater fluctuation across the site of about 0.83 metres. Early spring conditions (March 18, 2020) reported water levels ranging between 0.65 metres below grade (MW-7) and 1.11 metres below grade (TP-2). In general, the water table is a subdued replica of the local topography, with the depth to the shallow water table being greatest at the east property boundary and the shallowest at the west property boundary. Based on the topography and the monitored static water levels, the shallow groundwater flow direction on the site is west-north-westerly.

4. Seventy-five (75) wells were identified within 500 metres of the proposed residential development, of which 48 are classified as well supply records including water use for domestic (40), commercial (5) public (2), livestock (1), and irrigation (1) purposes. All wells obtain water from the overburden aquifer at an average depth of 36.4 metres, with yields ranging between 7.6 and 113.6 L/min. Static water levels range in the overburden aquifer between 0.3 and 18.1 metres with an average of 4.2 metres below grade.

5. The three (3) on-site drilled wells obtain water from a sand (TW-2 and TW-3) and gravel (TW-1) overburden aquifer at an average depth of 52 metres (TW-2 and TW-3) and an inferred depth of 35.7 metres (using comparable water found equal to well depth) in TW-1. The recommended pumping rate for all three wells is 34.1 L/min. Static water levels ranged from 3.4 to 4.3 metres. Based on the MECP well data, it is anticipated that a new well drilled on the proposed lots should obtain adequate potable water supplies at a depth of about 35 to 60 metres below grade.

6. Test wells TW-1, TW-2, and TW-3 were pumped continuously at rates of 50.0, 51.3, and 37.5 L/min for 360 minutes respectively on October 9, 2019, October 3, 2019, and September 25, 2019 respectively. The amounts of water pumped during the test were 18,200 litres (TW-1), 18,500 litres (TW-2), and 13, 500 litres (TW-3), which exceed the daily residential requirement of 2,250 litres. The on-site drilled test wells (TW-1, TW-2, and TW-3) meet the minimum daily and minimum peak use requirements and are considered capable of providing a sustainable domestic water supply.

7. The test curve for all three wells is characteristic of a confined aquifer. The three pumping tests provide consistent results with respect to the estimate T and S values estimated from the observation well data. On average, the T of the aquifer appears to be approximately 35 m^2/day with a corresponding average S value of 1.05 X 10^{-4}.

8. The pumping test data indicate that there is minimal (if any) hydraulic connection between the shallower gravel (TW-1) and sand (TW-2, TW-3) aquifers. In this regard, pumping at TW-1 creates no discernable effect at either of TW-2 or TW-3, whereas pumping of TW-2 causes a small, but measurable drawdown at TW-3 (and vice-versa). The observed effects were limited to a maximum of only 0.30 metres, when TW-2 was pumped continuously at 51.2 L/min, a much higher rate than would be experienced post-development. This is consistent with the comparatively high transmissivity of the aquifer tapped by TW-2 and TW-3. As such, interference effects are not expected to be problematic for this development. Minimal interference was observed in the shallow monitors during the pumping test.

9. Results of the water quality sampling conducted during the pumping tests indicate all tested parameters meet the Ontario Drinking Water Standards (ODWS) in TW-1, TW-2, and TW-3 with the exception of sodium (TW-2), total hardness, colour (TW-2), turbidity (TW-1), dissolved organic carbon (TW-2), total coliform (TW-2), and e.Coli (TW-3) above the Standards. Nitrate concentrations reported in the drilled wells were reported to be 1.39 mg/L (TW-1) and <0.05 mg/L (TW-2, TW-3). Clear differences between the two on-site aquifers were identified. All sampled parameters are within treatable limits in the tested wells. All test wells were subsequently chlorinated on November 17, 2019 in preparation for resampling on December 11, 2019. Free chlorine concentrations were obtained immediately prior to sample collection to verify the absence of chlorine residual. The laboratory reported total coliform and E.coli counts were "non-detected" for all three wells.

10. Long term monitoring over the past 5 years has clearly demonstrated a significant decrease in the nitrate concentrations for the proposed development. While fluctuations have occurred based on seasonal sampling and site conditions, the average nitrate concentration of the lowest values recorded within each of the standpipe monitors is 1.02 mg/L nitrate.

11. A nitrate loading mass balance calculation was completed using a daily sewage volume of 1,000 L/day for each of the nine (9) lots within the proposed subdivision. The theoretical nitrate concentration of about 9.6 mg/L indicates the subject property is capable of supporting the proposed nine lot residential development.

12. T-Times of the prevailing soil for the proposed lots and sewage disposal systems range between 15 and 35 min/cm for the upper soil horizon. As such, the required sewage system area will range from 600 m^2 for Lots 1 and 2, 750 m^2 for Lot 3, and 1,000 m^2 (prime and reserve).

13. Seasonal fluctuations in the test pit standpipes indicate the proposed Class 4 sewage disposal systems will require partially to fully raised beds with a 15 metre mantle in the downgradient flow direction depending on the final placement of the leaching bed. Depending on the final location of the sewage disposal system, Lot 1 will be an in-ground system, Lots 2 to 8 will be partially raised beds, while Lot 9 will be fully raised disposal bed.

Based on the hydrogeological and soils assessment conducted, the proposed development is considered suitable for private servicing for the proposed nine (9) lot residential development. Negligible interference or impact to the groundwater resources or the natural environment is anticipated as a result of the proposed development.

12.0 RECOMMENDATIONS

Based on the conclusions, the following recommendations are presented:

1. All new wells shall be properly constructed, developed and water quality samples collected in accordance with Ontario Regulation 903 of the *Ontario Water Resources Act*. All wells shall be continuously cased through non-water yielding formations.

2. It is recommended that pumps be located near the principal water-bearing zones. In addition, wells should be located to maximize their mutual separation distances and minimize potential interference. Well locations should also be selected to ensure that separation distances from sewage systems meet/exceed minimum standards.

3. Before a well water supply is used for potable purposes, a water sample shall be submitted to the local Health Department for bacteriological testing. Should bacteriological contamination be detected, the results should be discussed with the Health Department. Chlorination instructions and other general information on water wells are available from the Ministry of the Environment and/or the Regional Municipality of Durham Health Department.

4. Since the issue of groundwater heat pumps is not addressed in the report, a condition shall be placed in the development agreement indicating that the use of groundwater heat pumps has not been approved as part of the development.

5. Should water treatment be desired, a specialist should be consulted to select and install the appropriate water treatment equipment.

6. Where possible, the sewage disposal systems should be constructed the maximum distance from the shoreline as considered reasonably possible. All sewage disposal systems shall be designed in accordance with the *Ontario Building Code & Guide for Sewage Systems 1997, as updated,* and best construction practices, for the proposed dwelling to be constructed on each of the subject lots.

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Should you have any questions regarding this report, or require any additional information, please do not hesitate to contact the undersigned.

Respectfully Submitted,
GRACE & ASSOCIATES INC.





Thomas P. Grace C.E.T., B.Sc., P.Geo.
Environmental Geologist
Principal

Report Distribution: 1 digital copy O'Connor Bros. Corp.
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13.0 STATEMENT OF QUALIFICATIONS

This document was prepared by Grace & Associates Inc., a geological and environmental consulting firm that provides services to meet the demands of government regulations within an urban setting. The firm specializes in the principle disciplines of the earth sciences - geology, hydrogeology and engineering. Relocated to Lindsay in 1991 from Brooklin (Whitby), the firm has undertaken numerous geological and environmental studies throughout Ontario and Eastern Canada during the past twenty-nine (29) years. Our services have been provided on many of these studies on behalf of other respected engineering firms, private companies and individuals.

Our environmental consultants have extensive experience in environmental and geological studies, and are constantly upgrading their knowledge of current environmental practices and legislation. The study outlined herein was conducted by an experienced environmental geologist who has received the professional designations of *Professional Geoscientist* by the Association of Professional Geoscientists of Ontario and *Certified Environmental Consultant* by the Environmental Assessment Association.

14.0 STATEMENT OF LIMITATIONS

This report was prepared by Grace & Associates Inc., for O'Connor Bros. Corp., and any use of this report by a third party, or reliance upon it for a decision based upon it, is the sole and exclusive responsibility of the third party. Grace & Associates Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of any decisions, actions made, or reliance based upon this report.

Notwithstanding any provisions with this study to the contrary the obligations and liabilities to Grace & Associates Inc. under the study, whether based upon breach of contract, tort, including negligence, infringement of patents and indemnities, trade secrets or other intellectual property rights, fundamental breach or otherwise, shall be limited in the aggregate to an amount not exceeding the total amount of the fee payment to Grace & Associates Inc. pursuant hereto.

This report is based upon the best information available to Grace & Associates Inc. within the time constraints and scope of the assessment. Material presented within this report reflects the best professional judgement of Grace & Associates Inc. personnel given the amount of information made available at the time of preparation. This report has been produced in part using information supplied by O'Connor Bros. Corp. and other consultants completing work on behalf of O'Connor Bros. Corp.

15.0 REFERENCES

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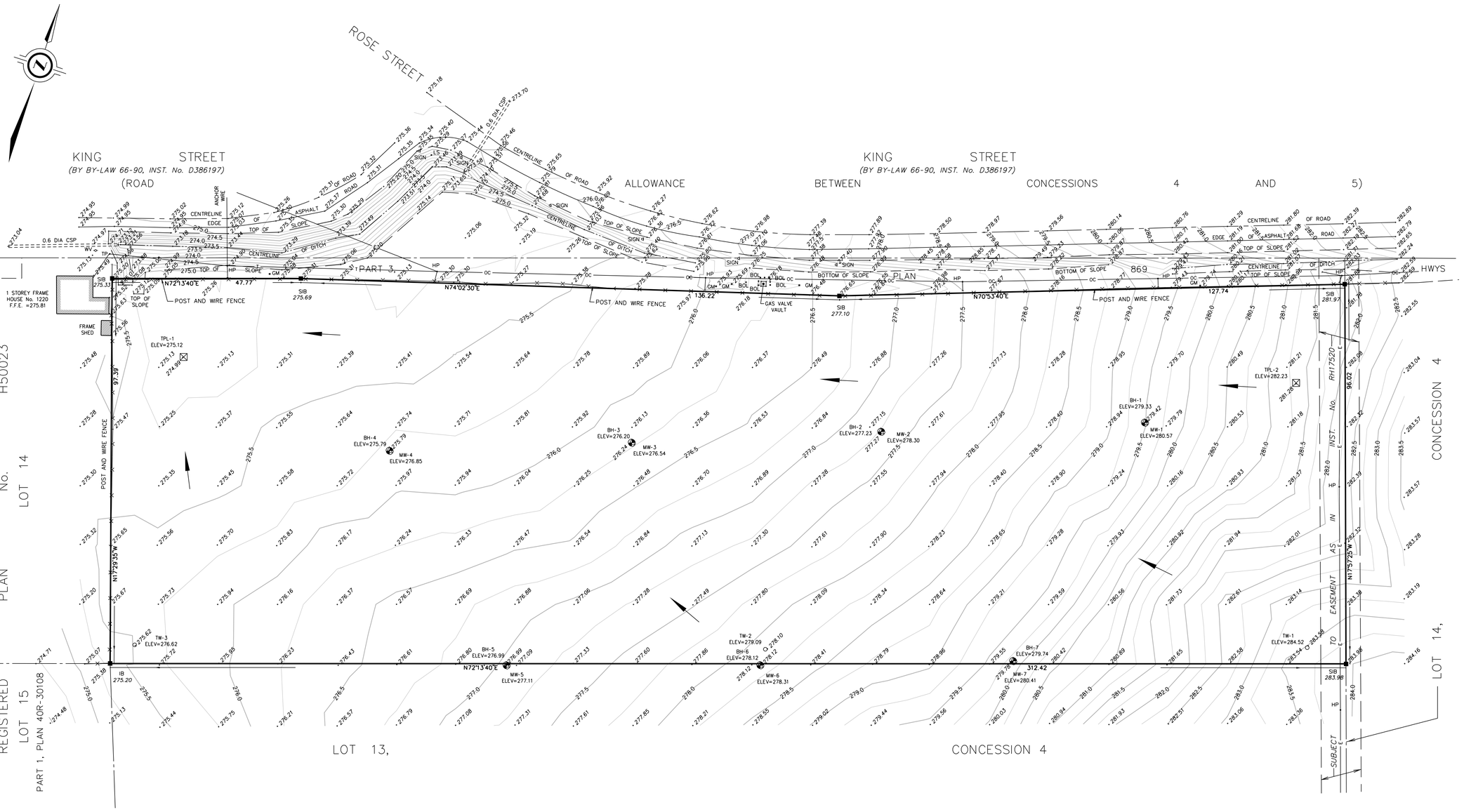
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APPENDIX A

SURVEY PLAN

FOR CONSTRUCTION PURPOSES ONLY



LOT GRADING PLAN OF

PART OF LOT 13 CONCESSION 4

(GEOGRAPHIC TOWNSHIP OF REACH)
NOW IN THE
TOWNSHIP OF SCUGOG
REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 500

10 0 10 20 30 metres

COE, FISHER, CAMERON
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METRIC DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NOTES

BEARINGS ARE UTM GRID, DERIVED FROM THE EASTERLY LIMIT OF LOT 14, REGISTERED PLAN No. H50023, AS SHOWN ON PLAN 40R-30108, HAVING A BEARING OF N17°29'35"W REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (79° WEST LONGITUDE) NAD83 (CSRS) (2010.0).

LEGEND

■ IB	DENOTES IRON BAR
■ SIB	DENOTES STANDARD IRON BAR
• GM	DENOTES GAS MARKER
• BOL	DENOTES BOLLARD
• HP	DENOTES HYDRO POLE
—|—	DENOTES HYDRO ANCHOR
• LS	DENOTES LIGHT STANDARD
• TP	DENOTES TELEPHONE POLE
◆ WV	DENOTES WATER VALVE
—E—	DENOTES OVERHEAD HYDRO
—T—	DENOTES OVERHEAD TELEPHONE
—OC—	DENOTES OVERHEAD HYDRO/TELEPHONE
F.F.E.	DENOTES FINISHED FLOOR ELEVATION
	DENOTES APPROXIMATE DIRECTION OF OVERLAND FLOW
249.36	DENOTES ORIGINAL GROUND
◆ BH	DENOTES BOREHOLE LOCATION
○ TW	DENOTES DRILLED WELL LOCATION
△ MW	DENOTES GROUNDWATER MONITOR LOCATION
☒ TPL	DENOTES TEST PIT LOCATION

BENCHMARK

ELEVATIONS SHOWN HEREON ARE GEODETIC DERIVED FROM BENCHMARK 00819828096 BEING A STEEL ROD WITH BRASS CAP LOCATED ON THE SOUTH SIDE OF HIGHWAY 7A, 1.30 km EAST OF THE JUNCTION OF HIGHWAY 7A AND HIGHWAY 7 & 12, 9.9m SOUTH OF THE CENTRELINE OF HIGHWAY 7A. BENCHMARK IS SET ON THE FENCE LINE 5.1m S.W. OF A BELL TELEPHONE UNDERGROUND CABLE BOX 26-1, 4.3m WEST OF A CORNER FENCE POST, 20cm NORTH OF A STEEL MARKER POST.

ELEVATION = 286.88m (CGVD-1928:1978)

THE FIELD WORK REPRESENTED BY THIS PLAN WAS COMPLETED ON NOVEMBER 22nd, 2018.

ADDITIONAL FIELD WORK TO LOCATE THE BOREHOLES, DRILLED WELLS, GROUNDWATER MONITORS AND TEST PITS WAS COMPLETED ON NOVEMBER 18th, 2019.

DATED: _____

GERALD G. HICKSON
ONTARIO LAND SURVEYOR

COE FISHER CAMERON LAND SURVEYORS
SURVEYING MAPPING GIS
A wholly owned subsidiary of J.D. Barnes Limited
3 COMMERCE PLACE, UNIT 201, LINDSAY, ON K9V 0N5
T: (705) 324-4152 F: (705) 324-8406 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
DHT	GGH	18-17-050-04

FILE: G:\18-17-050\04\Drawing\18-17-050-04.dgn DATED: 12/05/19

PLOTTED: 12/5/2019

APPENDIX B

LOGS AND
GRAIN SIZE DISTRIBUTION CURVES

GRACE & ASSOCIATES INC.
Geological & Environmental Consultants
16 Glenelg Street East
Lindsay, Ontario, K9V 1Y6
Phone: (705) 324-5408 Facsimile: (705) 324-2081

TEST PIT LOG TP-1

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: Yanmar V. 027	Date: September 15, 2015	TP-1

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 275.12				5 10 15 20
0.0	TOPSOIL, SILT, Some Sand, dark brown; damp; loose; irregular lower contact.				
	0.50 274.62				
0.5	SILT, Trace Sand, greyish tan; weakly layered to blocky; minor reddish mottling; no seepage; compact to dense with depth.				
1.0		TP-1.1	Grab		
1.5					
2.0					
	2.30 272.82				
	End of Hole				
2.5					
3.0					

Notes: 38mm standpipe installed 9/15/15 to 2.72 metres; 1.53 metres stick up. Dry upon completion.

Static Groundwater Level 12/10/15 1.10 metres below grade (274.02 mASL)
07/06/16 1.87 metres below grade (273.25 mASL)

Grain Size Distribution & Hydrometer Analysis TP-1.1 @ 1.0m

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TEST PIT LOG TP-2

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: Yanmar V. 027	Date: September 15, 2015	TP-2

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 282.23				5 10 15 20
0.0	TOPSOIL, SILT, Some Sand, medium brown; dry; loose; rootlets to 0.2m.				
	0.40 281.83				
0.5	SILT, Little Sand, greyish tan; weakly layered to blocky; stoney; gravelly @1.25 mbg.				
1.0		TP-2.1	Grab		
	1.25 280.98				
	SILT and SAND, Trace Gravel, light medium brown; loose; dry.				
1.5		TP-2.2	Grab		
2.0					
2.5		TP-2.3	Grab		
	2.72 279.51				
	End of Hole				
3.0					

Notes: 38mm standpipe installed 9/15/15 to 2.72 metres; 0.93 metre stick up.

Static Groundwater Level 12/10/15 1.92 metres below grade (280.31 mASL)
07/06/16 Dry (greater than 279.51 mASL)

Grain Size Distribution & Hydrometer Analysis TP-2.2 @ 1.5m

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Lindsay, Ontario, K9V 1Y6
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BOREHOLE LOG BH-1

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-1 (MW-1)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 279.33				5 10 15 20
0.0	TOPSOIL, SAND, Some Silt, dark brown; loose; damp. 0.40 278.93				
1.0	SAND, Some Silt, tan brown; moist; weakly mottled reddish brown decreasing with depth; greyish tan with depth; loose to compact.	BH-1.1	GS		
2.0	2.40 276.93				
3.0	SAND and GRAVEL, Little Silt, greyish tan; saturated; loose.	BH-1.2	GS		
	3.55 275.78				
4.0	End of Hole				
5.0					
6.0					

Soil Profile: Bentonite, Riser, Sand, Slotted Screen

Notes: 38mm slotted screen installed 11/23/15 to 3.55 metres; 1.08 metres stick up.

Static Groundwater Level 12/10/15 1.23 metres below grade (278.10 mASL)
07/06/16 1.84 metres below grade (277.49 mASL)

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Lindsay, Ontario, K9V 1Y6
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BOREHOLE LOG BH-2

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-2 (MW-2)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 277.23				5 10 15 20
0.0	TOPSOIL, SAND and SILT, medium dark brown; organics; loose; damp.				
	0.30 276.93				
	SAND, Some Silt, greenish tan; damp to moist with depth; very weak mottling at upper contact (i.e. 0.3-0.6 mbg).				
1.0		BH-2.1	GS		
2.0					
	2.25 274.98				
	SAND and GRAVEL, Little Silt, greyish tan; moist to saturated with depth; loose to compact with depth; less gravel from 2.9 to 3.1 mbg.				
3.0		BH-2.2	GS		
4.0	4.10 273.13				
	End of Hole				
5.0					
6.0					

Soil Profile: Bentonite, Riser, Sand, Slotted Screen

Notes: 38mm slotted screen installed 11/23/15 to 4.10 metres; 0.98 metre stick up.

Static Groundwater Level 12/10/15 0.64 metres below grade (276.59 mASL)
07/06/16 1.03 metres below grade (276.20 mASL)

Grain Size Distribution and Hydrometer Analysis BH-2.1 @ 1.1 mbg

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Lindsay, Ontario, K9V 1Y6
Phone: (705) 324-5408 Facsimile: (705) 324-2081

BOREHOLE LOG BH-3

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-3 (MW-3)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 276.20				5 10 15 20
0.0	TOPSOIL, SAND and SILT, dark brown; loose; damp; rootlets.				
	0.40 275.80				
1.0	SAND, Some Silt, greenish grey tan; iron oxide mottling; moist with depth; loose to compact. Increasingly coarse grained Sand with pebbles below 2.1 m; increasingly gravelly with depth.	BH-3.1	GS	Bentonite / Riser	
2.0		BH-3.2	GS	Sand / Slotted Screen	
3.0		BH-3.3	GS		
	3.95 272.25				
4.0	End of Hole				
5.0					
6.0					

Notes: 38mm slotted screen installed 11/23/15 to 3.95 metres; 1.17 metres stick up.

Static Groundwater Level 12/10/15 1.02 metres below grade (275.18 mASL)
07/06/16 1.36 metres below grade (274.84 mASL)

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BOREHOLE LOG BH-4

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-4 (MW-4)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 275.79				5 10 15 20
0.0	TOPSOIL, SAND, medium dark brown; loose; damp.				
	0.40 275.39				
	SILT, Trace Sand, Trace Gravel, tan light brown; weak to moderate mottling (iron oxide); moist with depth; loose to compact.				
1.0		BH-4.1	GS		
2.0					
	2.80 272.99				
	SAND, Some Silt, Trace Gravel; weakly mottled to 3.2 mbg; locally stoney; saturated with depth; compact.	BH-4.2	GS		
3.0					
4.0					
	4.60 271.19				
	End of Hole				
5.0					
6.0					

Soil Profile: Bentonite, Riser, Sand, Slotted Screen

Notes: 38mm slotted screen installed 11/23/15 to 4.60 metres; 1.01 metres stick up.

Static Groundwater Level 12/10/15 1.01 metres below grade (274.78 mASL)
07/06/15 1.61 metres below grade (274.18 mASL)

Grain Size Analysis and Hydrometer Analysis BH-4.1 @ 1.1 mbg

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BOREHOLE LOG BH-5

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-5 (MW-5)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 276.99				5 10 15 20
0.0	TOPSOIL, SILT and SAND, dark brown; dry to damp; compact; organic corn topping.				
	0.50 276.49				
	SILT and SAND, tan light brown; yellow mottling iron oxide; damp; compact.				
1.0		BH-5.1	GS		
	1.82 275.17				
2.0	SILT, Trace Sand, Trace Gravel, greyish tan; moderately mottled; moist to wet; loose to compact.	BH-5.2	GS		
	2.80 274.19				
3.0	SAND, Some Silt, Trace Gravel, greyish tan; no mottling below 2.3 mbg; moist.				
	3.96 273.03				
4.0	End of Hole				
5.0					
6.0					

Bentonite
Riser
Sand
Slotted Screen

Notes: 38mm slotted screen installed 11/23/15 to 3.96 metres; 1.06 metre stick up.

Static Groundwater Level 12/10/15 0.84 metres below grade (276.15 mASL)
07/06/16 1.45 metres below grade (275.54 mASL)

Grain Size Analysis and Hydrometer Analysis BH-5.2 @ 2.3 mbg

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BOREHOLE LOG BH-6

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-6 (MW-6)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile	Moisture Content (%)
	Depth (m) Ground Surface Elevation (m) 278.12				5 10 15 20
0.0	TOPSOIL, SAND and SILT, dark brown; damp; loose.				
	0.35 277.77				
	SILT, Little Sand, Trace Gravel, greenish tan; weak to moderate mottling; damp to moist at lower contact; loose to compact locally.			Bentonite / Riser	
1.0		BH-6.1	GS		
	1.60 276.52				
	SAND, Little Silt, Trace Gravel; stoney; moist; no mottling observed; compact to dense with depth.			Sand / Slotted Screen	
2.0		BH-6.2	GS		
	2.95 275.17				
3.0	End of Hole				
4.0					
5.0					
6.0					

Notes: 38mm slotted screen installed 11/23/15 to 2.95 metres; 0.97 metre stick up.

Static Groundwater Level 12/10/15 1.06 metres below grade (277.06 mASL)
07/06/16 1.62 metres below grade (276.50 mASL)

Grain Size Analysis and Hydrometer Analysis BH-6.1 @ 1.2 mbg

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BOREHOLE LOG BH-7

O'CONNOR BROS. CORP.

PROJECT NO.: R15-635

Equipment: GEOPROBE 7822 DT	Date: November 23, 2015	BH-7 (MW-7)

Depth (m)	Soil Description	Sample No.	Sample Type	Soil Profile
	Depth (m) Ground Surface Elevation (m) 279.74			
0.0	TOPSOIL, SAND and SILT, dark brown; damp; loose. 0.35 279.39			
	SILT and SAND, Trace Gravel, greenish grey to grey tan with depth; occasional pebble; damp to moist; loose to compact.			
1.0		BH-7.1	GS	
	1.50 278.24			
	SAND, Little Gravel, Trace Silt, greyish tan; damp to moist; compact to very dense with depth.			
2.0				
3.0	3.20 276.54			
	SAND, Little Gravel, Trace Silt, tan grey; refusal at cobble; very dense.			
4.0	4.00 275.74			
	End of Hole			
5.0				
6.0				

Soil Profile: Bentonite, Riser, Sand, Slotted Screen

Moisture Content (%): 5 10 15 20

Notes: 38mm slotted screen installed 11/23/15 to 4.00 metres; 1.17 metre stick up.

Static Groundwater Level 12/10/15 1.24 metres below grade (278.50 mASL)
07/06/16 1.93 metres below grade (277.81 mASL)

Grain Size Analysis and Hydrometer Analysis BH-7.1 @ 1.1 mbg

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS More than 50% of material is **larger** than No. 200 (75um) sieve size	GRAVEL AND GRAVELLY SOILS More than 50% of coarse fraction **retained** on No. 4 (4.75mm) sieve	CLEAN GRAVELS Little or No Fines (<5%)		GW	Well Graded Gravels, Gravel-Sand Mixtures, Little or No Fines (C_u>4)
				GP	Poorly Graded Gravels, Gravel-Sand Mixtures, Little or No Fines (C_u<4)
		GRAVELS WITH FINES Appreciable Amount of Fines (>12%)		GM	Silty Gravels, Gravel-Sand-Silt Mixtures (PI<4)
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures (PI>7)
	SAND AND SANDY SOILS More than 50% of coarse fraction **passing** No. 4 (4.75mm) sieve	CLEAN SANDS Little or No Fines (<5%)		SW	Well Graded Sands, Gravelly Sands, Little or No Fines (C_u>6)
				SP	Poorly Graded Sands, Gravelly Sands, Little or No Fines (C_u<6)
		SANDS WITH FINES Appreciable Amount of Fines (>12%)		SM	Silty Sands, Sand-Silt Mixtures (PI<4)
				SC	Clayey Sands, Sand-Clay Mixtures (PI>7)
FINE GRAINED SOILS More than 50% of material is **smaller** than No. 200 (75um) size	SILTS AND CLAYS	Liquid Limit **Less** than 50		ML	Inorganic Silts and Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands, or Clayey Silts with Slight Plasticity
				CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
				OL	Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS	Liquid Limit **Greater** than 50		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts
				CH	Inorganic Clays of High Plasticity, Fat Clays
				OH	Organic Clays of Medium to High Plasticity, Organic Silts
HIGHLY ORGANIC SOILS				PT	Peat, Humus, Swamp And Other Highly Organic Soils

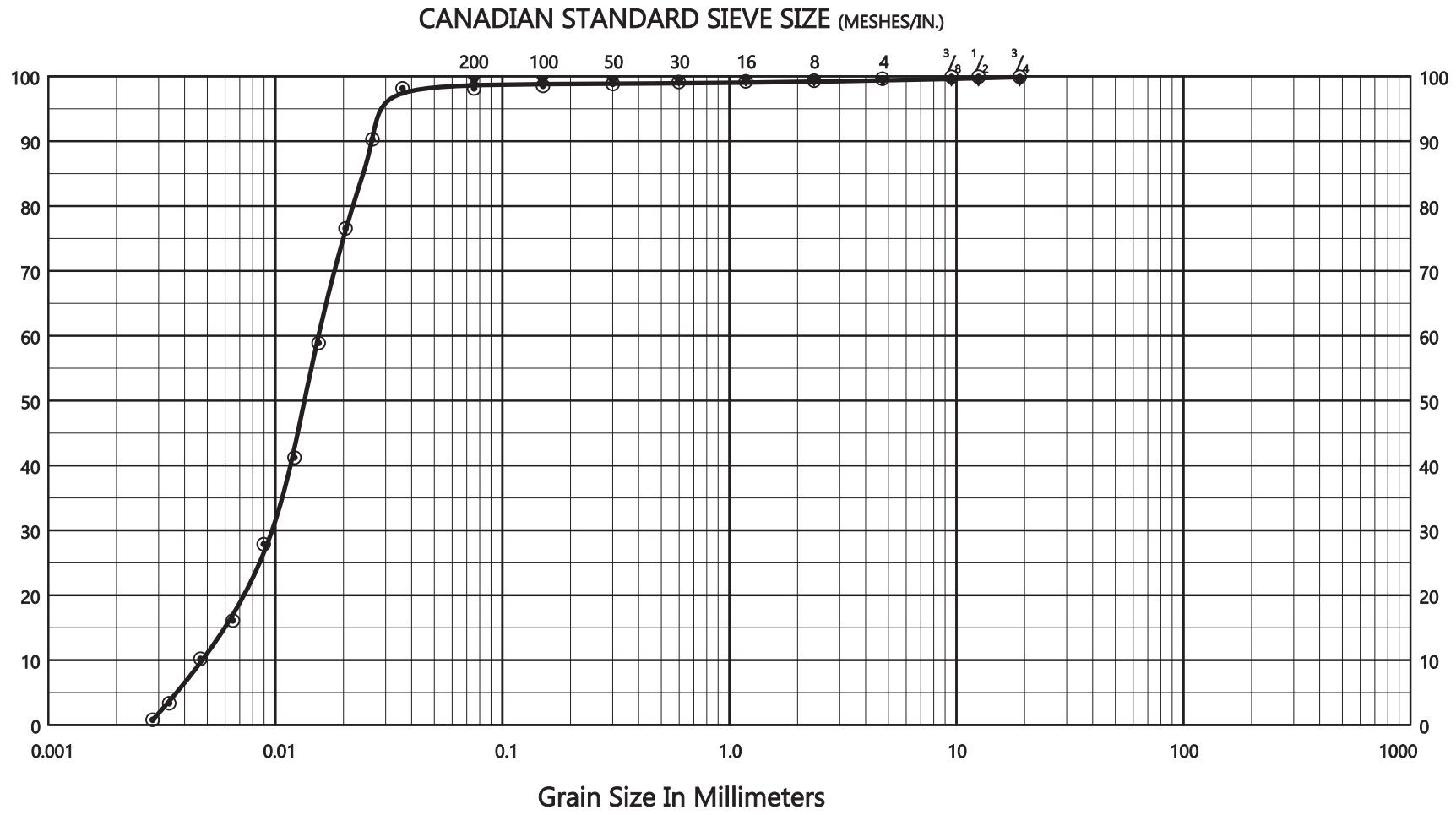
Note: Dual Symbols Are Used To Indicate Borderline Soil Classifications

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL DESCRIPTION

GRANULAR SOILS		COHESIVE SOILS			GRADATION	
RELATIVE DENSITY	STANDARD PENETRATION RESISTANCE (N-VALUE) Blows/300mm	CONSISTENCY	APPROX. UNDRAINED SHEAR STRENGTH (C_u) kPa	PSF	% Finer By Weight	
Very Loose	0 - 4	Very Soft	<12	<250	Trace	<10%
Loose	4 - 10	Soft	12 - 25	250 - 500	Little	10 - 20%
Compact	10 - 30	Firm	25 - 50	500 - 1000	Some	20 - 35%
Dense	30 - 50	Stiff	50 - 100	1000 - 2000	And	35 - 50%
Very Dense	>50	Very Stiff	100 - 200	2000 - 4000		
		Hard	>200	>4000		

GRAIN SIZE DISTRIBUTION



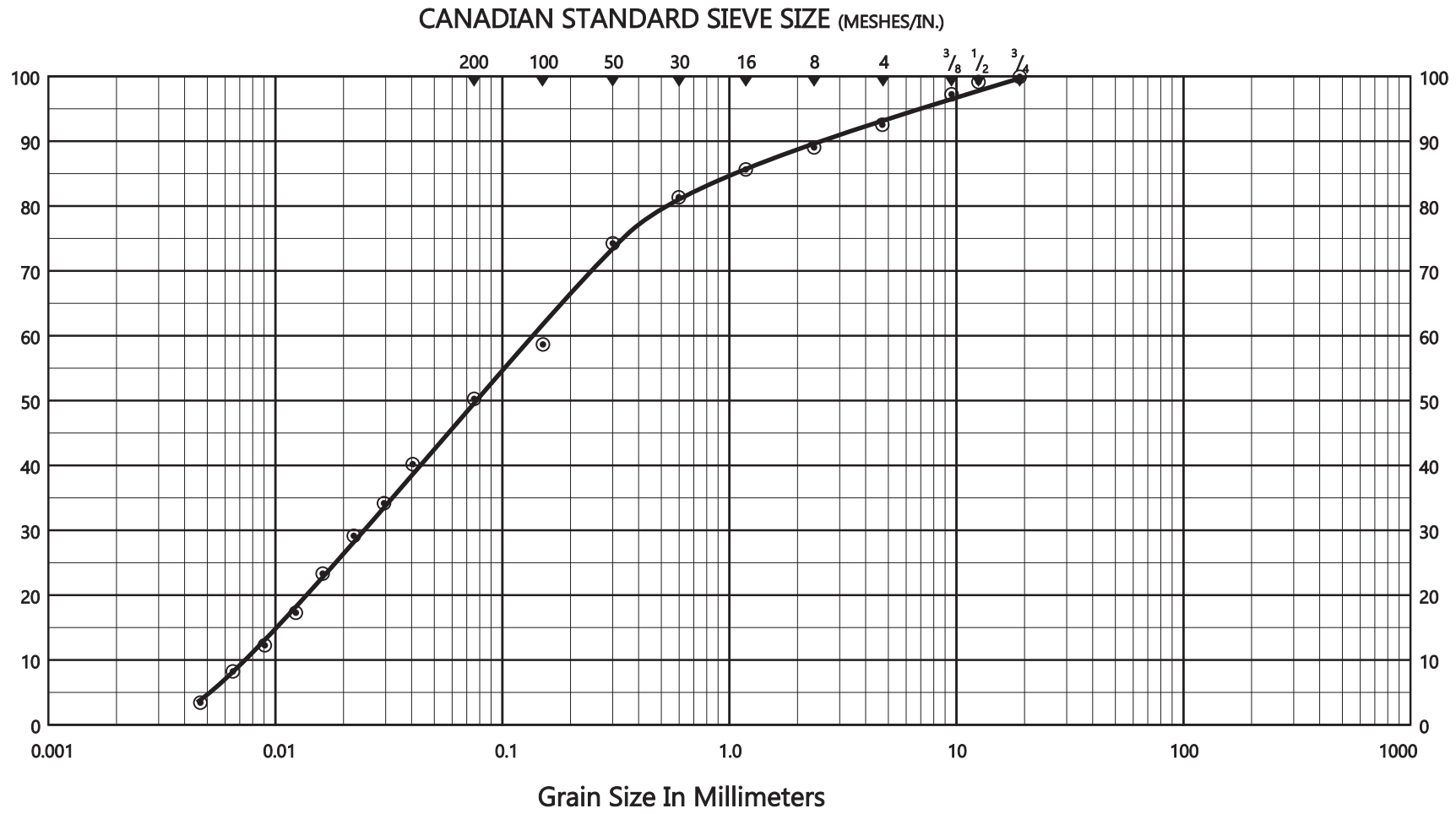
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
TP-1	1	1.0 m	13.0 %	ML	SILT, Trace Sand	$2.3x10^{-5}$	35 min/cm

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O'CONNOR BROS. CORP. R15-635 PLATE 1

GRAIN SIZE DISTRIBUTION



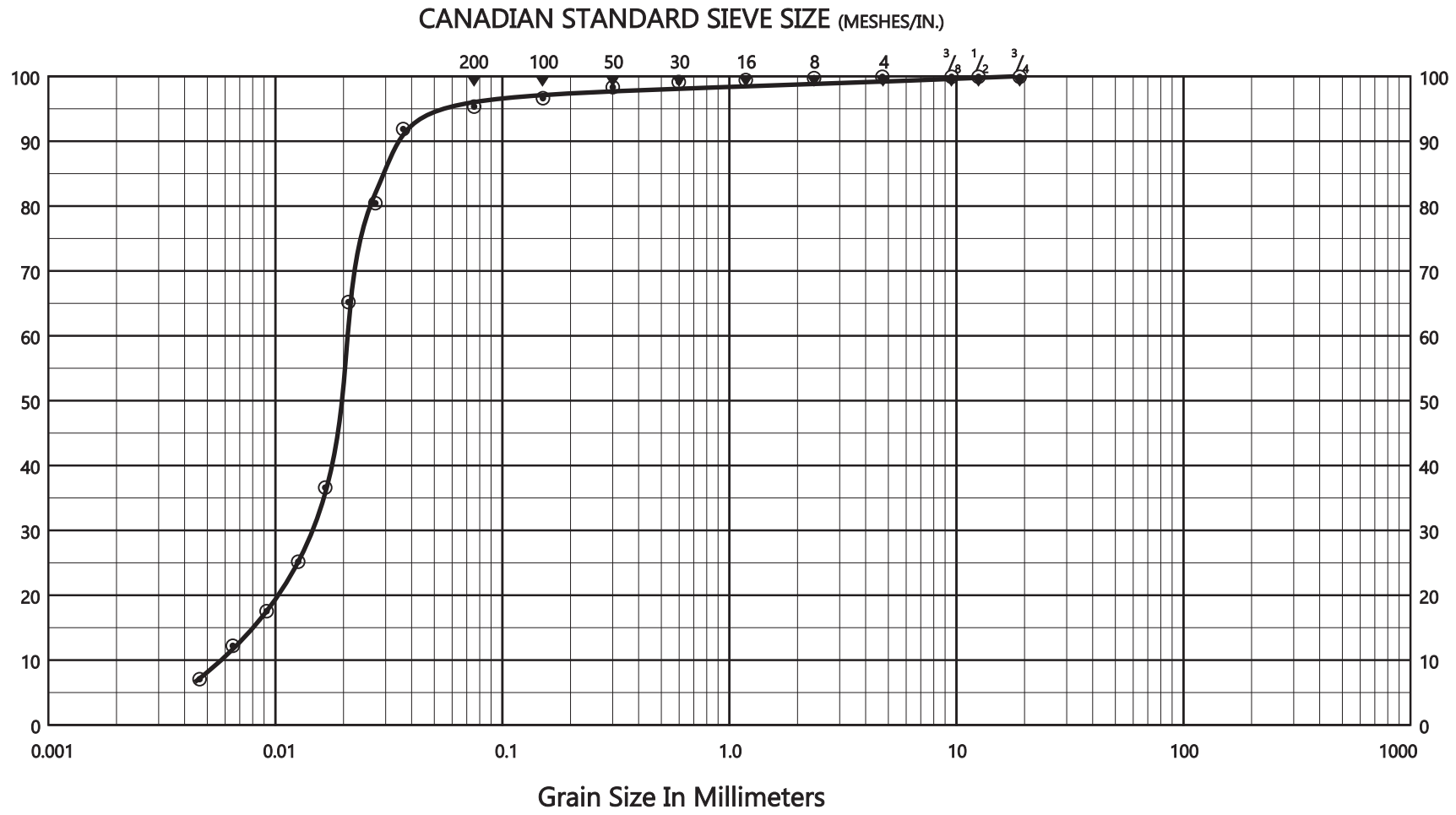
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
TP-2	2	1.5 m	5.0 %	SM	SILT and SAND, Trace Gravel	5.4×10^{-5}	15 min/cm

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O'CONNOR BROS. CORP. R15-635 PLATE 2

GRAIN SIZE DISTRIBUTION



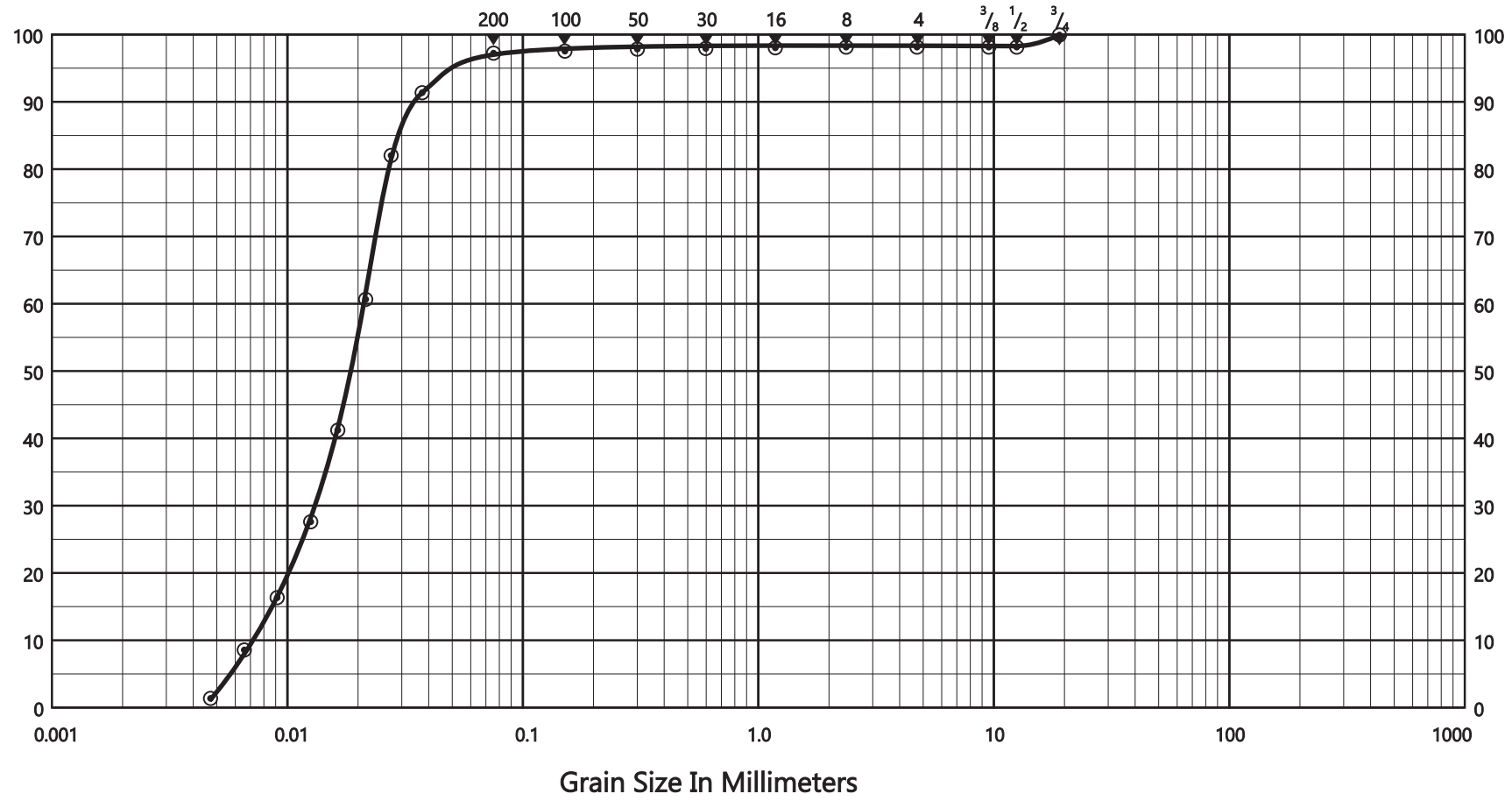
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
BH-2	1	1.1 m	15.8%	ML	SILT, Trace Sand, Trace Gravel	$3.3x10^{-5}$	35 min/cm

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O'CONNOR BROS. CORP. R15-635 PLATE 3

GRAIN SIZE DISTRIBUTION



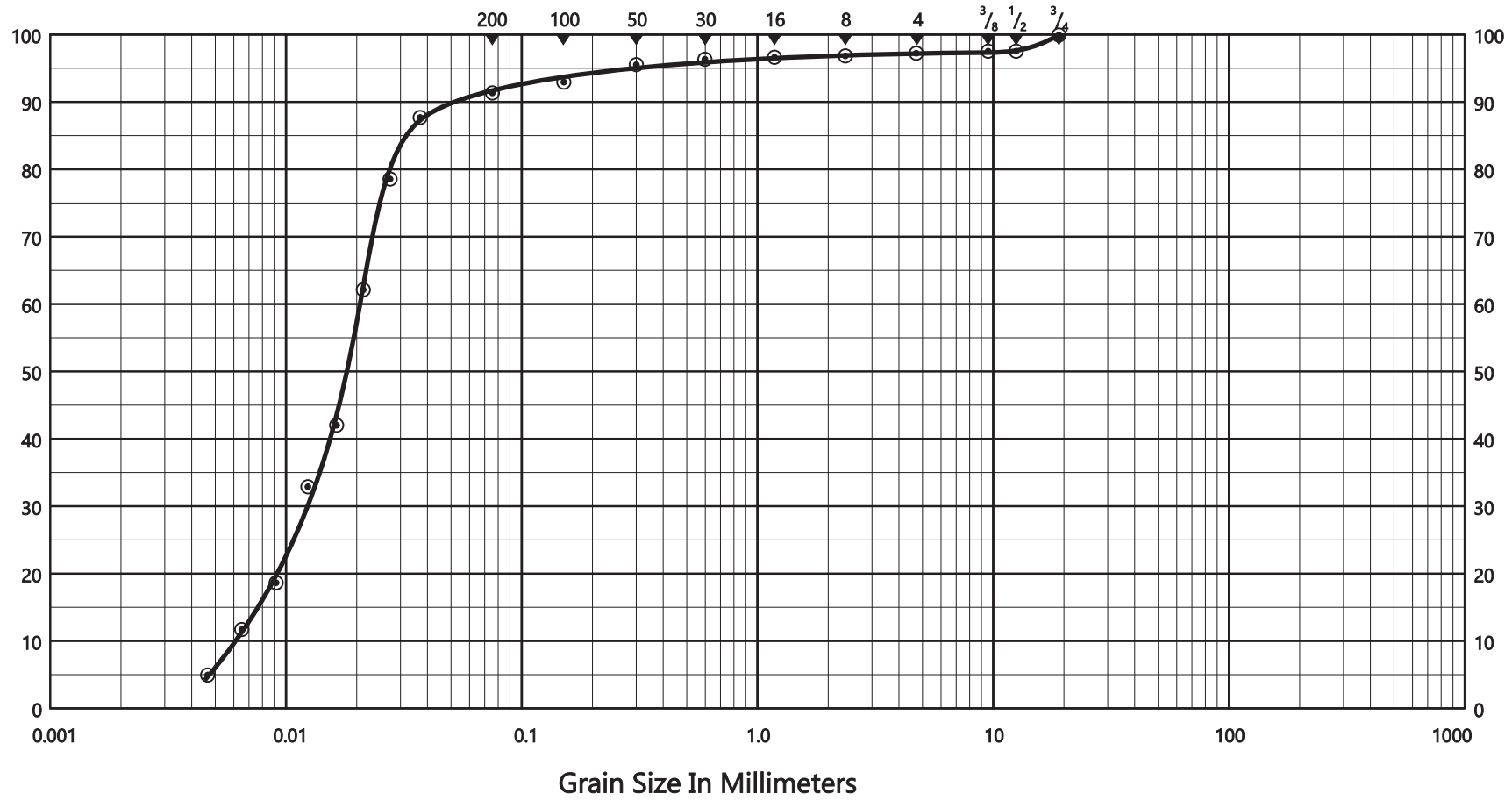
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
BH-4	1	1.1 m	16.6%	ML	SILT, Trace Sand, Trace Gravel	5.1×10^{-5}	35 min/cm

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O'CONNOR BROS. CORP. R15-635 PLATE 4

GRAIN SIZE DISTRIBUTION



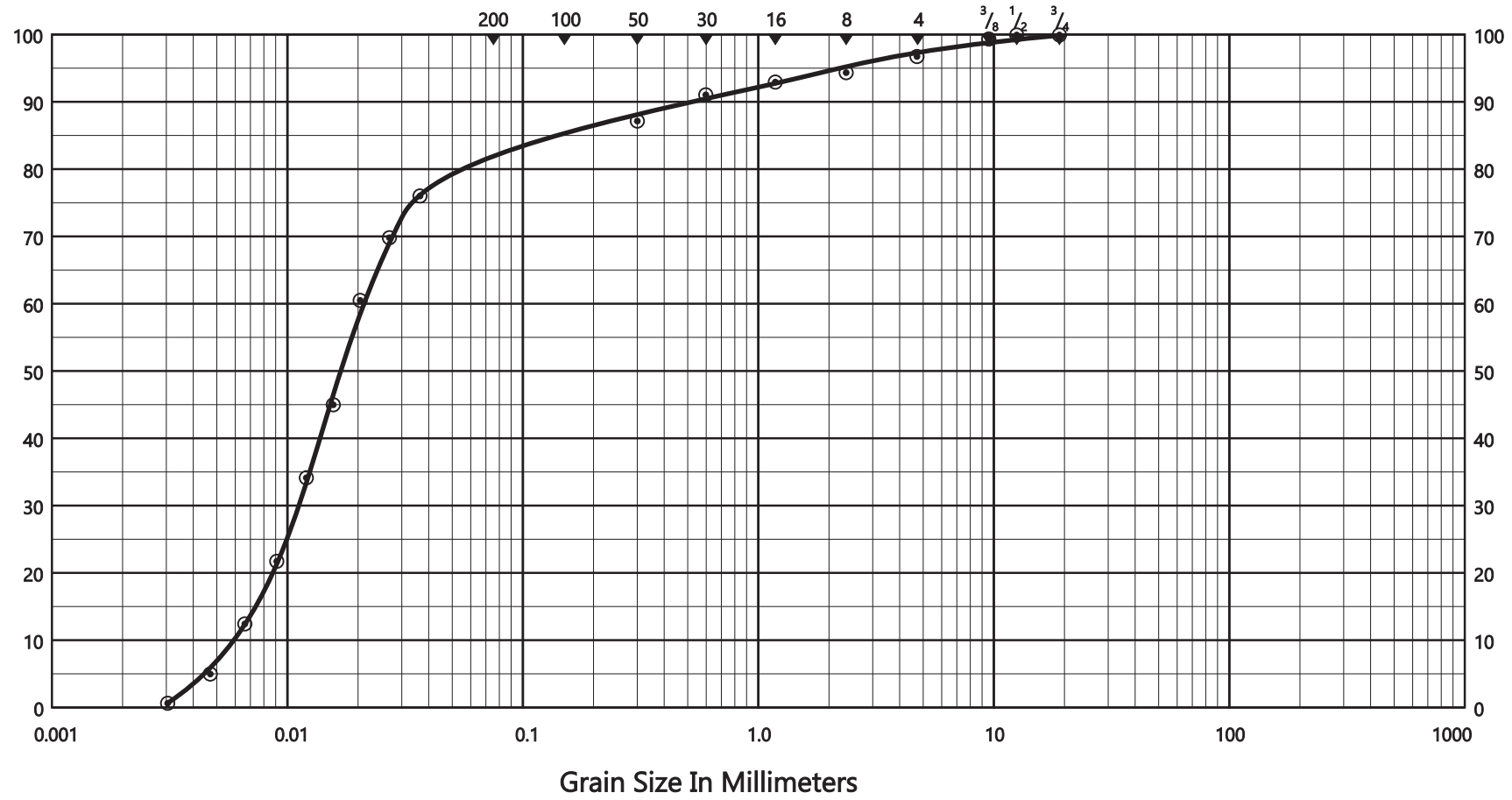
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
BH-5	2	2.3 m	16.9%	ML	SILT, Trace Sand, Trace Gravel	3.7×10^{-5}	35 min/cm

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GRAIN SIZE DISTRIBUTION



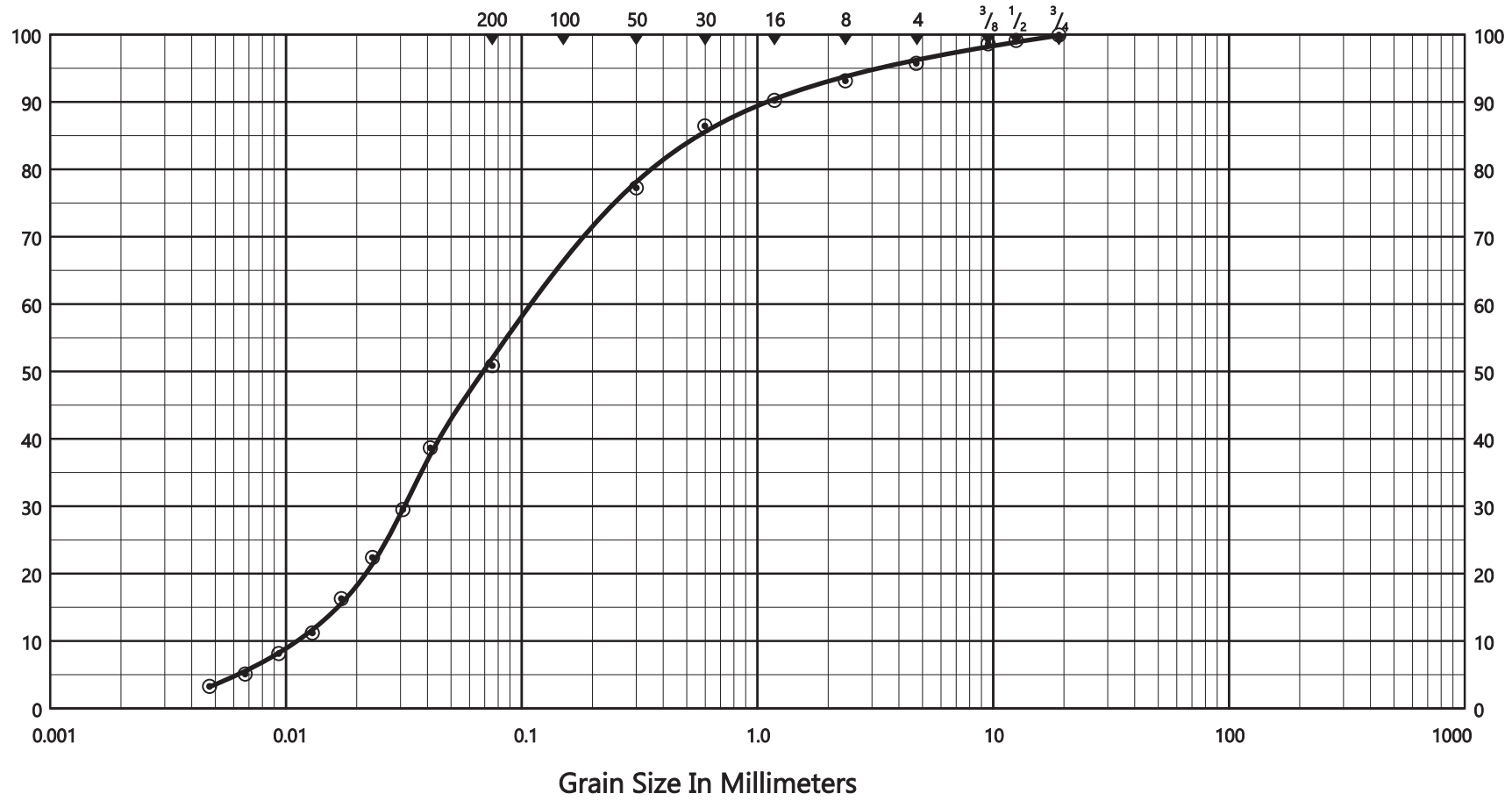
SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
BH-6	1	1.2 m	15.2%	SM/ML	SILT, Little Sand, Trace Gravel	$3.5x10^{-5}$	25 min/cm

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Geological & Environmental Consultants

O'CONNOR BROS. CORP. R15-635 PLATE 6

GRAIN SIZE DISTRIBUTION



SILT OR CLAY	SAND			GRAVEL		COBBLES
	FINE	MEDIUM	COARSE	FINE	COARSE	

BORING	SAMPLE	DEPTH	MOISTURE	SOIL TYPE	CLASSIFICATION	K (cm/sec)	T-Time
BH-7	1	1.1 m	7.1%	SM	SILT and SAND, Trace Gravel	1.4×10^{-4}	15 min/cm

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Geological & Environmental Consultants

O'CONNOR BROS. CORP. R15-635 PLATE 7

APPENDIX C

MECP WATER WELL RECORDS

MECP Water Well Records within 500 metres of Site
O'Connor Bros. Corp. Development

WELL ID	EASTING	NORTHING	ELEVATION	DATE DRILLED	WELL DEPTH (M)	DEPTH TO BEDROCK (M)	KIND OF WATER	FINAL STATUS	WATER USE	WATER FOUND (M)	STATIC LEVEL (m)	D PUMP LEVEL (M)	TIME HOUR	TIME MINUTE	RECOMMENDED PUMPING RATE (L/min)
1905422	661665	4882623	274	1979-08-01	12.2	OB	Fresh	Water Supply	Domestic	5	3.7	10.7	2	0	7.6
1905692	661765	4882673	275	1979-08-05	11.6	OB	Fresh	Water Supply	Domestic	11	5.5	UKN	2	0	18.9
1906120	662265	4883073	285	1981-06-30	27.4	OB	Fresh	Water Supply	Domestic	23	7.6	23.8	4	0	113.6
1906387	661765	4882973	276	1982-08-17	45.1	OB	Fresh	Water Supply	Livestock	45	3.0	30.5	3	30	75.7
1906388	661865	4882723	276	1982-08-02	50.6	OB	Fresh	Water Supply	Domestic	51	3.7	42.7	3	30	26.5
1906389	661515	4882623	275	1982-07-26	48.5	OB	Fresh	Water Supply	Domestic	48	4.6	30.5	2	30	26.5
1906390	661665	4882623	274	1982-07-19	45.4	OB	Fresh	Water Supply	Domestic	45	3.0	30.5	2	30	26.5
1906391	661615	4882673	274	1982-07-12	44.2	OB	Fresh	Water Supply	Domestic	44	1.2	30.5	2	30	26.5
1906392	661565	4882673	274	1982-08-20	41.8	OB	Fresh	Water Supply	Domestic	42	1.2	30.5	2	30	26.5
1906394	661615	4882573	275	1982-08-27	44.8	OB	Fresh	Water Supply	Domestic	45	3.7	30.5	2	30	26.5
1906412	661715	4882673	274	1982-08-16	30.5	OB	Fresh	Water Supply	Domestic	27	1.2	18.3	8	0	75.7
1906413	661715	4882623	274	1982-09-09	94.5	OB	Not stated	Abandoned-Quality	Domestic	35	6.7	45.7	6	0	37.9
1906414	661715	4882373	274	1982-08-05	45.7	OB	Fresh	Water Supply	Domestic	36	5.5	30.5	2	0	37.9
1906429	661715	4882673	274	1982-10-12	28.6	OB	Fresh	Water Supply	Domestic	29	1.8	24.4	3	30	26.5
1906430	661615	4882623	275	1982-10-07	51.5	OB	Fresh	Water Supply	Commerical	52	3.7	33.5	2	30	30.3
1906431	661715	4882723	275	1982-09-02	46.6	OB	Fresh	Water Supply	Domestic	47	3.7	30.5	3	30	26.5
1906489	661615	4882323	275	1982-10-21	46.0	OB	Fresh	Water Supply	Domestic	42	5.5	30.5	6	0	37.9
1906490	661915	4882723	277	1982-10-01	101.2	OB	Salty	Abandoned-Quality	Domestic	9	13.4	30.5	12	0	37.9
1906530	661615	4882323	275	1982-11-13	44.2	OB	Fresh	Water Supply	Domestic	41	3.0	30.5	2	0	37.9
1906531	661715	4882323	275	1982-12-02	38.1	OB	Fresh	Water Supply	Domestic	18	1.2	24.4	2	0	37.9
1906627	661515	4882523	276	1983-04-28	47.2	OB	Fresh	Water Supply	Commerical	47	2.4	30.5	3	30	26.5
1906692	661965	4882723	278	1983-09-01	41.1	OB	Fresh	Water Supply	Domestic	38	3.7	33.5	3	0	34.1
1906725	661615	4882473	275	1983-08-18	48.2	OB	Not stated	Water Supply	Domestic	28	3.7	UKN	8	0	22.7
1906760	661615	4882623	275	1983-11-15	47.5	OB	Fresh	Water Supply	Domestic	47	3.7	UKN	3	30	26.5
1907139	661890	4882720	277	1984-11-14	48.2	OB	Fresh	Water Supply	Domestic	48	3.7	22.9	2	30	26.5
1908920	661814	4882717	275	1988-03-03	41.1	OB	Fresh	Water Supply	Domestic	40	0.9	39.6	1	20	15.1
1910359	661594	4882591	275	1989-12-13	39.6	OB	Fresh	Water Supply	Domestic	40	1.8	14.6	1	0	37.9
1910777	661627	4882742	274	1990-08-23	13.4	OB	Fresh	Water Supply	Domestic	12	2.7	11.6	2	0	37.9
1911756	661433	4882566	275	1993-07-08	102.1	OB	Fresh	Water Supply	Domestic	100	6.1	22.3	3	0	37.9
1912293	661694	4882052	276	1994-12-21	6.4	OB	Fresh	Water Supply	Domestic	6	1.5	5.5	2	30	15.1
1912902	661623	4882279	275	1996-07-18	9.1	OB	Fresh	Water Supply	Domestic	5	1.5	8.5	3	30	56.8
1913032	661603	4882398	275	1996-11-27	11.9	OB	Fresh	Dewatering	Domestic	12	1.8	UKN	4	0	UKN
1913512	661892	4883027	278	1997-12-17	40.8	OB	Fresh	Water Supply	Domestic	41	6.1	29.0	1	0	37.9
1913946	661642	4882093	275	1998-12-02	40.2	OB	Fresh	Water Supply	Domestic	38	6.1	36.6	2	30	26.5
1916803	662018	4881920	285	2003-11-04	57.9	OB	Fresh	Water Supply	Commerical	58	6.1	54.9	3		26.5
1917778	661813	4882934	276	2005-09-05	133.0	OB	Fresh	Water Supply	Domestic	36	18.1	UKN	1	0	28.4
1917845	661566	4882803	274	2005-09-12	4.5	OB	Fresh	Observation Wells		3.60	0.0	0.0			0.0
4602191	661608	4882447	275	1955-08-16	9.1	OB	Fresh	Water Supply	Domestic	8	0.9	UKN	UKN	UKN	UKN
4602194	661626	4882316	275	1967-07-10	3.7	OB	Fresh	Water Supply	Commerical	2	0.3	3.7	UKN	UKN	7.6
4602195	662339	4882710	287	1958-10-20	9.8	OB	Fresh	Water Supply	Domestic	8	4.6	UKN	UKN	UKN	UKN
4602209	661612	4882904	274	1966-07-06	54.3	OB	Fresh	Water Supply	Public	52	3.7	22.9	5	0	56.8
4602210	661626	4882955	274	1967-11-19	54.3	OB	Fresh	Water Supply	Public	50	1.8	24.4	8	0	37.9
4604463	661925	4882393	278	1969-10-11	56.7	OB	Fresh	Water Supply	Domestic	56	15.2	51.8	2	30	15.1
4604561	661875	4882703	276	1970-10-29	7.6	OB	Fresh	Water Supply	Domestic	5	5.5	7.3			7.6
4605316	661635	4882313	275	1972-06-10	8.5	OB	Fresh	Water Supply	Commerical	3	1.8	7.9			18.9
4605738	661315	4882523	280	1973-09-05	70.1	OB	Fresh	Water Supply	Irrigation	68	8.5	21.3	4	30	113.6
4606201	661723	4882605	274	1975-03-06	24.4	OB	Fresh	Water Supply	Domestic	24	1.5	10.7	2	30	18.9
7052131	661634	4882698	274	2007-09-26	36.0	OB	Fresh	Water Supply	Domestic	36	3.0	30.5	1		26.5
7054490	661564	4882842	274	2007-12-08	0.0	0.0		Abandoned-Other	Not Used	0.00	0.0	0.0			0.0
7185243	661510	4882365	276	2012-06-27	6.1	0.0		Monitoring and Test Hole	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7185244	661516	4882337	276	2012-06-27	6.1	0.0		Test Hole	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7185245	661516	4882337	276	2012-06-27	4.6	0.0		Test Hole	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7190315	662223	4882685	286	2012-09-27	59.4	OB	Untested	Water Supply	Domestic	59	14.9	54.9	1		30.3
7197084	661487	4882751	274	2012-09-24	6.1	0.0	Untested	Monitoring and Test Hole	Monitoring and Test Hole	3.66	0.0	0.0			0.0
7206501	661689	4882921	275	2013-07-22	4.6	0.0		Monitoring and Test Hole	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7206502	661658	4882891	274	2013-07-22	5.5	0.0		Monitoring and Test Hole	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7206503	661549	4882889	273	2013-07-22	4.6	0.0		UKN	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7210370	661820	4882714	275	2013-10-19	29.3	OB	UKN	Water Supply	Domestic	UKN	1.4	27.4	1	0	28.4
7215607	661796	4882741	275	2013-01-28	20.1	0.0		Abandoned-Supply		0.00	0.0	0.0			0.0
7215609	661796	4882740	275	2013-10-01	71.6	0.0		Abandoned-Supply		0.00	0.0	0.0			0.0
7240772	661425	4882523	275	2015-04-22	0.0	0.0		UKN		0.00	0.0	0.0			0.0
7253982	661998	4882526	280	2015-11-23	2.9	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253983	661941	4882513	278	2015-11-23	4.0	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253984	661892	4882565	275	2015-11-23	4.0	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253985	661940	4882597	276	2015-11-23	4.0	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253986	661990	4882590	278	2015-11-23	4.0	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253987	662043	4882612	280	2015-11-23	3.5	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7253988	662063	4882554	282	2015-11-23	4.0	0.0		Observation Wells	Monitoring and Test Hole	0.00	0.0	0.0			0.0
7328299	661741	4882626	0	2018-10-26	4.6	0.0		UKN	Test Hole	0.00	0.0	0.0			0.0
7328300	661767	4882614	0	2018-10-26	6.1	0.0		UKN	Test Hole	0.00	0.0	0.0			0.0
7328301	661775	4882626	0	2018-10-26	6.1	0.0		UKN	Test Hole	0.00	0.0	0.0			0.0
7334342	662121	4882576	284	2019-04-17	36.7	OB	Fresh	Water Supply	Domestic	UKN	4.3	27.4	1		37.9
7334391	661988	4882534	278	2019-04-12	54.5	OB	Fresh	Water Supply	Domestic	54	4.0	24.4	1		37.9
7334392	661834	4882487	276	2019-04-02	51.5	OB	Fresh	Water Supply	Domestic	50	3.4	24.4	1		37.9
7340444	662482	4882757	0	2019-08-05	0.0	0.0		Abandoned-Supply		0.00	0.0	0.0			0.0
75				**AVERAGE**	**31.6**					**24.7**	**3.0**	**17.8**			**23.5**
				MIN	**2.9**					**0.0**	**0.3**	**3.7**			**7.6**
				MAX	**133.0**					**100.0**	**18.1**	**54.9**			**113.6**

Notes:

UKN Unknown; data not provided on water well record.

OB Overburden Well

1 Water Well Record Data obtained from Ministry of the Environment, Conservation and Parks Water Well Information System (WWIS) last updated April 30, 2020, © Queen's Printer.

MECP Water Well Records within 500 metres of Site
O'Connor Bros. Corp. Development

WELL ID	EASTING	NORTHING	ELEVATION	DATE DRILLED	WELL DEPTH (M)	DEPTH TO BEDROCK (M)	KIND OF WATER	FINAL STATUS	WATER USE	WATER FOUND (M)	STATIC LEVEL (m)	D PUMP LEVEL (M)	TIME HOUR	TIME MINUTE	RECOMMENDED PUMPING RATE (L/min)
1905422	661665	4882623	274	1979-08-01	12.2	OB	Fresh	Water Supply	Domestic	5.5	3.7	10.7	2	0	7.6
1905692	661765	4882673	275	1979-08-05	11.6	OB	Fresh	Water Supply	Domestic	10.7	5.5	UKN	2	0	18.9
1906120	662265	4883073	285	1981-06-30	27.4	OB	Fresh	Water Supply	Domestic	23.5	7.6	23.8	4	0	113.6
1906387	661765	4882973	276	1982-08-17	45.1	OB	Fresh	Water Supply	Livestock	45.1	3.0	30.5	3	30	75.7
1906388	661865	4882723	276	1982-08-02	50.6	OB	Fresh	Water Supply	Domestic	50.6	3.7	42.7	3	30	26.5
1906389	661515	4882623	275	1982-07-26	48.5	OB	Fresh	Water Supply	Domestic	48.5	4.6	30.5	2	30	26.5
1906390	661665	4882623	274	1982-07-19	45.4	OB	Fresh	Water Supply	Domestic	45.4	3.0	30.5	2	30	26.5
1906391	661615	4882673	274	1982-07-12	44.2	OB	Fresh	Water Supply	Domestic	44.2	1.2	30.5	2	30	26.5
1906392	661565	4882673	274	1982-08-20	41.8	OB	Fresh	Water Supply	Domestic	41.8	1.2	30.5	2	30	26.5
1906394	661615	4882573	275	1982-08-27	44.8	OB	Fresh	Water Supply	Domestic	44.8	3.7	30.5	2	30	26.5
1906412	661715	4882673	274	1982-08-16	30.5	OB	Fresh	Water Supply	Domestic	26.8	1.2	18.3	8	0	75.7
1906414	661715	4882373	274	1982-08-05	45.7	OB	Fresh	Water Supply	Domestic	36.0	5.5	30.5	2	0	37.9
1906429	661715	4882673	274	1982-10-12	28.6	OB	Fresh	Water Supply	Domestic	28.7	1.8	24.4	3	30	26.5
1906430	661615	4882623	275	1982-10-07	51.5	OB	Fresh	Water Supply	Commerical	51.5	3.7	33.5	2	30	30.3
1906431	661715	4882723	275	1982-09-02	46.6	OB	Fresh	Water Supply	Domestic	46.6	3.7	30.5	3	30	26.5
1906489	661615	4882323	275	1982-10-21	46.0	OB	Fresh	Water Supply	Domestic	41.8	5.5	30.5	6	0	37.9
1906530	661615	4882323	275	1982-11-13	44.2	OB	Fresh	Water Supply	Domestic	41.1	3.0	30.5	2	0	37.9
1906531	661715	4882323	275	1982-12-02	38.1	OB	Fresh	Water Supply	Domestic	18.3	1.2	24.4	2	0	37.9
1906627	661515	4882523	276	1983-04-28	47.2	OB	Fresh	Water Supply	Commerical	47.2	2.4	30.5	3	30	26.5
1906692	661965	4882723	278	1983-09-01	41.1	OB	Fresh	Water Supply	Domestic	38.4	3.7	33.5	3	0	34.1
1906725	661615	4882473	275	1983-08-18	48.2	OB	Not stated	Water Supply	Domestic	27.7	3.7	UKN	8	0	22.7
1906760	661615	4882623	275	1983-11-15	47.5	OB	Fresh	Water Supply	Domestic	46.6	3.7	UKN	3	30	26.5
1907139	661890	4882720	277	1984-11-14	48.2	OB	Fresh	Water Supply	Domestic	48.2	3.7	22.9	2	30	26.5
1908920	661814	4882717	275	1988-03-03	41.1	OB	Fresh	Water Supply	Domestic	40.2	0.9	39.6	1	20	15.1
1910359	661594	4882591	275	1989-12-13	39.6	OB	Fresh	Water Supply	Domestic	39.6	1.8	14.6	1	0	37.9
1910777	661627	4882742	274	1990-08-23	13.4	OB	Fresh	Water Supply	Domestic	12.2	2.7	11.6	2	0	37.9
1911756	661433	4882566	275	1993-07-08	102.1	OB	Fresh	Water Supply	Domestic	100.0	6.1	22.3	3	0	37.9
1912293	661694	4882052	276	1994-12-21	6.4	OB	Fresh	Water Supply	Domestic	6.1	1.5	5.5	2	30	15.1
1912902	661623	4882279	275	1996-07-18	9.1	OB	Fresh	Water Supply	Domestic	4.6	1.5	8.5	3	30	56.8
1913512	661892	4883027	278	1997-12-17	40.8	OB	Fresh	Water Supply	Domestic	40.8	6.1	29.0	1	0	37.9
1913946	661642	4882093	275	1998-12-02	40.2	OB	Fresh	Water Supply	Domestic	38.1	6.1	36.6	2	30	26.5
1916803	662018	4881920	285	2003-11-04	57.9	OB	Fresh	Water Supply	Commerical	57.9	6.1	54.9	3		26.5
1917778	661813	4882934	276	2005-09-05	133.0	OB	Fresh	Water Supply	Domestic	36.3	18.1	UKN	1	0	28.4
4602191	661608	4882447	275	1955-08-16	9.1	OB	Fresh	Water Supply	Domestic	8.2	0.9	UKN	UKN	UKN	UKN
4602194	661626	4882316	275	1967-07-10	3.7	OB	Fresh	Water Supply	Commerical	1.8	0.3	3.7	UKN	UKN	7.6
4602195	662339	4882710	287	1958-10-20	9.8	OB	Fresh	Water Supply	Domestic	8.2	4.6	UKN	UKN	UKN	UKN
4602209	661612	4882904	274	1966-07-06	54.3	OB	Fresh	Water Supply	Public	51.8	3.7	22.9	5	0	56.8
4602210	661626	4882955	274	1967-11-19	54.3	OB	Fresh	Water Supply	Public	50.3	1.8	24.4	8	0	37.9
4604463	661925	4882393	278	1969-10-11	56.7	OB	Fresh	Water Supply	Domestic	56.4	15.2	51.8	2	30	15.1
4604561	661875	4882703	276	1970-10-29	7.6	OB	Fresh	Water Supply	Domestic	5.5	5.5	7.3			7.6
4605316	661635	4882313	275	1972-06-10	8.5	OB	Fresh	Water Supply	Commerical	3.0	1.8	7.9			18.9
4605738	661315	4882523	280	1973-09-05	70.1	OB	Fresh	Water Supply	Irrigation	68.3	8.5	21.3	4	30	113.6
4606201	661723	4882605	274	1975-03-06	24.4	OB	Fresh	Water Supply	Domestic	24.4	1.5	10.7	2	30	18.9
7052131	661634	4882698	274	2007-09-26	36.0	OB	Fresh	Water Supply	Domestic	36.0	3.0	30.5	1		26.5
7190315	662223	4882685	286	2012-09-27	59.4	OB	Untested	Water Supply	Domestic	59.4	14.9	54.9	1		30.3
7210370	661820	4882714	275	2013-10-19	29.3	OB	UKN	Water Supply	Domestic	UKN	1.4	27.4	1	0	28.4
7334342	662121	4882576	284	2019-04-17	36.7	OB	Fresh	Water Supply	Domestic	UKN	4.3	27.4	1		37.9
7334391	661988	4882534	278	2019-04-12	54.5	OB	Fresh	Water Supply	Domestic	53.6	4.0	24.4	1		37.9
7334392	661834	4882487	276	2019-04-02	51.5	OB	Fresh	Water Supply	Domestic	50.3	3.4	24.4	1		37.9
49				**AVERAGE**	**40.5**					**36.4**	**4.2**	**26.3**			**34.4**
				MIN	**3.7**					**1.8**	**0.3**	**3.7**			**7.6**
	86			**MAX**	**133.0**					**100.0**	**18.1**	**54.9**			**113.6**
	42														

Notes:

UKN Unknown; data not provided on water well record.

OB Overburden Well

1 Water Well Record Data obtained from Ministry of the Environment, Conservation and Parks Water Well Information System (WWIS) last updated April 30, 2020, © Queen's Printer.

* Test Well depth measured during logger deployment

* Test Well elevations obtained from CFC Survey

Test Well

APPENDIX D

DOOR-TO-DOOR
WELL SURVEY RESULTS

Study Area

0 100 200 400 Meters

N



Orthophotograph provided by Ontario Ministry of Natural Resources and Forestry
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Base Data obtained from: Ontario Ministry of Natural Resources, © Queens Printer for Ontario, 2018.

Date created: May, 2018.

Legend

250 m Study Area

Development Area

GRACE & ASSOCIATES INC.
Geological & Environmental Consultants
16 Glenelg Street East
Lindsay, Ontario, K9V 1Y6
Phone: (705) 324-5408 Facsimile: (705) 324-2081

GRACE & ASSOCIATES INC.
Geological & Environmental Consultants

16 Glenelg Street East
Lindsay, Ontario
K9V 1Y6

Telephone: (705) 324-5408
Facsimile: (705) 324-2081

Tuesday, August 7, 2018

Dear Home Owner:

Grace & Associates Inc., Geological & Environmental Consultants, has been retained to conduct a hydrogeological investigation on well water quality and quantity in the area. The study includes locating existing water wells, springs and streams on the property, the observation of the soil materials at surface, and the collection of representative water samples. The survey is extremely important to correctly assess well water usage and quality in the area. The results of our study will be presented in a report to be submitted to the Regional Municipality of Durham.

This letter is to introduce you to Russell Wykes of Grace & Associates Inc., who will be in the area during the week of August 6th and will be asking you to provide information about your well and to enquire as to whether we can monitor your well during the planned testing. During the survey, a representative water sample may also be collected for analysis. The results of any tests on your well, if performed, will be provided to you at no cost.

If you have received this letter and are not contacted by our staff during the survey, it would be appreciated if you could contact this office to contribute any details on your well and water supply. The survey is extremely important to correctly assess conditions in the area. Your cooperation in this matter is greatly appreciated. A copy of the well survey questionnaire has been attached for your convenience.

Should you have any questions, or require additional information on this survey, please do not hesitate to contact our office.

Yours very truly,
GRACE & ASSOCIATES INC.



Beatrize Vitorino, HBSc.
Environmental Analyst

O'Connor Proposed Subdivision Development
Door to Door Water Well Survey: Manchester Ontario
Survey: August 16, 2018
Sampling results correspondence August 27-30, 2018

Address	Comment
5 Brook Street	No answer; letter delivered
11 Brook Street	No answer; letter delivered
12 Brook Street	No answer; letter delivered
1207 Highway 7A	No answer; letter delivered
1209 Highway 7A	No answer; letter delivered
1213 Highway 7A	No answer; letter delivered
1214 Highway 7A	No answer; letter delivered
1217 Highway 7A	No answer; letter delivered
1221 Highway 7A	No answer; letter delivered
1225 Highway 7A	No answer; letter delivered
13801 Highway 12	Commercial: Restaurant; owner not present; letter delivered
13901 Highway 12	No answer; letter delivered
13951 Highway 12	No answer; letter delivered
13991 Highway 12	No answer; letter delivered
14025 Highway 12	Commercial; owner not present; letter delivered
1207 King Street	No answer; letter delivered
1208 King Street	No answer; letter delivered
1210 King Street	No answer; letter delivered
1211 King Street	No answer; letter delivered
1217 King Street	No answer; letter delivered
1223 King Street	Commercial; owner not present; letter delivered
1227 King Street	Homeowner not interested in participating; letter delivered
1237 King Street	Homeowner not interested in participating; letter delivered
1245 King Street	No answer; letter delivered
1251 King Street	Letter delivered; survey completed with homeowner Bill Knight. Dug well unknown depth and age; no problems with well Groundwater sample collected from exterior tap for nitrate and microbiological analyses
1261 King Street	Letter delivered; survey completed with homeowner Bill Knight. 140' deep drilled well unknown age; no problems with well Groundwater sample collected from exterior tap for nitrate and microbiological analyses
1310 King Street	Homeowner not interested in participating; letter delivered
1320 King Street	Commercial: Bed and Breakfast; letter delivered
3 Rose Street	No answer; letter delivered
4 Rose Street	No answer; letter delivered
8 Rose Street	No answer; letter delivered
17 Rose Street	No answer; letter delivered

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Monday, August 27, 2018

Bill Knight
1261 King Street
Port Perry, Ontario
L9L 1B5

Dear Mr. Knight:

Thank you for your cooperation with our water well survey on August 16 of this year. The information from your well has been very helpful in assisting us with our hydrogeological investigation of the area. At the time of our survey, we obtained water samples from your properties at 1251 and 1261 King Street and had them analyzed for bacteriological and nitrate parameters. The following are the results of the analyses:

1251 King Street		
Bacteria:	Total Coliforms	ND (Not Detected)
	Escherichia coli (E-Coli)	ND (Not Detected)
	Nitrate	0.33 mg/L
1261 King Street		
Bacteria:	Total Coliforms	72
	Escherichia coli (E-Coli)	ND (Not Detected)
	Nitrate	<0.05 mg/L

The results indicate that the water sample obtained from the residence at 1261 King Street shows evidence of bacterial contamination and may be unsafe to drink. We recommend that 2 to 3 additional samples be collected 1 to 3 weeks apart, and submitted to your local health unit to confirm the presence or absence of bacteria. If the water is to be consumed, it should be boiled for at least 5 minutes to kill bacteria. The Ministry's "Disinfection Instruction Sheet" has been enclosed with this letter for your guidance.

The nitrate concentrations reported in the samples meet the Standard, being less than the maximum acceptable concentration of 10 mg/L in the (ODWS).

Should you have any questions, or require additional information, please do not hesitate to contact this office.

Sincerely,

GRACE & ASSOCIATES INC.
Beatrize Vitorino
Environmental Analyst

/Enclosure

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T374715

MICROBIOLOGY ANALYSIS REVIEWED BY: Rocio Morales, Inorganics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Aug 23, 2018

PAGES (INCLUDING COVER): 8

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

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Certificate of Analysis

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:R.W.

Microbiological Analysis (water)

DATE RECEIVED: 2018-08-17

DATE REPORTED: 2018-08-23

					SAMPLE DESCRIPTION:	Res. 1261.635	Res. 1251.635
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2018-08-16	2018-08-16
Parameter	Unit	G / S: A	G / S: B	RDL		9478194	9478195
Escherichia coli	CFU/100mL	0		1		ND[B]	ND[B]
Total Coliforms	CFU/100mL	0		1		72[>A]	ND[B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

9478194-9478195 ND - Not Detected.

Certified By:



Results relate only to the items tested and to all the items tested

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Certificate of Analysis

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:R.W.

Nitrate/Nitrite (Water)

DATE RECEIVED: 2018-08-17

DATE REPORTED: 2018-08-23

					SAMPLE DESCRIPTION:	Res. 1261.635	Res. 1251.635
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2018-08-16	2018-08-16
Parameter	Unit	G / S: A	G / S: B	RDL		9478194	9478195
Nitrate as N	mg/L	10.0		0.05		<0.05[<A]	0.33[<A]
Nitrite as N	mg/L	1.0		0.05		<0.05[<A]	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

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Guideline Violation

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
9478194	Res. 1261.635	O.Reg.169/03(mg/L)	Microbiological Analysis (water)	Total Coliforms	CFU/100mL	0	72

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:R.W.

Microbiology Analysis

RPT Date: Aug 23, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Microbiological Analysis (water)															
Escherichia coli	9476548		ND	ND	NA	< 1									
Total Coliforms	9476548		ND	ND	NA	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:R.W.

Water Analysis

RPT Date: Aug 23, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	9476669		<0.25	<0.25	NA	< 0.05	93%	90%	110%	100%	90%	110%	97%	80%	120%
Nitrite as N	9476669		<0.25	<0.25	NA	< 0.05	NA	90%	110%	96%	90%	110%	92%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T374715

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

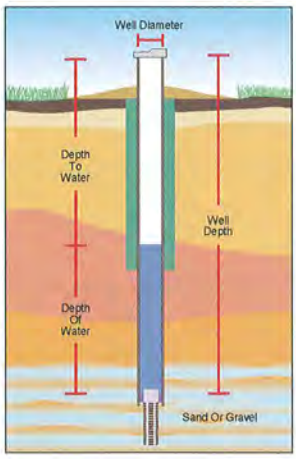
SAMPLING SITE:

SAMPLED BY:R.W.

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Escherichia coli	MIC-93-7010	EPA 1604	Membrane Filtration
Total Coliforms	MIC-93-7010	EPA 1604	Membrane Filtration
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

Disinfection Instruction Sheet



If your drinking water continues to test positive on repeated submissions, consult your local health unit, which can help you interpret the results of your tests and provide you with advice on what measures you can take to safeguard your drinking water.

The first step in identifying the reason for repeated adverse water quality is to conduct a visual inspection of your well. Start with a close look at your well. The area around it should be clear of any potential contaminant sources, such as pets, lawn care products, and gardens. Once you're satisfied that the area around your well is okay, take a good, close look at the well itself. If you have an older well, make sure that the cap and the sealant around the well casing isn't cracked or damaged. If it is, you need to fix or replace it right away.

If the source of the problem can't be detected, consult a licensed well contractor right away to identify the source of the problem and eliminate it. You can save yourself a lot of money by doing this instead of rushing out to buy a home treatment device that may be expensive to install, operate, and maintain. And it may not eliminate the source of your trouble.

(If you have a cistern, please talk to your public health unit about disinfection requirements.)

1. Measure the diameter of the well.
2. Measure the well depth and the static or resting water level, then calculate the depth of water in the well.
3. Using the table on this sheet, measure out the amount of bleach needed. (The table gives the volume of bleach needed for different well sizes.) Then, pour the mixture into your well.
4. If possible, mix the water in the well. This can be accomplished by attaching a hose to a tap, running water from the well, through the hose and back into the well.
5. After adding chlorine to the well, remove or bypass any carbon filters that are in the system for water treatment. If you don't, these filters will remove the chlorine from the water, and any pipes beyond the filter will not get disinfected. Replace with new filters after chlorination to avoid reintroducing bacteria into the system.
6. Run water at every faucet in the house (and barn, if you have one) until a strong chlorine odour is detected. Be aware that your nose may lose its ability to detect chlorine.
7. If there is no chlorine smell or it is very weak, add more bleach to the well and repeat Step 6 above.
8. Drain the water heater and fill with chlorinated water.
9. Backflush the water softener and all water filters (except carbon filters).
10. Let the chlorinated water stand in the system for at least 12 hours.
11. Clear chlorine from the well by running an outside hose to the ground surface. Then, run clear water through the faucets until the water no longer smells of chlorine.
12. Avoid putting too much chlorine into the septic system because the bacteria needed for septic decomposition may be killed.
13. Do not drink the water without boiling it until test results show the water is safe to drink.

Volume of Bleach to Add for Every 3 Metres (10 Feet) of Water in the Well*

Casing Diameter		Volume of Unscented Bleach (5.25% solution)
Millimetres	Inches	Millilitres
50	2	6
100	4	30
150	6	60
200	8	100
250	10	200
300	12	250
400	16	400
500	20	650
600	24	900
900	36	2000 (2 litres)
1200	48	3600 (3.6 litres)

For example: If you have 6 metres (20 feet) of water in your well and it has a casing diameter of 100 mm or 4 inches, you would add 60 mm or 2 fluid ounces of bleach.

* For questions or more information on how to disinfect your well, contact your local health unit.

Ontario

For more information

Ontario Government Ministry Abbreviations

Ministry of Health and Long-Term Care
MOHLTC (also MOH)

Ministry of the Environment
MOE (also MOEE)

Ontario Ministry of Agriculture and Food
OMAF (also OMAFRA)

Ontario Government Information Lines

MOE Public Information Centre: 1-800-565-4923

MOE Water Well Records: 1-888-396-9355

MOHLTC INFOline: 1-800-268-1154

OMAF Agricultural Information Contact Centre: 1-877-424-1300

Ontario Government Web Sites

MOE: www.ene.gov.on.ca

MOHLTC: www.health.gov.on.ca

OMAF: www.gov.on.ca/omaf

Publications available on-line

Health Canada: www.hc-sc.gc.ca

- *A Guide to Well Water Treatment and Maintenance;*
- *Water treatment devices for disinfection of drinking water.*

MOHLTC: www.health.gov.on.ca

- *How to use water safely during a "Boil Water Advisory";*
- *E. coli Bacteria;*
- List of Public Health Units in Ontario.

OMAF: www.gov.on.ca/omaf

- *Assessing the Potential for Ground Water Contamination on Your Farm*, Publication 97-017;
- *Best Management Practices: Water Wells*, OMAFRA and Agriculture and Agri-Food Canada, 2003 (to order).

MOE: www.ene.gov.on.ca

- *Important Facts About Water Well Construction*, Publication 3788;
- *Water Wells and Groundwater Supplies: The Protection of Water Quality in Bored and Dug Wells*, Information Sheet PIB 601b;
- *Water Wells and Groundwater Supplies: The Protection of Water Quality in Drilled Wells*, Information Sheet PIB 602b.

Ontario

Beatrize Vitorino

From: Beatrize Vitorino <bvga@sympatico.ca>
Sent: August-30-18 4:08 PM
To: 'billyknight3@live.ca'
Cc: tgga@sympatico.ca
Subject: RE: Well Analysis Results

Good afternoon Mr. Knight,

Further to our telephone conversation this afternoon, I have contacted the lab to request a review of analysis results; I will email you once I receive their response.

We will contact you when confirmed the date we will be sampling at the proposed development site, to arrange bacteriological sampling at both residences (1251 and 1261 King Street).

Should you have any questions, or require additional information, please do not hesitate to contact this office.

Respectfully,

Beatrize

From: Beatrize Vitorino [mailto:bvga@sympatico.ca]
Sent: August-30-18 12:40 PM
To: 'billyknight3@live.ca' <billyknight3@live.ca>
Cc: tgga@sympatico.ca
Subject: Well Analysis Results

Good afternoon Mr. Knight,

Further to our telephone conversation this afternoon, please find attached to this email, the letter mailed to you with the laboratory analysis results completed of the samples collected from the wells at 1251 and 1261 King Street.

The results indicate that the water sample obtained from the residence at 1261 King Street shows evidence of bacterial contamination (total coliforms = 72 CFU/100 mL) and may be unsafe to drink. The Ontario Drinking Standard for total coliforms is not detectable (ie. 0). The presence of any total coliform bacteria in treated water indicates a review of the treatment system is required and corrective action is necessary. You indicated that the UV lamp replacement schedule at your residence was upcoming.

We recommend that 2 to 3 additional bacteriological samples be collected 1 to 3 weeks apart, and submitted to your local health unit to confirm the presence or absence of bacteria. If the water is to be consumed, it should be boiled for at least 5 minutes to kill bacteria.

The Ministry's "Disinfection Instruction Sheet" has been enclosed with the letter for your guidance.

You also mentioned in our conversation that you have experienced problems in the past with your well; I would direct you contact an experienced well driller to assess your well to determine if well upgrades would benefit your well source water.

Should you have any questions, or require additional information, please do not hesitate to contact this office.

Respectfully,

Beatrize Vitorino

From: Beatrize Vitorino <bvga@sympatico.ca>
Sent: September 4, 2018 10:05 AM
To: billyknight3@live.ca
Cc: tgga@sympatico.ca
Subject: RE: Well Analysis Results

Good morning Bill,

We have received correspondence from the lab confirming that the results of the sample submitted from 1261 King Street are correct.

I am waiting for a date to conduct sampling and will contact you once known.

Should you have any questions, or require additional information, please do not hesitate to contact this office.

Respectfully,

Beatrize

From: Beatrize Vitorino [mailto:bvga@sympatico.ca]
Sent: August-30-18 4:08 PM
To: 'billyknight3@live.ca' <billyknight3@live.ca>
Cc: tgga@sympatico.ca
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Respectfully,

Beatrize

From: Beatrize Vitorino [mailto:bvga@sympatico.ca]
Sent: August-30-18 12:40 PM
To: 'billyknight3@live.ca' <billyknight3@live.ca>
Cc: tgga@sympatico.ca
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Respectfully,

Beatrize Vitorino
Environmental Analyst
GRACE & ASSOCIATES INC.
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APPENDIX E

PUMPING TEST DATA

GRACE & ASSOCIATES INC.
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16 Glenelg Street East
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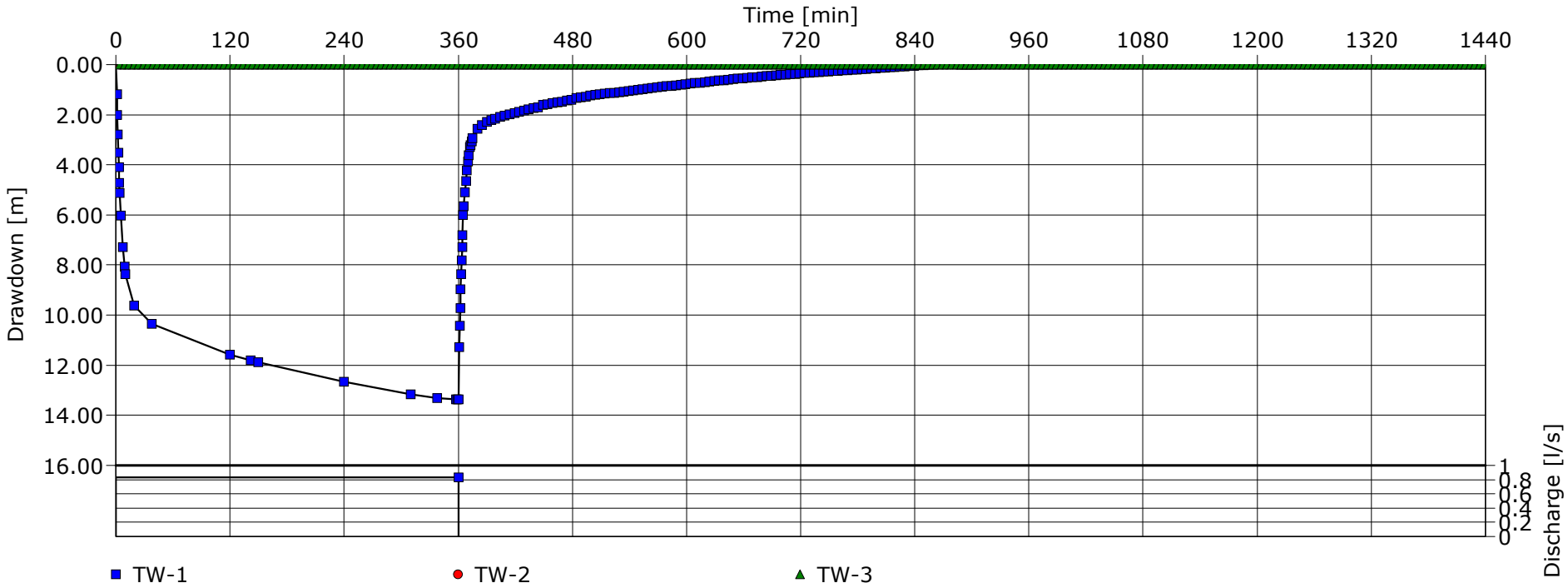
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-1	Pumping Well: TW-1
Test Conducted by: TG/BV		Test Date: 10/09/19
Analysis Performed by: BK	TW-1, Time-Drawdown (all wells)	Analysis Date: 11/18/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.8333 [l/s]	



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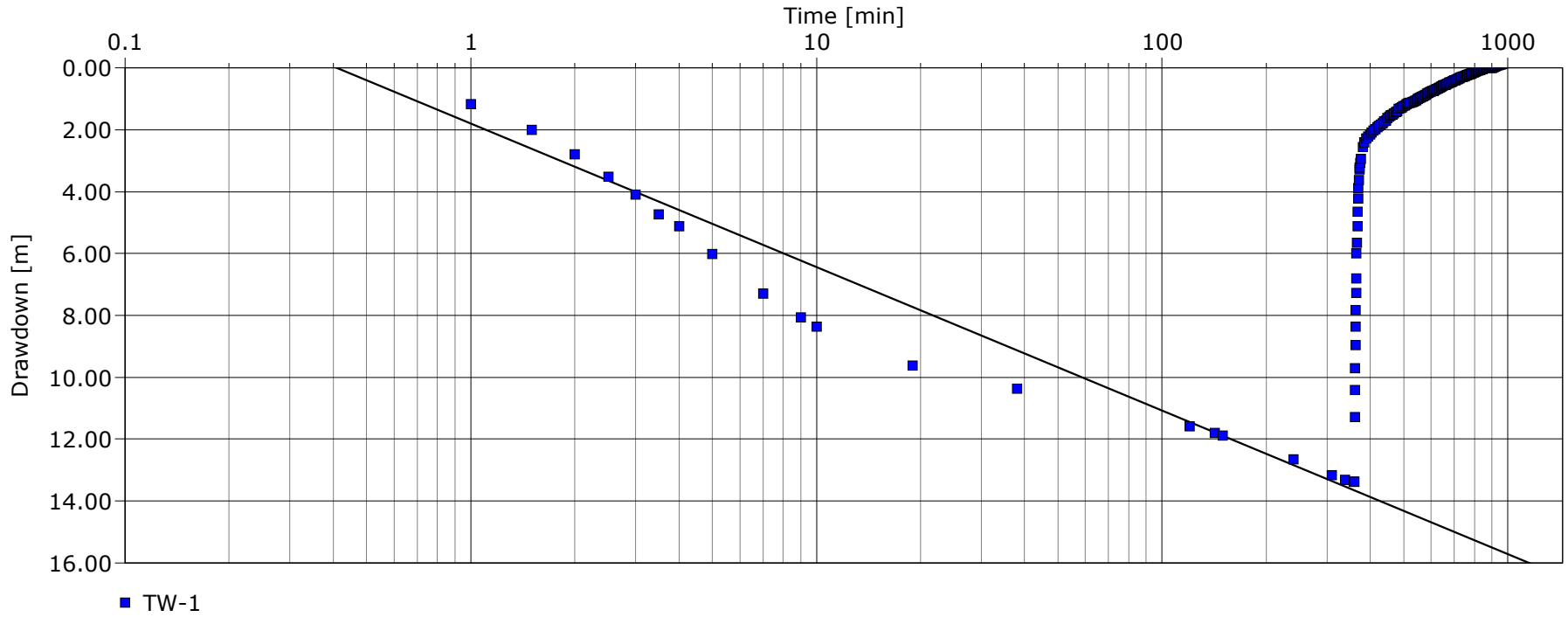
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-1	Pumping Well: TW-1
Test Conducted by: TG/BV		Test Date: 10/09/19
Analysis Performed by: BK	TW-1, Cooper-Jacob (pumped well data)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.8333 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW-1	2.84×10^{0}	2.84×10^{0}		0.07	

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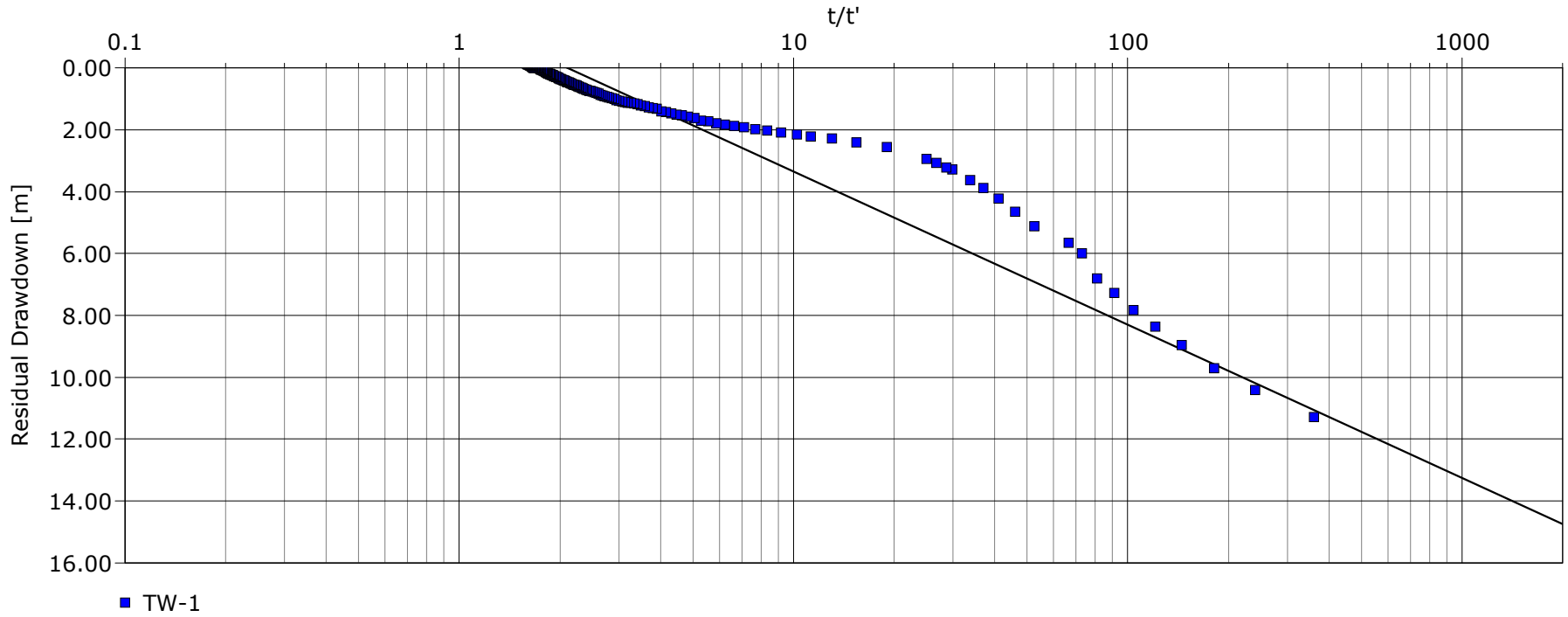
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-1	Pumping Well: TW-1
Test Conducted by: TG/BV		Test Date: 10/09/19
Analysis Performed by: BK	TW-1, Theis Recovery (pumped well data)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.8333 [l/s]	



Calculation using THEIS & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Radial Distance to PW [m]
TW-1	2.66×10^{0}	2.66×10^{0}	0.07

O'Connor Proposed Subdivision Development
R15-635
October 9, 2019

Pumping Test Observations

Well TW-1
Initial Static Level Reading: 8.55 m TOC
Stickup: 0.89 metres
Initial Static Level: 7.66 metres

RDG: Static Level reading from Top of Casing
Pumping test started at 9:01 am
Pumping test ended at 3:01 pm
Pump depth: 35.97 metres

Pumping

Elapsed Time (min)	Pumping Rate (L/min)	Static Level (mTOC)
0.0		8.55
0.5		
1.0		9.73
1.5		10.55
2.0		11.34
2.5		12.06
3.0		12.65
3.5		13.28
4.0		13.67
4.5		
5.0		14.57
6.0		
7.0		15.84
8.0		
9.0		16.62
10.0		16.92
15.0		
19.0		18.18
21.0		
30.0	50.0	
38.0		18.91
49.0		19.12
120.0		20.13
123.0		
142.0		20.35
150.0		20.44
180.0	50.0	
190.0		
202.0		
240.0		21.21
241.0		
247.0		
300.0	50.0	
310.0		21.71
314.0		
338.0		21.87
343.0		
344.0		
358.0		21.92
359.0		21.92
360.0		21.92

Recovery
Started at 3:01 pm

Elapsed Time (min)	Recovery Time (min)	Static Level (mTOC)
360.0	0.0	21.92
360.5	0.5	
361.0	1.0	19.84
361.5	1.5	18.97
362.0	2.0	18.26
362.5	2.5	17.52
363.0	3.0	16.91
363.5	3.5	16.37
364.0	4.0	15.83
364.5	4.5	15.36
365.0	5.0	14.55
365.5	5.5	14.21
367.0	7.0	13.66
368.0	8.0	13.20
369.0	9.0	12.77
370.0	10.0	12.43
371.0	11.0	12.17
372.5	11.5	11.84
373.0	13.0	11.77
374.0	14.0	11.62
375.0	15.0	11.50
380.0	20.0	11.11
385.0	25.0	10.96
390.0	30.0	10.84
395.0	35.0	10.76
446.0	86.0	10.21
451.0	91.0	10.17
629.0	269.0	9.21
3324.0	2964.0	7.16

O'Connor Proposed Subdivision Development
R15-635
October 9, 2019

TW-1
Water Quality Observations
TW-1 (pumping) **1370 King Street, Manchester, ON**

Pumping Test TW-1
TEST: 360 MINUTES @ 49.5 L/min (average rate)
Pumping test started at: 9:01 AM
Pumping test ended at: 3:01 PM

Actual Time	Elapsed Time (min)	pH	Temperature (oC)	Do (%)	Do (mg/L)	Conductivity (mS/cm)	ORP	Turbidity (NTU)
9:01 AM	0.0							
9:03 AM	2.0	7.78	7.6	4.2	32.50	475.3	780.3	
9:06 AM	5.0	7.80	7.8	17.7	7.20	439.0	694.6	
9:11 AM	10.0	7.58	7.9	41.5	4.21	436.1	382.1	
9:16 AM	15.0	7.60	7.9	17.8	2.18	439.5	247.8	
9:20 AM	19.0							199.0
9:21 AM	20.0	7.64	8.0	16.2	1.98	442.5	172.2	
9:31 AM	30.0	7.67	8.0	14.9	1.80	431.6	129.2	
10:01 AM	60.0	7.70	8.1	12.6	1.54	348.6	72.2	452.0
11:54 AM	173.0	7.75	8.3	9.6	1.15	308.2	-18.6	
1:10 PM	249.0	7.76	8.4	8.3	0.99	306.4	-37.6	
2:01 PM	300.0	7.76	8.5	7.6	0.90	306.2	-44.7	
2:46 PM	345.0	7.76	8.4	6.2	0.74	305.7	-51.3	
3:01 PM	360.0							Pumping Stop

Equipment:
YSI Model 556 MPS
Hach Colourimeter DR/890
Hanna Instruments C114 Turbidity Meter (Low Range)

O'Connor Proposed Subdivision Development
R15-635
October 9, 2019

Monitoring Well Observations
TW-1 Pumping test started at 9:01 am
TW-1 Pumping test ended at 3:01 pm
RDG: Static Level reading from Top of Casing

TW-2 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
7:54	-	TW-2	8.22	*prior to pumping
10:56	115	TW-2	8.22	
12:54	233	TW-2	8.22	
14:33	332	TW-2	8.22	
16:21	440	TW-2	8.22	*test recovery

TW-3 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
7:38	-	TW-3	5.81	*prior to pumping
10:52	111	TW-3	5.81	
12:42	221	TW-3	5.81	
14:29	328	TW-3	5.81	
16:16	435	TW-3	5.81	*test recovery

O'Connor Proposed Subdivision Development
R15-635
October 9, 2019

Monitoring Well Observations
TW-1 Pumping test started at 9:01 am
TW-1 Pumping test ended at 3:01 pm
RDG: Static Level reading from Top of Casing

Test Well Monitoring

Monitor	Distance from TW-1 (metres)	Elasped Time (min)	Total Drawdown (metres)
TW-2	137	332	0.00
TW-3	296	328	0.00

Test Pit Standpipe and Monitoring Well Monitoring

Monitor	Distance from TW-1 (metres)	Elasped Time (min)	Total Drawdown (metres)
TP-1	293	326	0.00
TP-2	67	318	0.00
MW-1	70	320	0.01
MW-2	121	321	0.01
MW-3	178	322	0.00
MW-4	237	325	0.01
MW-5	202	330	0.00
MW-6	138	334	0.00
MW-7	74	336	0.00

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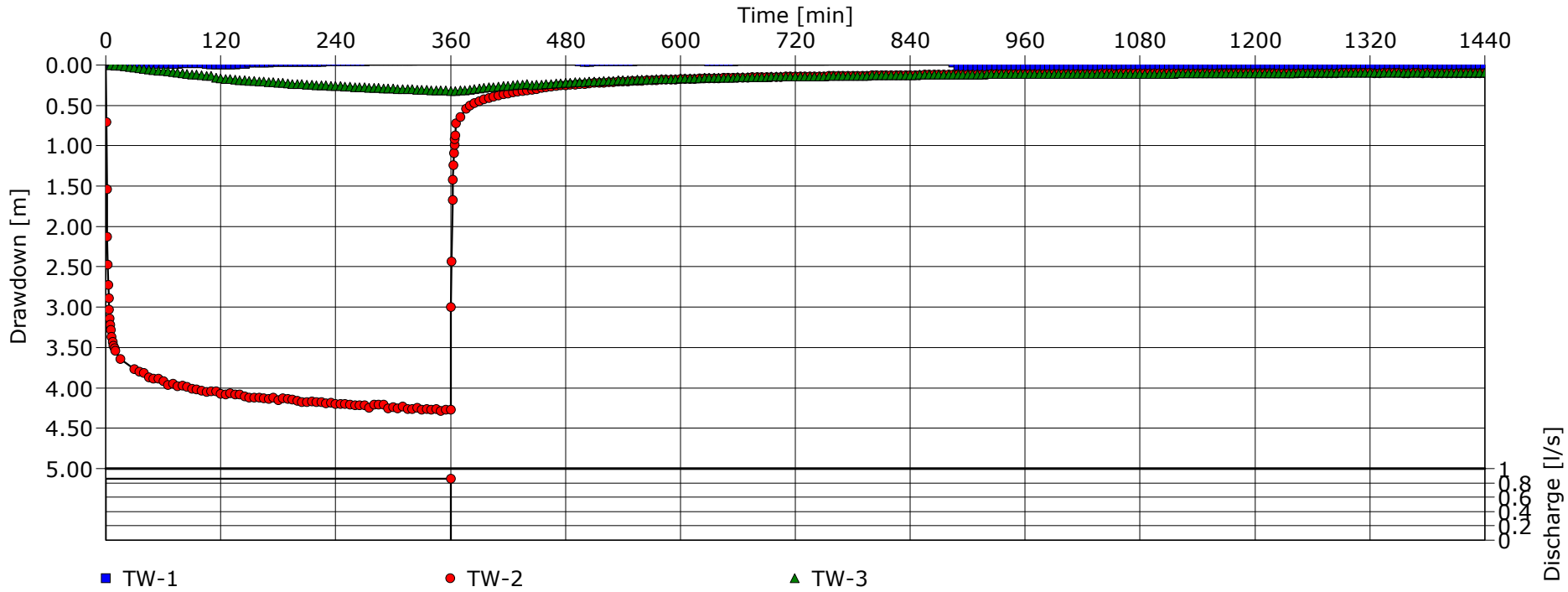
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-2	Pumping Well: TW-2
Test Conducted by: TG/BV		Test Date: 10/03/19
Analysis Performed by: BK	TW-2, Time-Drawdown (all wells)	Analysis Date: 11/18/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.855 [l/s]	



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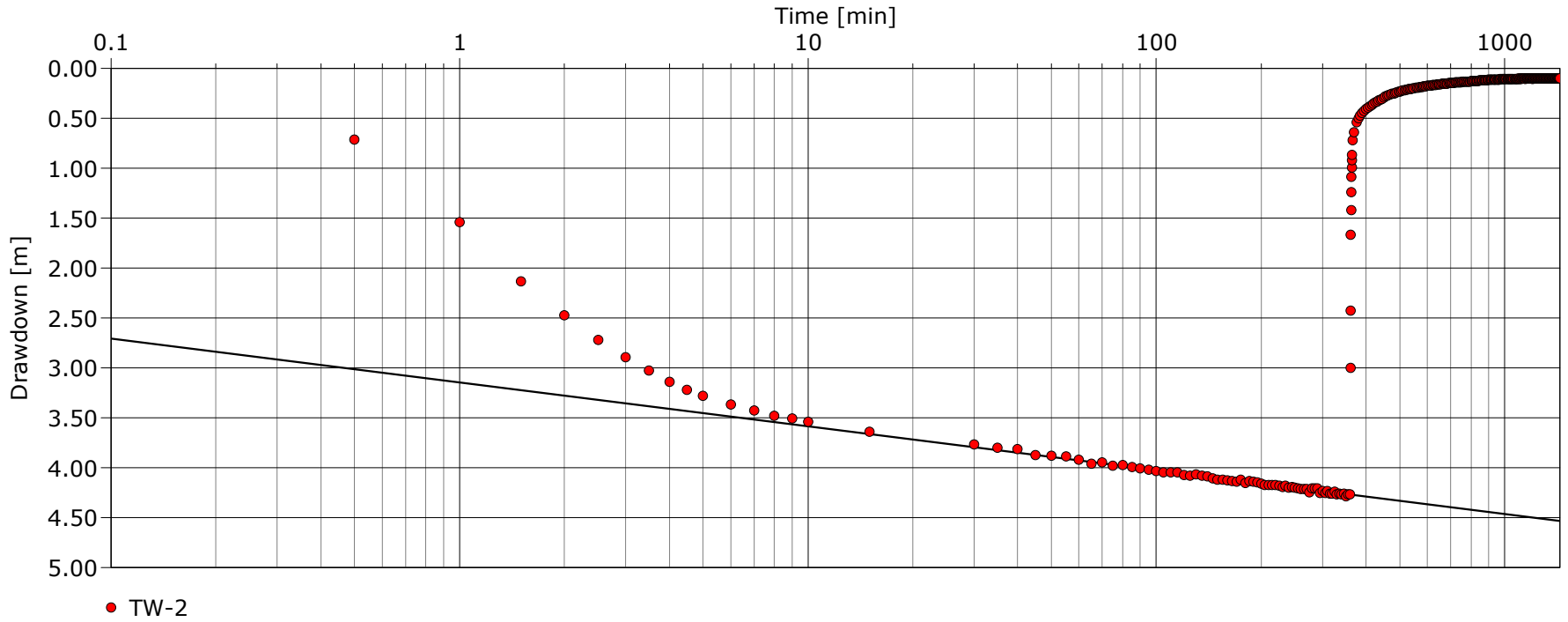
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-2	Pumping Well: TW-2
Test Conducted by: TG/BV		Test Date: 10/03/19
Analysis Performed by: BK	TW-2, Cooper-Jacob (pumped well)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.855 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW-2	3.08×10^{1}	3.08×10^{1}		0.07	

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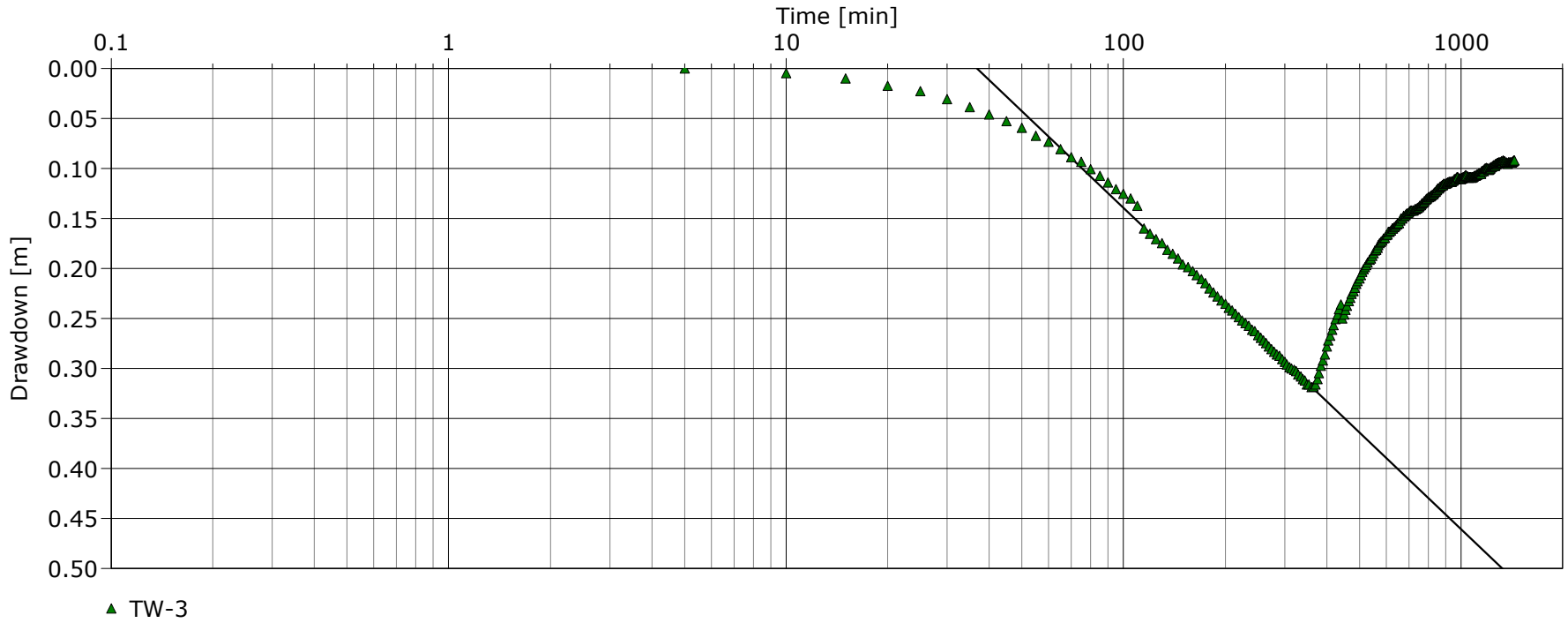
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-2	Pumping Well: TW-2
Test Conducted by: TG/BV		Test Date: 10/03/19
Analysis Performed by: BK	TW-2, Cooper-Jacob (TW-3 obs data)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.855 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW-3	4.21×10^{1}	4.21×10^{1}	1.14×10^{-4}	145.32	

O'Connor Proposed Subdivision Development
R15-635
October 3, 2019

Pumping Test Observations

Well TW-2
Initial Static Level Reading: 8.17 m TOC
Stickup: 0.98 metres
Initial Static Level: 7.19 metres

RDG: Static Level reading from Top of Casing
Pumping test started at 9:00 am
Pumping test ended at 3:00 pm
Pump depth: 42.67 metres

Pumping

Elapsed Time (min)	Pumping Rate (L/min)	Static Level (mTOC)
0.0		8.17
0.5		8.88
1.0		9.71
1.5		10.30
2.0		10.64
2.5		10.89
3.0		11.06
3.5		11.20
4.0		11.31
4.5		11.39
5.0		11.45
6.0		11.54
7.0		11.60
8.0		11.65
9.0		11.68
10.0		11.71
15.0		11.81
30.0		11.94
60.0		12.09
61.0		
65.0	50.0	
75.0		12.18
120.0		
123.0		
140.0		12.26
170.0		
180.0	50.0	
185.0	50.0	
190.0		12.31
250.0		12.37
255.0	50.0	
268.0		
280.0		
335.0		12.43
336.0		
343.0		
358.0		
359.0		12.44
360.0		12.44

Recovery
Started at 3:00 pm

Elapsed Time (min)	Recovery Time (min)	Static Level (mTOC)
360.0	0.0	12.44
360.5	0.5	11.17
361.0	1.0	10.60
361.5	1.5	
362.0	2.0	9.84
362.5	2.5	9.59
363.0	3.0	9.41
363.5	3.5	9.26
364.0	4.0	9.16
364.5	4.5	9.09
365.0	5.0	9.04
365.5	5.5	8.89
367.0	7.0	
368.0	8.0	
369.0	9.0	
370.0	10.0	8.81
371.0	11.0	
372.5	11.5	
373.0	13.0	
374.0	14.0	
376.0	16.0	8.71
380.0	20.0	
385.0	25.0	8.64
390.0	30.0	8.62
400.0	40.0	8.57
427.0	67.0	8.49
445.0	85.0	8.46
455.0	95.0	8.45
525.0	165.0	8.38
1626.0	1266.0	8.25

O'Connor Proposed Subdivision Development
R15-635
October 3, 2019

TW-2
Water Quality Observations
TW-2 (pumping) **1370 King Street, Manchester, ON**

Pumping Test TW-2
TEST: 360 MINUTES @ 49.5 L/min (average rate)
Pumping test started at: 9:00 AM
Pumping test ended at: 3:00 PM

Actual Time	Elapsed Time (min)	pH	Temperature (oC)	Do (%)	Do (mg/L)	Conductivity (mS/cm)	ORP	Turbidity (NTU)
9:00 AM	0.0							
9:05 AM	5.0	8.82	7.8	28.5	3.36	221.3	-141.6	
9:20 AM	20.0	8.65	7.8	16.7	2.01	210.5	-131.4	
10:05 AM	65.0	8.65	7.9	17.4	2.09	210.4	-131.5	
11:09 AM	129.0	8.64	7.9	18.8	2.26	210.6	-118.7	
12:05 PM	185.0	8.64	8.0	18.7	2.24	207.4	-133.3	
1:20 PM	260.0	8.63	8.0	19.0	2.27	210.7	-137.3	
2:49 PM	349.0	8.63	8.0	18.6	2.23	210.8	-135.2	
3:00 PM	360.0							Pumping Stop

Equipment:

YSI Model 556 MPS
Hach Colourimeter DR/890
Hanna Instruments C114 Turbidity Meter (Low Range)

O'Connor Proposed Subdivision Development
R15-635
October 3, 2019

Monitoring Well Observations
TW-2 Pumping test started at 9:00 am
TW-2 Pumping test ended at 3:00 pm
RDG: Static Level reading from Top of Casing

TW-1 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
7:30	-	TW-1	7.41	*prior to pumping
10:27	86	TW-1	7.37	
11:30	149	TW-1	7.38	
13:05	244	TW-1	7.36	
14:29	328	TW-1	7.34	
16:13	432	TW-1	7.36	*test recovery
16:40	459	TW-1	7.35	*test recovery

TW-3 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
8:20	-	TW-3	5.75	*prior to pumping
9:56	55	TW-3	5.82	
11:00	119	TW-3	5.91	
13:53	292	TW-3	6.04	
14:18	317	TW-3	6.05	
15:54	353	TW-3	6.02	*test recovery
16:30	449	TW-3	6.00	*test recovery

O'Connor Proposed Subdivision Development
R15-635
October 3, 2019

Monitoring Well Observations
TW-2 Pumping test started at 9:00 am
TW-2 Pumping test ended at 3:00 pm
RDG: Static Level reading from Top of Casing

Test Well Monitoring

Monitor	Distance from TW-2 (metres)	Elasped Time (min)	Total Drawdown (metres)
TW-1	137	328	0.07
TW-3	159	317	0.30

Test Pit Standpipe and Monitoring Well Monitoring

Monitor	Distance from TW-2 (metres)	Elasped Time (min)	Total Drawdown (metres)
TP-1	165	319	0.00
TP-2	150	327	0.00
MW-1	115	325	0.01
MW-2	62	324	+0.01
MW-3	62	322	0.00
MW-4	107	320	0.00
MW-5	66	332	0.00
MW-6	4	333	+0.02
MW-7	63	330	0.00

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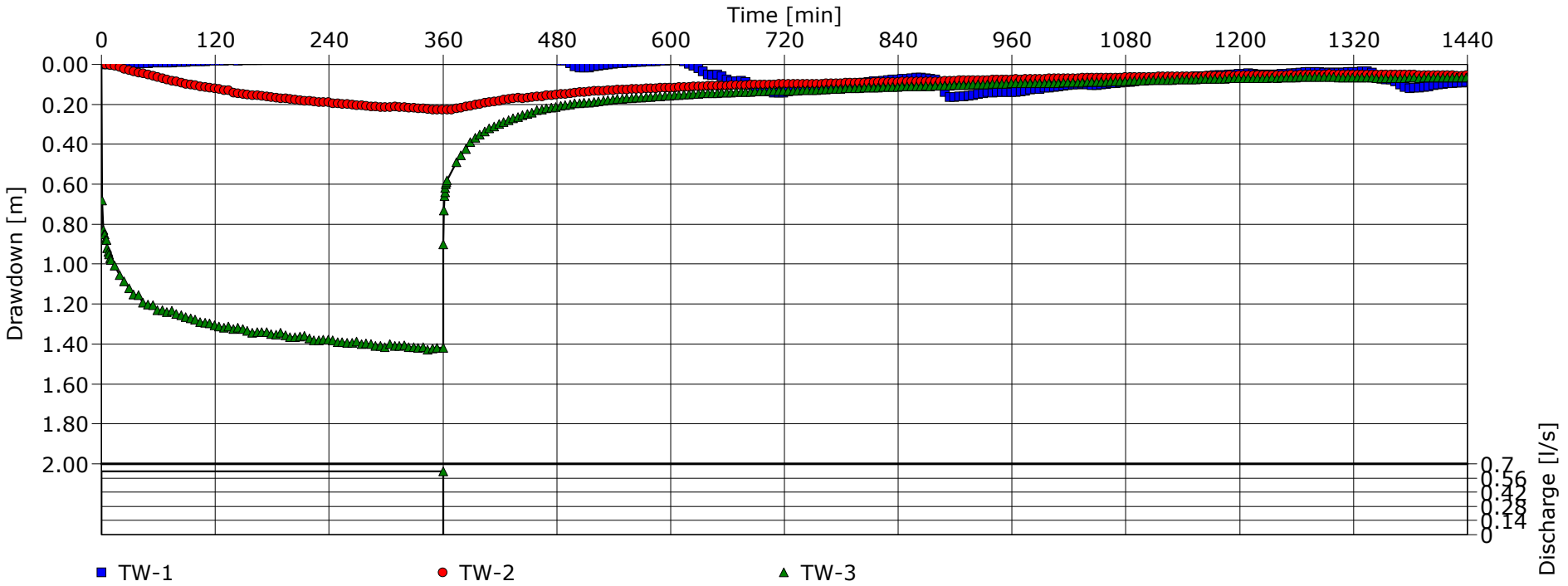
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-3	Pumping Well: TW-3
Test Conducted by: TG/BV		Test Date: 9/25/19
Analysis Performed by: BK	TW-3, Time-Drawdown (all wells)	Analysis Date: 11/18/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.625 [l/s]	



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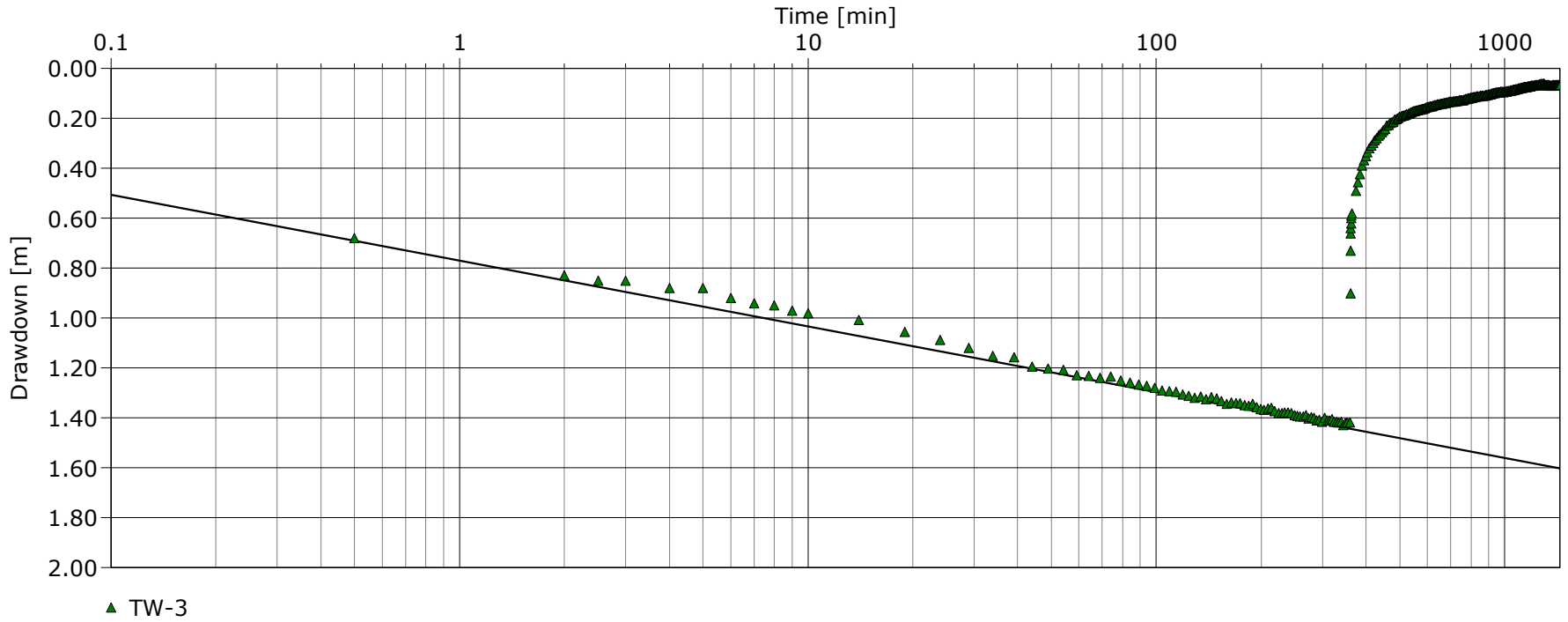
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-3	Pumping Well: TW-3
Test Conducted by: TG/BV		Test Date: 9/25/19
Analysis Performed by: BK	TW-3, Cooper-Jacob (pumped well)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.625 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW-3	3.76×10^{1}	3.76×10^{1}		0.07	

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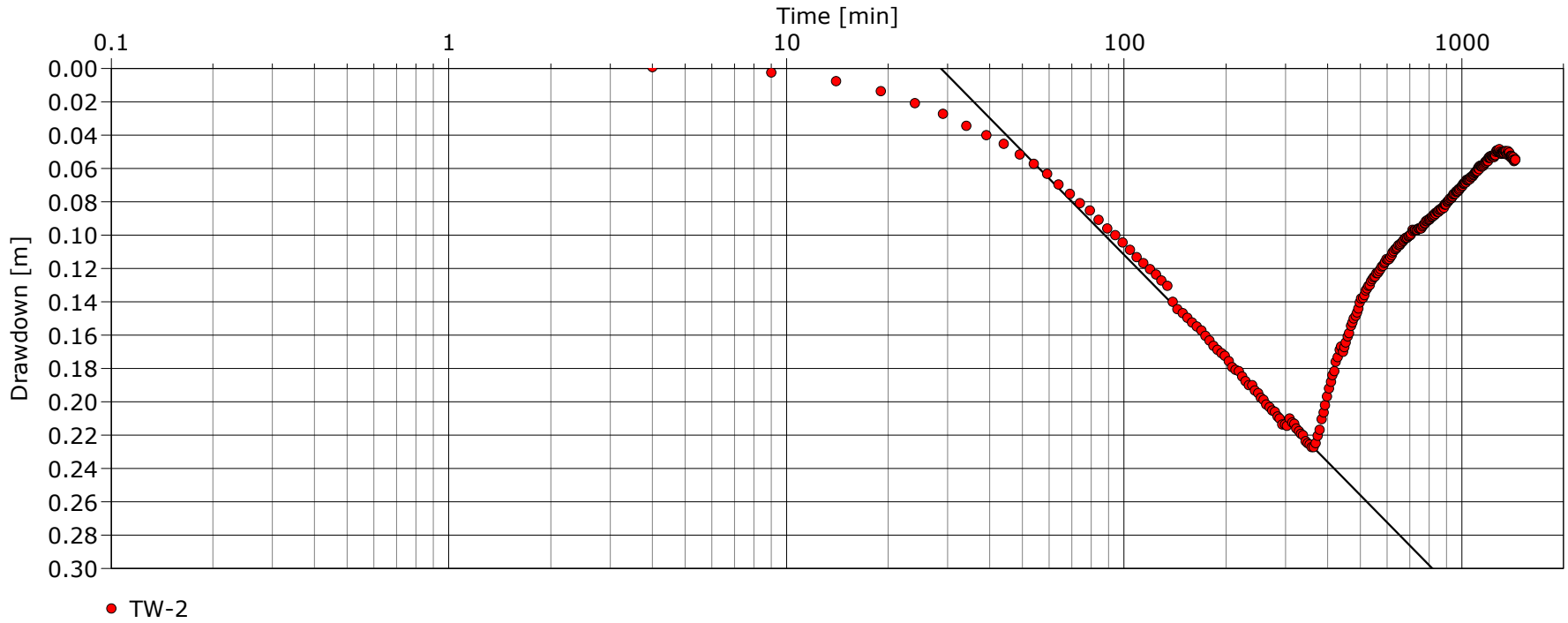
Pumping Test Analysis Report

Project: Hydrogeological Assessment Residential Subdivision

Number: R15-635

Client: O'Connor Bros. Corp.

Location: Manchester, Ontario	Pumping Test: TW-3	Pumping Well: TW-3
Test Conducted by: TG/BV		Test Date: 9/25/19
Analysis Performed by: BK	TW-3, Cooper-Jacob (TW-2 obs data)	Analysis Date: 11/19/19
Aquifer Thickness: 1.00 m	Discharge: variable, average rate 0.625 [l/s]	



Calculation using COOPER & JACOB

Observation Well	Transmissivity [m²/d]	Hydraulic Conductivity [m/d]	Storage coefficient	Radial Distance to PW [m]	
TW-2	4.80×10^{1}	4.80×10^{1}	1.02×10^{-4}	145.32	

O'Connor Proposed Subdivision Development
R15-635
September 25, 2019

Pumping Test Observations

Well TW-3
Initial Static Level Reading: 5.72 m TOC
Stickup: 1.04 metres
Initial Static Level: 4.68 metres below grade

RDG: Static Level reading from Top of Casing
Pumping test started at 9:01 am
Pumping test ended at 3:01 pm
Pump depth: 42.67 metres

Pumping

Elapsed Time (min)	Pumping Rate (L/min)	Static Level (mTOC)
0.0		5.72
0.5		6.40
1.0		
1.5		
2.0		6.55
2.5		6.57
3.0		6.57
3.5		
4.0		6.60
4.5		
5.0		6.60
6.0		6.64
7.0		6.66
8.0		6.67
9.0		6.69
10.0		6.70
15.0		
19.0	37.5	
27.0		6.81
30.0		6.84
60.0		6.95
80.0		6.99
90.0		
120.0		7.03
165.0		7.06
180.0		
183.0		
185.0	37.5	
220.0	37.5	
255.0		
250.0		7.10
287.0		
300.0		7.13
302.0		
334.0		7.14
343.0		
348.0	37.5	
355.0		7.14
359.0		7.14
360.0		7.14

Recovery
Started at 3:00 pm

Elapsed Time (min)	Recovery Time (min)	Static Level (mTOC)
360.0	0.0	7.14
360.5	0.5	6.62
361.0	1.0	6.45
361.5	1.5	6.38
362.0	2.0	6.36
362.5	2.5	6.34
363.0	3.0	6.32
363.5	3.5	6.31
364.0	4.0	6.30
364.5	4.5	
365.0	5.0	6.27
365.5	5.5	6.25
367.0	7.0	
368.0	8.0	
369.0	9.0	6.19
370.0	10.0	6.22
371.0	11.0	
372.5	11.5	
373.0	13.0	
374.0	14.0	
375.0	15.0	6.21
380.0	20.0	6.17
385.0	25.0	
390.0	30.0	6.11
400.0	40.0	
435.0	75.0	5.99
445.0	85.0	
460.0	100.0	5.95
1154.0	794.0	5.79
1759.0	1399.0	5.78

O'Connor Proposed Subdivision Development
R15-635
September 25, 2019

TW-3
Water Quality Observations
TW-3 (pumping) **1370 King Street, Manchester, ON**

Pumping Test TW-3
TEST: 360 MINUTES @ 37.5 L/min (average rate)
Pumping test started at 9:01 am
Pumping test ended at 3:01 pm

Actual Time	Elapsed Time (min)	pH	Temperature (oC)	Do (%)	Do (mg/L)	Conductivity (mS/cm)	ORP	Turbidity (NTU)
9:01 AM	0.0							
9:05 AM	4.0	7.94	9.3	45.50	5.15	324.6	-190.8	
9:15 AM	14.0	7.90	9.0	18.0	2.12	280.1	-162.2	
9:45 AM	44.0	7.85	9.2	13.8	1.10	263.6	-121.2	
10:05 AM	64.0	7.99	9.2	7.0	1.62	261.6	-129.5	
10:31 AM	90.0	8.01	9.4	10.4	1.17	262.9	-136.2	
12:10 PM	189.0	8.10	10.3	8.6	0.98	267.9	-126.5	
12:58 PM	237.0	8.08	10.1	9.0	1.02	266.1	-126.7	
1:42 PM	281.0	8.03	10.3	14.4	1.62	267.4	-139.9	
2:45pm	344.0	8.04	10.4	10.4	1.17	267.5	-143.1	
								Pumping Stop
4:00 PM	419.0	8.01	12.7	20.3	2.16	285.6	-93.9	Standing pail water yellow bubbles surrouding YSI probe and interior wall pail walls; clear; metal odour

Equipment:
YSI Model 556 MPS
Hach Colourimeter DR/890
Hanna Instruments C114 Turbidity Meter (Low Range)

O'Connor Proposed Subdivision Development
R15-635
September 25, 2019

Monitoring Well Observations
TW-3 Pumping test started at 9:01 am
TW-3 Pumping test ended at 3:01 pm
RDG: Static Level reading from Top of Casing

TW-1 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
7:23	-	TW-1	7.28	*prior to pumping
9:53	52	TW-1	7.26	
11:28	147	TW-1	7.26	
14:19	318	TW-1	7.22	
16:36	455	TW-1	7.21	*test recovery

TW-2 Monitoring

Time	Elasped Time (min)	Monitor	Reading mTOC	
7:40	-	TW-2	8.14	*prior to pumping
9:46	45	TW-2	8.18	
11:21	140	TW-2	8.28	
14:13	192	TW-2	8.35	
15:45	404	TW-2	8.34	
16:29	448	TW-2	8.31	*test recovery

O'Connor Proposed Subdivision Development
R15-635
September 25, 2019

Monitoring Well Observations
TW-3 Pumping test started at 9:01 am
TW-3 Pumping test ended at 3:01 pm
RDG: Static Level reading from Top of Casing

Test Well Monitoring

Monitor	Distance from TW-3 (metres)	Elasped Time (min)	Total Drawdown (metres)
TW-1	296	328	0.06
TW-2	159	317	0.21

Test Pit Standpipe and Monitoring Well Monitoring

Monitor	Distance from TW-3 (metres)	Elasped Time (min)	Total Drawdown (metres)
TP-1	74	331	0.00
TP-2	301	320	0.00
MW-1	261	323	0.00
MW-2	196	325	0.00
MW-3	136	326	0.00
MW-4	81	328	0.00
MW-5	94	308	0.00
MW-6	158	310	0.00
MW-7	222	314	0.00

APPENDIX F

LABORATORY
CERTIFICATES OF ANALYSES

NITRATE MONITORING

O'Connor Proposed Lot Development
December 2015 to September 2020
Groundwater Monitoring

Nitrate (mg/L)				
***ODWS: 10 mg/L**				
MW-1	13.6			
	17.1			
	15.9			
	4.98			
	5.78	Monitor		
	3.78	Average		
	2.54			
	5.46			
	7.72			
	8.5			
	4.53			
	7.46	**8.11**	6.93	Geometric Mean
MW-2	7.53			
	8.06			
	7.78			
	7.79	Monitor		
	0.14	Average		
	7.73			
	6.69			
	6.17			
	6.39	**6.48**	4.67	Geometric Mean
MW-3	3.11			
	2.73			
	2.55	Monitor		
	1.67	Average		
	1.5			
	1.07			
	0.87			
	0.49	**1.75**	1.49	Geometric Mean
MW-4	4.54			
	8.22			
	5.42			
	5.1			
	5.4	Monitor		
	4.53	Average		
	4.15			
	3.19			
	1.71			
	1.13			
	2.04	**4.13**	3.60	Geometric Mean
MW-5	5.66			
	4.6			
	4.35			
	3.93			
	4.82	Monitor		
	4.93	Average		
	4.31			
	3.41			
	0.89			
	2.26			
	0.15	**3.57**	2.66	Geometric Mean
MW-6	8.12			
	8.24			
	7.97			
	5.58	Monitor		
	3.81	Average		
	1.98			
	3.54			
	3.02			
	2.3	**4.95**	4.34	Geometric Mean
MW-7	10.5			
	10.5			
	8.07			
	1.19			
	1	Monitor		
	7.68	Average		
	4.99			
	6.56			
	0.35			
	5.33			
	1.17	**5.21**	3.34	Geometric Mean
Average	**5.02**			
Geometric Mean	**3.64**			

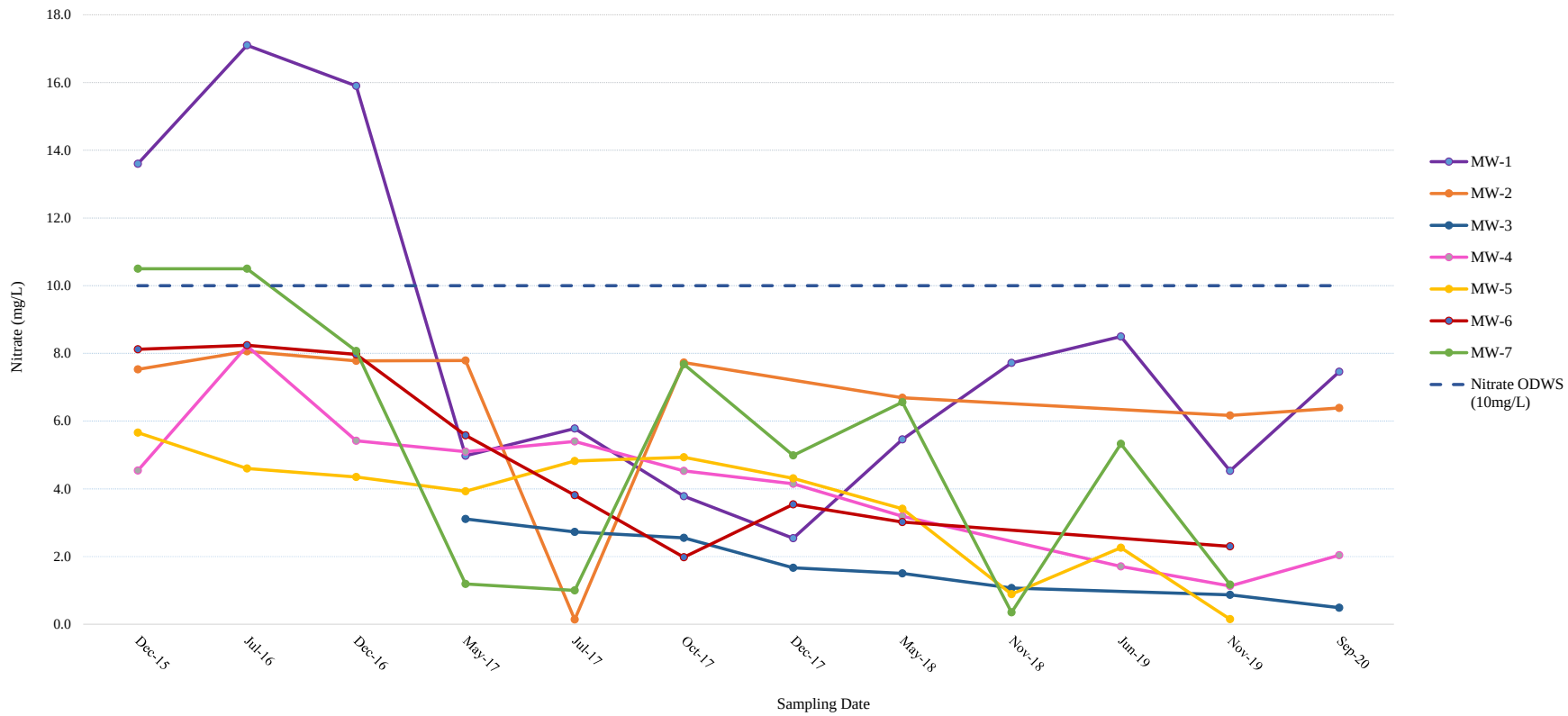
Average Annual all Monitors	
8.33	Dec-15
9.45	Jul-16
8.25	Dec-16
4.53	May-17
3.38	Jul-17
4.74	Oct-17
3.53	Dec-17
4.26	May-17
2.51	Nov-18
4.45	Jun-19
2.33	Dec-19
4.10	30-Sep

Drilled Wells installed in 2019

TW-1	0.05	
TW-2	0.05	
TW-3	0.05	
Average with Wells	**4.82**	
Geometric Mean with Wells	**3.06**	

*Ontario Drinking Water Standards, Objectives and Guidelines, June 2006
All drilled wells reported nitrate concentrations of <0.05 mg/L

O'Connor Proposed Lot Development
2015 to 2020 Nitrate Groundwater Monitoring



GRACE & ASSOCIATES INC.
Geological & Environmental Consultants

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 15T052306

WATER ANALYSIS REVIEWED BY: Elizabeth Polakowska, MSc (Animal Sci), PhD (Agri Sci), Inorganic Lab Supervisor

DATE REPORTED: Dec 17, 2015

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 15T052306

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2015-12-11

DATE REPORTED: 2015-12-17

				SAMPLE DESCRIPTION:	MW-1.635	MW-2.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	12/10/2015	12/10/2015	12/10/2015	12/10/2015	12/10/2015	12/10/2015
Parameter	Unit	G / S	RDL		7280672	7280677	7280680	7280682	7280686	7280688
Nitrate as N	mg/L	10.0	0.05		13.6	7.53	4.54	5.66	8.12	10.5
Nitrite as N	mg/L	1.0	0.05		0.17	0.06	<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

Certified By: Elizabeth Rolakowska

Results relate only to the items tested and to all the items tested

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Guideline Violation

AGAT WORK ORDER: 15T052306

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7280672	MW-1.635	O.Reg.169/03(mg/L)	Nitrate/Nitrite (Water)	Nitrate as N	10.0	13.6
7280688	MW-7.635	O.Reg.169/03(mg/L)	Nitrate/Nitrite (Water)	Nitrate as N	10.0	10.5

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 15T052306

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Dec 17, 2015			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	7281533		0.26	0.30	14.3%	< 0.05	95%	90%	110%	108%	90%	110%	108%	80%	120%
Nitrite as N	7281533		<0.10	<0.10	NA	< 0.05	NA	90%	110%	101%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Elizabeth Rolakowska

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 15T052306

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 16T113665

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jul 18, 2016

PAGES (INCLUDING COVER): 6

VERSION*: 1

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*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 16T113665

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2016-07-08

DATE REPORTED: 2016-07-18

		SAMPLE DESCRIPTION:		MW-1.635	MW-2.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		7/6/2016	7/6/2016	7/6/2016	7/6/2016	7/6/2016	7/6/2016
Parameter	Unit	G / S	RDL	7691051	7691071	7691072	7691073	7691074	7691075
Nitrate as N	mg/L	10.0	0.05	17.1	8.06	8.22	4.60	8.24	10.5
Nitrite as N	mg/L	1.0	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

Certified By:



Results relate only to the items tested and to all the items tested

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Guideline Violation

AGAT WORK ORDER: 16T113665

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7691051	MW-1.635	O.Reg.169/03(mg/L)	Nitrate/Nitrite (Water)	Nitrate as N	10.0	17.1
7691075	MW-7.635	O.Reg.169/03(mg/L)	Nitrate/Nitrite (Water)	Nitrate as N	10.0	10.5

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 16T113665

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jul 18, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	7690944		<0.25	<0.25	NA	< 0.05	98%	90%	110%	92%	90%	110%	92%	80%	120%
Nitrite as N	7690944		<0.25	<0.25	NA	< 0.05	NA	90%	110%	94%	90%	110%	92%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL (Reporting Limit), the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 16T113665

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 16T174374

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: Jan 09, 2017

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

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Certificate of Analysis

AGAT WORK ORDER: 16T174374

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate & Nitrite (Water)

DATE RECEIVED: 2016-12-29

DATE REPORTED: 2017-01-09

				SAMPLE DESCRIPTION:	MW-1.635	MW-2.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2016-12-28	2016-12-28	2016-12-28	2016-12-28	2016-12-28	2016-12-28
Parameter	Unit	G / S	RDL		8111530	8111531	8111532	8111533	8111534	8111535
Nitrate as N	mg/L	10.0	0.05		15.9	7.78	5.42	4.35	7.97	8.07
Nitrite as N	mg/L	1.0	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

Certified By: Amanjot Bhela

Results relate only to the items tested and to all the items tested

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 16T174374

PROJECT: R15-635

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CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8111530	MW-1.635	O.Reg.169/03(mg/L)	Nitrate & Nitrite (Water)	Nitrate as N	mg/L	10.0	15.9

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 16T174374

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jan 09, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate & Nitrite (Water)															
Nitrate as N	8111675		<0.05	<0.05	NA	< 0.05	94%	90%	110%	100%	90%	110%	91%	80%	120%
Nitrite as N	8111675		<0.05	<0.05	NA	< 0.05	NA	90%	110%	94%	90%	110%	98%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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FAX (905)712-5122
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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 16T174374

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T213312

WATER ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: May 16, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T213312

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2017-05-05

DATE REPORTED: 2017-05-16

				SAMPLE DESCRIPTION:	MW-1.635	MW-2.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635	MW-3.635	TP-1.635
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2017-05-04	2017-05-04	2017-05-04	2017-05-04	2017-05-04	2017-05-04	2017-05-04	2017-05-04
Parameter	Unit	G / S	RDL		8374358	8374360	8374361	8374362	8374363	8374364	8374365	8374366
Nitrate as N	mg/L	10.0	0.05		4.98	7.79	5.10	3.93	5.58	1.19	3.11	6.70
Nitrite as N	mg/L	1.0	0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

				SAMPLE DESCRIPTION:	TP-2.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2017-05-04
Parameter	Unit	G / S	RDL		8374367
Nitrate as N	mg/L	10.0	0.05		2.89
Nitrite as N	mg/L	1.0	0.05		<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T213312

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: May 16, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	8378246		7.12	7.13	0.1%	< 0.05	95%	90%	110%	100%	90%	110%	96%	80%	120%
Nitrite as N	8378246		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	110%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T213312

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T240831

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jul 31, 2017

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T240831

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2017-07-20

DATE REPORTED: 2017-07-31

				SAMPLE DESCRIPTION:	MW-1.635	MW-2.635	MW-3.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635	TP-1.635
				SAMPLE TYPE:	Water	Water	Water	Water	Water	Water	Water	Water
				DATE SAMPLED:	2017-07-19	2017-07-19	2017-07-19	2017-07-19	2017-07-19	2017-07-19	2017-07-19	2017-07-19
Parameter	Unit	G / S	RDL		8588681	8588683	8588684	8588685	8588686	8588687	8588688	8588689
Nitrate as N	mg/L	10.0	0.05		5.78	0.14	2.73	5.40	4.82	3.81	1.00	<0.05
Nitrite as N	mg/L	1.0	0.05		<0.05	1.33	0.13	<0.05	<0.05	<0.05	<0.05	<0.05

				SAMPLE DESCRIPTION:	TP-2.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2017-07-19
Parameter	Unit	G / S	RDL		8588690
Nitrate as N	mg/L	10.0	0.05		9.81
Nitrite as N	mg/L	1.0	0.05		0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Divine Basily

Results relate only to the items tested and to all the items tested

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17T240831

PROJECT: R15-635

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CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8588683	MW-2.635	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Nitrite as N	mg/L	1.0	1.33

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T240831

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jul 31, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	8587000		<0.25	<0.25	NA	< 0.05	98%	90%	110%	105%	90%	110%	106%	80%	120%
Nitrite as N	8587000		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T240831

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T273112

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Oct 26, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 17T273112

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2017-10-18

DATE REPORTED: 2017-10-26

		SAMPLE DESCRIPTION:		MW-1.635	MW-2.635	MW-3.635	MW-4.635	MW-5.635	MW-6.635	MW-7.635
		SAMPLE TYPE:		Water	Water	Water	Water	Water	Water	Water
		DATE SAMPLED:		2017-10-16	2017-10-16	2017-10-16	2017-10-16	2017-10-16	2017-10-16	2017-10-16
Parameter	Unit	G / S	RDL	8828410	8828412	8828413	8828414	8828415	8828416	8828418
Nitrate as N	mg/L		0.05	3.78	7.73	2.55	4.53	4.93	1.98	7.68
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Iris Verástegui

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AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T273112

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 26, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8828418	8828418	7.68	7.65	0.4%	< 0.05	97%	90%	110%	107%	90%	110%	96%	80%	120%
Nitrite as N	8828418	8828418	<0.05	<0.05	NA	< 0.05	NA	90%	110%	110%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T273112

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293152

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 17T293152

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

		SAMPLE DESCRIPTION:		MW-1. 635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2017-12-07
Parameter	Unit	G / S	RDL	8964456
Nitrate as N	mg/L	10.0	0.05	2.54
Nitrite as N	mg/L	1.0	0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293152

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8964668		<0.25	<0.25	NA	< 0.05	100%	90%	110%	108%	90%	110%	112%	80%	120%
Nitrite as N	8964668		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293152

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293168

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T293168

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

				SAMPLE DESCRIPTION:	MW-3. 635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8964433	
Nitrate as N	mg/L	10.0	0.05	1.67	
Nitrite as N	mg/L	1.0	0.05	<0.05	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293168

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8964668		<0.25	<0.25	NA	< 0.05	100%	90%	110%	108%	90%	110%	112%	80%	120%
Nitrite as N	8964668		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293168

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293170

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 17T293170

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

			SAMPLE DESCRIPTION:	MW-4. 635
			SAMPLE TYPE:	Water
			DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8963840
Nitrate as N	mg/L		0.05	4.15
Nitrite as N	mg/L		0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Iris Verástegui

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293170

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8964668		<0.25	<0.25	NA	< 0.05	100%	90%	110%	108%	90%	110%	112%	80%	120%
Nitrite as N	8964668		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293170

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293173

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 17T293173

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

				SAMPLE DESCRIPTION:	MW-5. 635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2017-12-07
Parameter	Unit	G / S	RDL	8963783	
Nitrate as N	mg/L	10.0	0.05	4.31	
Nitrite as N	mg/L	1.0	0.05	<0.05	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293173

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8964668		<0.25	<0.25	NA	< 0.05	100%	90%	110%	108%	90%	110%	112%	80%	120%
Nitrite as N	8964668		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293173

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CANADA L4Z 1Y2
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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293163

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

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*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 17T293163

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

		SAMPLE DESCRIPTION:		MW-6. 635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2017-12-07
Parameter	Unit	G / S	RDL	8964448
Nitrate as N	mg/L	10.0	0.05	3.54
Nitrite as N	mg/L	1.0	0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293163

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8964668		<0.25	<0.25	NA	< 0.05	100%	90%	110%	108%	90%	110%	112%	80%	120%
Nitrite as N	8964668		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	94%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293163

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 17T293158

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 15, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 17T293158

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

NO2 / NO3 (Water)

DATE RECEIVED: 2017-12-08

DATE REPORTED: 2017-12-15

		SAMPLE DESCRIPTION:		MW-7. 635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2017-12-07
Parameter	Unit	G / S	RDL	8964496
Nitrate as N	mg/L	10.0	0.05	4.99
Nitrite as N	mg/L	1.0	0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O.Reg.169/03(mg/L)
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Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293158

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

Water Analysis

RPT Date: Dec 15, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	8963687		<0.25	<0.25	NA	< 0.05	98%	90%	110%	108%	90%	110%	95%	80%	120%
Nitrite as N	8963687		<0.25	<0.25	NA	< 0.05	NA	90%	110%	98%	90%	110%	93%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 17T293158

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:Rw

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345765

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 18T345765

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

			SAMPLE DESCRIPTION:	MW-1.635
			SAMPLE TYPE:	Water
			DATE SAMPLED:	2018-05-29
Parameter	Unit	G / S	RDL	9292986
Nitrate as N	mg/L		0.05	5.46
Nitrite as N	mg/L		0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Iris Verástegui

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345765

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9285474		<0.25	<0.25	NA	< 0.05	90%	90%	110%	106%	90%	110%	107%	80%	120%
Nitrite as N	9285474		<0.25	<0.25	NA	< 0.05	NA	90%	110%	94%	90%	110%	116%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345765

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345764

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 18T345764

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

			SAMPLE DESCRIPTION:	MW-2.635
			SAMPLE TYPE:	Water
			DATE SAMPLED:	2018-05-31
Parameter	Unit	G / S	RDL	9292984
Nitrate as N	mg/L	10.0	0.10	6.69
Nitrite as N	mg/L	1.0	0.10	<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

9292984 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345764

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9295286		<0.10	<0.10	NA	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	9295286		<0.10	<0.10	NA	< 0.05	NA	90%	110%	98%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345764

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345761

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 18T345761

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

		SAMPLE DESCRIPTION:		MW-3.635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2018-05-31
Parameter	Unit	G / S	RDL	9292983
Nitrate as N	mg/L	10.0	0.10	1.50
Nitrite as N	mg/L	1.0	0.10	<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

9292983 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345761

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9295286		<0.10	<0.10	NA	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	9295286		<0.10	<0.10	NA	< 0.05	NA	90%	110%	98%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345761

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345759

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 18T345759

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

		SAMPLE DESCRIPTION:		MW-4.635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2018-05-31
Parameter	Unit	G / S	RDL	9292982
Nitrate as N	mg/L	10.0	0.10	3.19
Nitrite as N	mg/L	1.0	0.10	<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
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9292982 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345759

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9295286		<0.10	<0.10	NA	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	9295286		<0.10	<0.10	NA	< 0.05	NA	90%	110%	98%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
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Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345759

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345757

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 18T345757

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

			SAMPLE DESCRIPTION:		MW-5.635
			SAMPLE TYPE:		Water
			DATE SAMPLED:		2018-05-31
Parameter	Unit	G / S	RDL		9292980
Nitrate as N	mg/L	10.0	0.10		3.41
Nitrite as N	mg/L	1.0	0.10		<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

9292980 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345757

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9295286		<0.10	<0.10	NA	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	9295286		<0.10	<0.10	NA	< 0.05	NA	90%	110%	98%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Results relate only to the items tested and to all the items tested

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345757

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345754

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 18T345754

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

		SAMPLE DESCRIPTION:		MW-6.635
		SAMPLE TYPE:		Water
		DATE SAMPLED:		2018-05-31
Parameter	Unit	G / S	RDL	9292976
Nitrate as N	mg/L	10.0	0.10	3.02
Nitrite as N	mg/L	1.0	0.10	<0.10

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

9292976 Elevated RDLs indicate the degree of sample dilutions prior to the analysis to keep analytes within the calibration range, reduce matrix interference and/or to avoid contaminating the instrument.

Certified By: Nivine Basily

Results relate only to the items tested and to all the items tested

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345754

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9295286		<0.10	<0.10	NA	< 0.05	92%	90%	110%	100%	90%	110%	98%	80%	120%
Nitrite as N	9295286		<0.10	<0.10	NA	< 0.05	NA	90%	110%	98%	90%	110%	100%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345754

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T345766

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Jun 11, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Environmental Services Association of Alberta (ESAA)

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 18T345766

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

NO2 / NO3 (Water)

DATE RECEIVED: 2018-06-01

DATE REPORTED: 2018-06-11

				SAMPLE DESCRIPTION:	MW-7.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2018-05-31
Parameter	Unit	G / S	RDL	9292994	
Nitrate as N	mg/L	10.0	0.05	6.56	
Nitrite as N	mg/L	1.0	0.05	<0.05	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Iris Verástegui

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345766

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 11, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
NO2 / NO3 (Water)															
Nitrate as N	9299099		13.4	13.5	1.0%	< 0.05	94%	90%	110%	104%	90%	110%	101%	80%	120%
Nitrite as N	9299099		<0.25	<0.25	NA	< 0.05	NA	90%	110%	105%	90%	110%	110%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T345766

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 18T414787

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Dec 03, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Environmental Services Association of Alberta (ESAA)

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AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 18T414787

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2018-11-29

DATE REPORTED: 2018-12-03

				SAMPLE DESCRIPTION:	MW-1.635	MW-3.635	MW-5.635	MW-7.635
				SAMPLE TYPE:	Water	Water	Water	Water
				DATE SAMPLED:	2018-11-28	2018-11-28	2018-11-28	2018-11-28
Parameter	Unit	G / S	RDL		9746989	9746990	9746991	9746992
Nitrate as N	mg/L	10.0	0.05		7.72	1.07	0.89	0.35
Nitrite as N	mg/L	1.0	0.05		<0.05	<0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T414787

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Dec 03, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	9746223		12.6	12.1	3.5%	< 0.05	90%	90%	110%	108%	90%	110%	109%	80%	120%
Nitrite as N	9746223		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	103%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Results relate only to the items tested and to all the items tested

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 18T414787

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested and to all the items tested

AGAT Laboratories

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T480097

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jun 25, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Results relate only to the items tested. Results apply to samples as received.
All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T480097

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2019-06-14

DATE REPORTED: 2019-06-25

				SAMPLE DESCRIPTION:	MW-1.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2019-06-14
Parameter	Unit	G / S: A	G / S: B	RDL	277489
Nitrate as N	mg/L	10.0		0.05	8.50[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Results relate only to the items tested. Results apply to samples as received.

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480097

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 25, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	286795		<0.25	<0.25	NA	< 0.05	93%	90%	110%	102%	90%	110%	101%	80%	120%
Nitrite as N	286795		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	106%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: For duplicates as the measured result approaches the Reporting Limit (RL), the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



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Results relate only to the items tested. Results apply to samples as received.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480097

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T480106

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jun 25, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T480106

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2019-06-14

DATE REPORTED: 2019-06-25

				SAMPLE DESCRIPTION:	MW-4.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2019-06-14
Parameter	Unit	G / S: A	G / S: B	RDL	277407
Nitrate as N	mg/L	10.0		0.05	1.71[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC
AGAT WORK ORDER: 19T480106
PROJECT: R15-635
ATTENTION TO: BEATRIZE VITORINO
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Jun 25, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	286795		<0.25	<0.25	NA	< 0.05	93%	90%	110%	102%	90%	110%	101%	80%	120%
Nitrite as N	286795		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	106%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: For duplicates as the measured result approaches the Reporting Limit (RL), the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480106

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T480104

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jun 25, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 19T480104

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2019-06-14

DATE REPORTED: 2019-06-25

					SAMPLE DESCRIPTION:	MW-5.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-06-14
Parameter	Unit	G / S: A	G / S: B	RDL	277455	
Nitrate as N	mg/L	10.0		0.05	2.26[<A]	
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480104

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 25, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	286795		<0.25	<0.25	NA	< 0.05	93%	90%	110%	102%	90%	110%	101%	80%	120%
Nitrite as N	286795		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	106%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: For duplicates as the measured result approaches the Reporting Limit (RL), the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480104

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T480109

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jun 25, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 19T480109

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2019-06-14

DATE REPORTED: 2019-06-25

				SAMPLE DESCRIPTION:	MW-7.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2019-06-14
Parameter	Unit	G / S: A	G / S: B	RDL	277403
Nitrate as N	mg/L	10.0		0.05	5.33[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480109

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 25, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	286795		<0.25	<0.25	NA	< 0.05	93%	90%	110%	102%	90%	110%	101%	80%	120%
Nitrite as N	286795		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	106%	80%	120%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: For duplicates as the measured result approaches the Reporting Limit (RL), the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480109

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

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CLIENT NAME: GRACE & ASSOCIATES INC
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LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T480100

WATER ANALYSIS REVIEWED BY: Parvathi Malemath, Data Reviewer

DATE REPORTED: Jun 25, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 19T480100

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Nitrate/Nitrite (Water)

DATE RECEIVED: 2019-06-14

DATE REPORTED: 2019-06-25

					SAMPLE DESCRIPTION:	TW-1.635	TW-2.635	TW-3.635
					SAMPLE TYPE:	Water	Water	Water
					DATE SAMPLED:	2019-06-14	2019-06-14	2019-06-14
Parameter	Unit	G / S: A	G / S: B	RDL		277480	277481	277482
Nitrate as N	mg/L	10.0		0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]
Nitrite as N	mg/L	1.0		0.05		<0.05[<A]	<0.05[<A]	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480100

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Jun 25, 2019

PARAMETER	Batch	Sample Id	DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
			Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Nitrate/Nitrite (Water)															
Nitrate as N	282644		<0.25	<0.25	NA	< 0.05	91%	90%	110%	102%	90%	110%	102%	80%	120%
Nitrite as N	282644		<0.25	<0.25	NA	< 0.05	NA	90%	110%	99%	90%	110%	109%	80%	120%

Comments: NA signifies Not Applicable.
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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T480100

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547652

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 19T547652

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-1.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	743518	
Nitrate as N	mg/L	10.0	10.0	0.05	4.53[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547652

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	743659		1.04	1.02	1.9%	< 0.05	97%	90%	110%	101%	90%	110%	101%	85%	115%
Nitrite as N	743659		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	102%	85%	115%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:

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5835 COOPERS AVENUE
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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547652

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547653

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 19T547653

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-2.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	743515	
Nitrate as N	mg/L	10.0	10.0	0.05	6.17[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547653

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	743659		1.04	1.02	1.9%	< 0.05	97%	90%	110%	101%	90%	110%	101%	85%	115%
Nitrite as N	743659		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	102%	85%	115%

Comments: NA signifies Not Applicable.
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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547653

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547655

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 19T547655

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-3.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	742645	
Nitrate as N	mg/L	10.0	10.0	0.05	0.87[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547655

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	743659		1.04	1.02	NA	< 0.05	97%	90%	110%	101%	90%	110%	101%	85%	115%
Nitrite as N	743659		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	102%	85%	115%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547655

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547656

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 19T547656

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-4.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	743359	
Nitrate as N	mg/L	10.0	10.0	0.05	1.13[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547656

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	743659		1.04	1.02	NA	< 0.05	97%	90%	110%	101%	90%	110%	101%	85%	115%
Nitrite as N	743659		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	102%	85%	115%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547656

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547657

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 19T547657

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-5.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	742552	
Nitrate as N	mg/L	10.0	10.0	0.05	0.15[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547657

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	743659		1.04	1.02	NA	< 0.05	97%	90%	110%	101%	90%	110%	101%	85%	115%
Nitrite as N	743659		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	102%	85%	115%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547657

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

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(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547757

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T547757

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-6.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	742654	
Nitrate as N	mg/L	10.0	10.0	0.05	2.30[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547757

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	738427		2.70	2.67	1.1%	< 0.05	98%	90%	110%	101%	90%	110%	102%	85%	115%
Nitrite as N	738427		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	103%	85%	115%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547757

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T547759

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Nov 27, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 19T547759

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-11-22

DATE REPORTED: 2019-11-27

					SAMPLE DESCRIPTION:	MW-7.635
					SAMPLE TYPE:	Water
					DATE SAMPLED:	2019-11-21
Parameter	Unit	G / S: A	G / S: B	RDL	742711	
Nitrate as N	mg/L	10.0	10.0	0.05	1.17[<A]	
Nitrite as N	mg/L	1.0	1.0	0.05	<0.05[<A]	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547759

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Water Analysis

RPT Date: Nov 27, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	738427		2.70	2.67	1.1%	< 0.05	98%	90%	110%	101%	90%	110%	102%	85%	115%
Nitrite as N	738427		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	103%	85%	115%

Comments: NA signifies Not Applicable.
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Certified By: Nivine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T547759

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
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LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 20T651753

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Sep 23, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 20T651753

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2020-09-17

DATE REPORTED: 2020-09-23

				SAMPLE DESCRIPTION:	MW-1.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2020-09-16 11:17
Parameter	Unit	G / S: A	G / S: B	RDL	1455932
Nitrate as N	mg/L	10.0		0.05	7.46[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC
AGAT WORK ORDER: 20T651753
PROJECT: R15-635
ATTENTION TO: BEATRIZE VITORINO
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Sep 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
Nitrate as N	1454847		<0.25	<0.25	NA	< 0.05	101%	70%	130%	103%	80%	120%	110%	70%	130%
Nitrite as N	1454847		<0.25	<0.25	NA	< 0.05	102%	70%	130%	104%	80%	120%	113%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 20T651753

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 20T651755

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Sep 23, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 20T651755

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2020-09-17

DATE REPORTED: 2020-09-23

				SAMPLE DESCRIPTION:	MW-2.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2020-09-16 11:22
Parameter	Unit	G / S: A	G / S: B	RDL	1455933
Nitrate as N	mg/L	10.0		0.05	6.39[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 20T651755

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Sep 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
Nitrate as N	1454847		<0.25	<0.25	NA	< 0.05	101%	70%	130%	103%	80%	120%	110%	70%	130%
Nitrite as N	1454847		<0.25	<0.25	NA	< 0.05	102%	70%	130%	104%	80%	120%	113%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 20T651755

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

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CLIENT NAME: GRACE & ASSOCIATES INC
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(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 20T651759

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Sep 23, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 20T651759

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2020-09-17

DATE REPORTED: 2020-09-23

				SAMPLE DESCRIPTION:	MW-3.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2020-09-16 11:25
Parameter	Unit	G / S: A	G / S: B	RDL	1455934
Nitrate as N	mg/L	10.0		0.05	0.49[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories
5835 COOPERS AVENUE
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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC
AGAT WORK ORDER: 20T651759
PROJECT: R15-635
ATTENTION TO: BEATRIZE VITORINO
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Sep 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
Nitrate as N	1454847		<0.25	<0.25	NA	< 0.05	101%	70%	130%	103%	80%	120%	110%	70%	130%
Nitrite as N	1454847		<0.25	<0.25	NA	< 0.05	102%	70%	130%	104%	80%	120%	113%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 20T651759

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

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FAX (905)712-5122
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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 20T651761

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Sep 23, 2020

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.
- All samples will be disposed of within 30 days following analysis, unless expressly agreed otherwise in writing. Please contact your Client Project Manager if you require additional sample storage time.
- AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.
- This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
- The test results reported herewith relate only to the samples as received by the laboratory.
- Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.
- All reportable information as specified by ISO/IEC 17025:2017 is available from AGAT Laboratories upon request.

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Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 20T651761

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

(Water) Inorganic Chemistry

DATE RECEIVED: 2020-09-17

DATE REPORTED: 2020-09-23

				SAMPLE DESCRIPTION:	MW-4.635
				SAMPLE TYPE:	Water
				DATE SAMPLED:	2020-09-16 11:28
Parameter	Unit	G / S: A	G / S: B	RDL	1455929
Nitrate as N	mg/L	10.0		0.05	2.04[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards. Na value derived from O. Reg 248, B Refers to O. Reg 169/03 - Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC
AGAT WORK ORDER: 20T651761
PROJECT: R15-635
ATTENTION TO: BEATRIZE VITORINO
SAMPLING SITE:
SAMPLED BY:

Water Analysis

RPT Date: Sep 23, 2020			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Water) Inorganic Chemistry															
Nitrate as N	1454847		<0.25	<0.25	NA	< 0.05	101%	70%	130%	103%	80%	120%	110%	70%	130%
Nitrite as N	1454847		<0.25	<0.25	NA	< 0.05	102%	70%	130%	104%	80%	120%	113%	70%	130%

Comments: If RPD value is NA, the results of the duplicates are less than 5x the RDL and the RPD will not be calculated.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 20T651761

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH

Results relate only to the items tested. Results apply to samples as received.

PUMPING TESTS

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T529150

MICROBIOLOGY ANALYSIS REVIEWED BY: Rocio Morales, Inorganics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Oct 18, 2019

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request

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Certificate of Analysis

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2019-10-10

DATE REPORTED: 2019-10-18

				SAMPLE DESCRIPTION:	TW-1.635-3HR	TW-1.635-6HR
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2019-10-09	2019-10-09
Parameter	Unit	G / S	RDL		609425	609426
Fecal Coliform	CFU/100mL		2		ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

609425-609426 RDL > 1 indicates dilutions of the sample.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E.Coli and BCC (Using DC Agar)

DATE RECEIVED: 2019-10-10

DATE REPORTED: 2019-10-18

					SAMPLE DESCRIPTION:	TW-1.635-3HR	TW-1.635-6HR
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-10-09	2019-10-09
Parameter	Unit	G / S: A	G / S: B	RDL		609425	609426
Background Colony Count - DC Agar	CFU/100mL			2		ND	ND
Escherichia coli - DC Agar	CFU/100mL	0	0	2		ND[<A]	ND[<A]
Total Coliforms - DC Agar	CFU/100mL	0	0	2		ND[<A]	ND[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

609425-609426 RDL >1 indicates dilutions of the sample.
ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

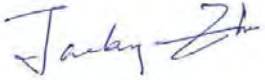
DATE RECEIVED: 2019-10-10

DATE REPORTED: 2019-10-18

			SAMPLE DESCRIPTION:		TW-1.635-3HR	TW-1.635-6HR
			SAMPLE TYPE:		Water	Water
			DATE SAMPLED:		2019-10-09	2019-10-09
Parameter	Unit	G / S: A	G / S: B	RDL	609425	609426
Electrical Conductivity	µS/cm			2	407	404
pH	pH Units		6.5-8.5	NA	7.55	7.62
Total Hardness (as CaCO3) (Calculated)	mg/L		80-100	0.5	198	196
Total Dissolved Solids	mg/L		500	20	258[<B]	250[<B]
Alkalinity (as CaCO3)	mg/L		30-500	5	193	191
Chloride	mg/L		250	0.10	6.32[<B]	5.45[<B]
(Nitrate + Nitrite) as N (Calculated)	mg/L			0.07	1.93	1.39
Nitrate as N	mg/L	10.0		0.05	1.93[<A]	1.39[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]	<0.05[<A]
Sulphate	mg/L		500	0.10	27.3[<B]	26.7[<B]
Ammonia as N	mg/L			0.02	0.12	0.11
Dissolved Organic Carbon	mg/L		5	0.5	1.1[<B]	1.2[<B]
Colour	TCU		5	5	<5[<B]	<5[<B]
Turbidity	NTU		5	0.5	41.2[>B]	8.0[>B]
Calcium	mg/L			0.05	42.4	42.0
Magnesium	mg/L			0.05	22.4	22.2
Sodium	mg/L	20	200	0.05	9.47[<A]	9.47[<A]
Iron	mg/L		0.3	0.010	<0.010[<B]	<0.010[<B]
Manganese	mg/L		0.05	0.002	0.013[<B]	0.011[<B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

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CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
609425	TW-1.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculated)	mg/L	80-100	198
609425	TW-1.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Turbidity	NTU	5	41.2
609426	TW-1.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculated)	mg/L	80-100	196
609426	TW-1.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Turbidity	NTU	5	8.0

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 18, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Fecal Coliforms in Water															
Fecal Coliform	609426	609426	ND	ND	NA	< 1									
Total Coliforms & E.Coli and BCC (Using DC Agar)															
Background Colony Count - DC Agar	609426	609426	ND	ND	NA	< 1									
Escherichia coli - DC Agar	609426	609426	ND	ND	NA	< 1									
Total Coliforms - DC Agar	609426	609426	ND	ND	NA	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

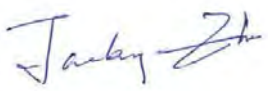
SAMPLED BY:

Water Analysis

RPT Date: Oct 18, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Electrical Conductivity	609237		618	620	0.3%	< 2	100%	80%	120%						
pH	609237		7.90	7.80	1.3%	NA	100%	90%	110%						
Total Dissolved Solids	602890		1270	1300	2.3%	< 20	98%	80%	120%						
Alkalinity (as CaCO3)	609237		262	263	0.4%	< 5	99%	80%	120%						
Chloride	609113		28.3	29.8	5.2%	< 0.10	106%	90%	110%	101%	90%	110%	100%	85%	115%
Nitrate as N	609113		<0.25	<0.25	NA	< 0.05	107%	90%	110%	105%	90%	110%	109%	85%	115%
Nitrite as N	609113		<0.25	<0.25	NA	< 0.05	NA	90%	110%	91%	90%	110%	111%	85%	115%
Sulphate	609113		8.16	8.40	2.9%	< 0.10	110%	90%	110%	107%	90%	110%	115%	85%	115%
Ammonia as N	609425	609425	0.12	0.12	0.0%	< 0.02	96%	90%	110%	99%	90%	110%	99%	70%	130%
Dissolved Organic Carbon	603197		2.2	2.3	NA	< 0.5	105%	90%	110%	100%	90%	110%	93%	80%	120%
Colour	608065		<5	<5	NA	< 5	100%	90%	110%						
Turbidity	609425	609425	41.2	41.7	1.2%	< 0.5	101%	90%	110%						
Calcium	609425	609425	42.4	42.2	0.5%	< 0.05	100%	90%	110%	100%	90%	110%	96%	70%	130%
Magnesium	609425	609425	22.4	22.6	0.9%	< 0.05	94%	90%	110%	95%	90%	110%	94%	70%	130%
Sodium	609425	609425	9.47	9.51	0.4%	< 0.05	96%	90%	110%	97%	90%	110%	94%	70%	130%
Iron	608206		1.01	0.995	1.5%	< 0.010	102%	90%	110%	97%	70%	130%	101%	70%	130%
Manganese	608206		0.045	0.045	0.0%	< 0.002	108%	90%	110%	106%	90%	110%	100%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T529150

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Background Colony Count - DC Agar	MIC-93-7010	MOE Method E3407	MF-Incubator
Escherichia coli - DC Agar	MIC-93-7010	MOE Method E3407	MF/INCUBATOR
Total Coliforms - DC Agar	MIC-93-7010	EPA 1604	MF/INCUBATOR
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3) (Calculated)	MET-93-6105	EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
(Nitrate + Nitrite) as N (Calculated)	INOR-93-6004	SM 4110 B	CALCULATION
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Colour	INOR-93-6046	SM 2120 C	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T529152

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Oct 16, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

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Certificate of Analysis

AGAT WORK ORDER: 19T529152

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Sulphide (Water)

DATE RECEIVED: 2019-10-10

DATE REPORTED: 2019-10-16

				SAMPLE DESCRIPTION:	TW-1.635-3HR	TW-1.635-6HR
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2019-10-09	2019-10-09
Parameter		Unit	G / S	RDL	610225	610227
Sulphide		mg/L	0.05	0.05	<0.05	<0.05

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T529152

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 16, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sulphide (Water)															
Sulphide	616407		<0.05	<0.05	NA	< 0.05	100%	80%	120%	100%	85%	115%	99%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T529152

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER

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LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T526437

MICROBIOLOGY ANALYSIS REVIEWED BY: Rocio Morales, Inorganics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Oct 15, 2019

PAGES (INCLUDING COVER): 9

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

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Certificate of Analysis

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2019-10-04

DATE REPORTED: 2019-10-15

				SAMPLE DESCRIPTION:	TW-2.635-3HR	TW-2.635-6HR
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2019-10-03	2019-10-03
Parameter	Unit	G / S	RDL	586843	586844	
Fecal Coliform	CFU/100mL		2	ND	ND	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

586843-586844 RDL > 1 indicates dilutions of the sample.
ND - Not Detected

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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AGAT WORK ORDER: 19T526437

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E.Coli and BCC (Using DC Agar)

DATE RECEIVED: 2019-10-04

DATE REPORTED: 2019-10-15

				SAMPLE DESCRIPTION:	TW-2.635-3HR	TW-2.635-6HR
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2019-10-03	2019-10-03
Parameter	Unit	G / S: A	G / S: B	RDL	586843	586844
Background Colony Count - DC Agar	CFU/100mL			2	170	62
Escherichia coli - DC Agar	CFU/100mL	0	0	2	ND[<A]	ND[<A]
Total Coliforms - DC Agar	CFU/100mL	0	0	2	14[>B]	6[>B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

586843-586844 RDL >1 indicates dilutions of the sample.
ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Certificate of Analysis

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-10-04

DATE REPORTED: 2019-10-15

					SAMPLE DESCRIPTION:	TW-2.635-3HR	TW-2.635-6HR
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-10-03	2019-10-03
Parameter	Unit	G / S: A	G / S: B	RDL		586843	586844
Electrical Conductivity	µS/cm			2		295	297
pH	pH Units	6.5-8.5		NA		7.57	7.73
Total Hardness (as CaCO3) (Calculated)	mg/L	80-100		0.5		42.6	41.8
Total Dissolved Solids	mg/L	500		20		152[<A]	156[<A]
Alkalinity (as CaCO3)	mg/L	30-500		5		150	150
Chloride	mg/L	250		0.10		5.51[<A]	5.71[<A]
Nitrate as N	mg/L		10.0	0.05		<0.05[<B]	<0.05[<B]
Nitrite as N	mg/L		1.0	0.05		<0.05[<B]	<0.05[<B]
(Nitrate + Nitrite) as N (Calculated)	mg/L			0.07		<0.07	<0.07
Sulphate	mg/L	500		0.10		0.13[<A]	0.14[<A]
Ammonia as N	mg/L			0.02		0.27	0.27
Dissolved Organic Carbon	mg/L	5		0.5		8.4[>A]	7.7[>A]
Colour	TCU	5		5		20[>A]	19[>A]
Turbidity	NTU	5		0.5		0.9[<A]	<0.5[<A]
Calcium	mg/L			0.05		10.5	10.3
Magnesium	mg/L			0.05		3.99	3.90
Sodium	mg/L	200	20	0.05		51.4[B-A]	51.2[B-A]
Iron	mg/L	0.3		0.010		<0.010[<A]	<0.010[<A]
Manganese	mg/L	0.05		0.002		0.017[<A]	0.017[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines, B Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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Guideline Violation

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
586843	TW-2.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Colour	TCU	5	20
586843	TW-2.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Dissolved Organic Carbon	mg/L	5	8.4
586843	TW-2.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculate	mg/L	80-100	42.6
586843	TW-2.635-3HR	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	51.4
586843	TW-2.635-3HR	O.Reg.169/03(mg/L)	Total Coliforms & E.Coli and BCC (Using DC Agar)	Total Coliforms - DC Agar	CFU/100mL	0	14
586843	TW-2.635-3HR	O.Reg.169/03-inc O&G	Total Coliforms & E.Coli and BCC (Using DC Agar)	Total Coliforms - DC Agar	CFU/100mL	0	14
586844	TW-2.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Colour	TCU	5	19
586844	TW-2.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Dissolved Organic Carbon	mg/L	5	7.7
586844	TW-2.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculate	mg/L	80-100	41.8
586844	TW-2.635-6HR	O.Reg.169/03(mg/L)	Inorganic Chemistry (Water)	Sodium	mg/L	20	51.2
586844	TW-2.635-6HR	O.Reg.169/03(mg/L)	Total Coliforms & E.Coli and BCC (Using DC Agar)	Total Coliforms - DC Agar	CFU/100mL	0	6
586844	TW-2.635-6HR	O.Reg.169/03-inc O&G	Total Coliforms & E.Coli and BCC (Using DC Agar)	Total Coliforms - DC Agar	CFU/100mL	0	6

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 15, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Fecal Coliforms in Water															
Fecal Coliform	586843	586843	ND	ND	NA	< 1									
Total Coliforms & E.Coli and BCC (Using DC Agar)															
Background Colony Count - DC Agar	586843	586843	170	156	8.6%	< 1									
Escherichia coli - DC Agar	586843	586843	ND	ND	NA	< 1									
Total Coliforms - DC Agar	586843	586843	14	12	15.4%	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 15, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Electrical Conductivity	583941		4590	4580	0.2%	< 2	99%	80%	120%	NA			NA		
pH	583941		7.84	7.74	1.3%	NA	100%	90%	110%	NA			NA		
Total Dissolved Solids	584013		192	196	2.1%	< 20	98%	80%	120%	NA			NA		
Alkalinity (as CaCO3)	583941		460	464	0.9%	< 5	99%	80%	120%	NA			NA		
Chloride	587368		39.5	45.4	13.9%	< 0.10	97%	90%	110%	95%	90%	110%	94%	85%	115%
Nitrate as N	587368		<0.25	<0.25	NA	< 0.05	101%	90%	110%	101%	90%	110%	104%	85%	115%
Nitrite as N	587368		<0.25	<0.25	NA	< 0.05	NA	90%	110%	103%	90%	110%	115%	85%	115%
Sulphate	587368		15.1	16.4	8.3%	< 0.10	107%	90%	110%	105%	90%	110%	106%	85%	115%
Ammonia as N	587068		0.06	0.06	NA	< 0.02	101%	90%	110%	103%	90%	110%	98%	70%	130%
Dissolved Organic Carbon	583935		1.5	1.4	NA	< 0.5	102%	90%	110%	98%	90%	110%	83%	80%	120%
Colour	590658		6	6	NA	< 5	100%	90%	110%	NA			NA		
Turbidity	584013		2.2	2.2	NA	< 0.5	99%	90%	110%	NA			NA		
Calcium	586548		16.7	16.9	1.2%	< 0.05	103%	90%	110%	103%	90%	110%	103%	70%	130%
Magnesium	586548		3.01	3.02	0.3%	< 0.05	105%	90%	110%	105%	90%	110%	103%	70%	130%
Sodium	586548		52.0	52.0	0.0%	< 0.05	101%	90%	110%	101%	90%	110%	100%	70%	130%
Iron	593320		<0.010	<0.010	NA	< 0.010	100%	90%	110%	97%	90%	110%	79%	70%	130%
Manganese	593320		0.052	0.051	1.9%	< 0.002	103%	90%	110%	104%	90%	110%	99%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Veraástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T526437

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Background Colony Count - DC Agar	MIC-93-7010	MOE Method E3407	MF-Incubator
Escherichia coli - DC Agar	MIC-93-7010	MOE Method E3407	MF/INCUBATOR
Total Coliforms - DC Agar	MIC-93-7010	EPA 1604	MF/INCUBATOR
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3) (Calculated)	MET-93-6105	EPA SW-846 6010C & 200.7	CALCULATION
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
(Nitrate + Nitrite) as N (Calculated)	INOR-93-6004	SM 4110 B	CALCULATION
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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http://www.agatlabs.com

CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T526539

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Oct 16, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

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Certificate of Analysis

AGAT WORK ORDER: 19T526539

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Sulphide (Water)

DATE RECEIVED: 2019-10-04

DATE REPORTED: 2019-10-16

					SAMPLE DESCRIPTION:	TW-2.635-3HR	TW-2.635-6HR
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-10-03	2019-10-03
Parameter	Unit	G / S: A	G / S: B	RDL		587869	587872
Sulphide	mg/L	0.05		0.05		<0.05[<A]	<0.05[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines, B Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T526539

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 16, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sulphide (Water)															
Sulphide	616407		<0.05	<0.05	NA	< 0.05	100%	80%	120%	100%	85%	115%	99%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T526539

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER

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ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T522767

MICROBIOLOGY ANALYSIS REVIEWED BY: Rocio Morales, Inorganics Lab Supervisor

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Oct 04, 2019

PAGES (INCLUDING COVER): 9

VERSION*: 1

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Certificate of Analysis

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Fecal Coliforms in Water

DATE RECEIVED: 2019-09-26

DATE REPORTED: 2019-10-04

				SAMPLE DESCRIPTION:	TW-3.635-3HR	TW-3.635-6HR
				SAMPLE TYPE:	Water	Water
				DATE SAMPLED:	2019-09-25	2019-09-25
Parameter	Unit	G / S	RDL		562839	562840
Fecal Coliform	CFU/100mL		1		ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

562839-562840 ND - Not Detected

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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AGAT WORK ORDER: 19T522767

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Total Coliforms & E.Coli and BCC (Using DC Agar)

DATE RECEIVED: 2019-09-26

DATE REPORTED: 2019-10-04

					SAMPLE DESCRIPTION:	TW-3.635-3HR	TW-3.635-6HR
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-09-25	2019-09-25
Parameter	Unit	G / S: A	G / S: B	RDL		562839	562840
Background Colony Count - DC Agar	CFU/100mL			1		NDOGN	NDOGN
Escherichia coli - DC Agar	CFU/100mL	0	0	1		NDOGN[<A]	NDOGN[<A]
Total Coliforms - DC Agar	CFU/100mL	0	0	1		NDOGN[<A]	NDOGN[<A]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to O.Reg.169/03-inc O&G Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

562839-562840 NDOGN – No Data; Overgrown with non- target, refers to over-crowding microbial growth;

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



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Certificate of Analysis

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-09-26

DATE REPORTED: 2019-10-04

			SAMPLE DESCRIPTION:		TW-3.635-3HR	TW-3.635-6HR
			SAMPLE TYPE:		Water	Water
			DATE SAMPLED:		2019-09-25	2019-09-25
Parameter	Unit	G / S: A	G / S: B	RDL	562839	562840
Electrical Conductivity	µS/cm			2	392	390
pH	pH Units		6.5-8.5	NA	7.95	7.92
Total Hardness (as CaCO3) (Calculated)	mg/L		80-100	0.5	151	149
Total Dissolved Solids	mg/L		500	20	164[<B]	178[<B]
Alkalinity (as CaCO3)	mg/L		30-500	5	172	179
Chloride	mg/L		250	0.10	1.12[<B]	1.02[<B]
Nitrate as N	mg/L	10.0		0.05	<0.05[<A]	<0.05[<A]
Nitrite as N	mg/L	1.0		0.05	<0.05[<A]	<0.05[<A]
(Nitrate + Nitrite) as N (Calculated)	mg/L			0.07	<0.07	<0.07
Sulphate	mg/L		500	0.10	12.9[<B]	12.8[<B]
Ammonia as N	mg/L			0.02	0.14	0.13
Dissolved Organic Carbon	mg/L		5	0.5	1.2[<B]	1.0[<B]
Colour	TCU		5	5	<5[<B]	<5[<B]
Turbidity	NTU		5	0.5	2.0[<B]	1.5[<B]
Calcium	mg/L			0.05	28.9	28.2
Magnesium	mg/L			0.05	19.1	19.0
Sodium	mg/L	20	200	0.05	14.2[<A]	14.2[<A]
Iron	mg/L		0.3	0.010	<0.010[<B]	<0.010[<B]
Manganese	mg/L		0.05	0.002	0.024[<B]	0.023[<B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
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Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Iris Verástegui

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AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

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CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
562839	TW-3.635-3HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculated)	mg/L	80-100	151
562840	TW-3.635-6HR	O.Reg. 169(mg/L)AO&OG	Inorganic Chemistry (Water)	Total Hardness (as CaCO3) (Calculate	mg/L	80-100	149

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Microbiology Analysis

RPT Date: Oct 04, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Coliforms & E.Coli and BCC (Using DC Agar)															
Background Colony Count - DC Agar	526715		ND	ND	NA	< 1									
Escherichia coli - DC Agar	526715		ND	ND	NA	< 1									
Total Coliforms - DC Agar	526715		ND	ND	NA	< 1									
Fecal Coliforms in Water															
Fecal Coliform	560883		NDOGT	NDOGT	NA	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable.
NDOGT - No Data; Overgrown with Target, refers to over-crowding microbial growth; NA - % RPD Not Applicable

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 04, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Electrical Conductivity	562249		423	423	0.0%	< 2	102%	80%	120%	NA			NA		
pH	562249		7.78	7.77	0.1%	NA	100%	90%	110%	NA			NA		
Total Dissolved Solids	562839	562839	164	166	1.2%	< 20	98%	80%	120%	NA			NA		
Alkalinity (as CaCO3)	562249		141	139	1.4%	< 5	98%	80%	120%	NA			NA		
Chloride	562229		34.2	34.1	0.3%	< 0.10	92%	90%	110%	104%	90%	110%	107%	85%	115%
Nitrate as N	562229		1.30	1.31	0.8%	< 0.05	102%	90%	110%	105%	90%	110%	106%	85%	115%
Nitrite as N	562229		<0.25	<0.25	NA	< 0.05	NA	90%	110%	109%	90%	110%	108%	85%	115%
Sulphate	562229		39.2	39.3	0.3%	< 0.10	92%	90%	110%	102%	90%	110%	102%	85%	115%
Ammonia as N	562839	562839	0.14	0.14	0.0%	< 0.02	100%	90%	110%	100%	90%	110%	97%	70%	130%
Dissolved Organic Carbon	563391		23.2	23.3	0.4%	< 0.5	103%	90%	110%	94%	90%	110%	96%	80%	120%
Colour	577146		32	33	3.1%	< 5	100%	90%	110%	NA			NA		
Turbidity	560902		2880	2880	0.0%	< 0.5	97%	90%	110%	NA			NA		
Calcium	566837		67.0	66.9	0.1%	< 0.05	100%	90%	110%	99%	90%	110%	98%	70%	130%
Magnesium	566837		6.17	6.12	0.8%	< 0.05	93%	90%	110%	94%	90%	110%	93%	70%	130%
Sodium	566837		1.39	1.38	0.7%	< 0.05	97%	90%	110%	96%	90%	110%	98%	70%	130%
Iron	564786		<0.010	<0.010	NA	< 0.010	94%	90%	110%	98%	90%	110%	80%	70%	130%
Manganese	564786		0.004	0.004	NA	< 0.002	102%	90%	110%	102%	90%	110%	97%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T522767

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Fecal Coliform	MIC-93-7000	SM 9222 D	MF/INCUBATOR
Background Colony Count - DC Agar	MIC-93-7010	MOE Method E3407	MF-Incubator
Escherichia coli - DC Agar	MIC-93-7010	MOE Method E3407	MF/INCUBATOR
Total Coliforms - DC Agar	MIC-93-7010	EPA 1604	MF/INCUBATOR
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3) (Calculated)	MET-93-6105	EPA SW-846 6010C & 200.7	CALCULATION
Total Dissolved Solids	INOR-93-6028	SM 2540 C	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
(Nitrate + Nitrite) as N (Calculated)	INOR-93-6004	SM 4110 B	CALCULATION
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Colour	INOR-93-6046	SM 2120 B	SPECTROPHOTOMETER
Turbidity	INOR-93-6044	SM 2130 B	NEPHELOMETER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

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ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T522875

WATER ANALYSIS REVIEWED BY: Jacky Zhu, Spectroscopy Technician

DATE REPORTED: Oct 04, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

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Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Results relate only to the items tested. Results apply to samples as received.
All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19T522875

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Sulphide (Water)

DATE RECEIVED: 2019-09-26

DATE REPORTED: 2019-10-04

					SAMPLE DESCRIPTION:	TW-3.635-3HR	TW-3.635-6HR
					SAMPLE TYPE:	Water	Water
					DATE SAMPLED:	2019-09-25	2019-09-25
Parameter	Unit	G / S: A	G / S: B	RDL		565394	565395
Sulphide	mg/L		0.05	0.05		<0.05[<B]	<0.05[<B]

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248, B Refers to Ontario Drinking Water Quality Standards - Aesthetic Objectives and Operational Guidelines
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T522875

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Oct 04, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Sulphide (Water)															
Sulphide	582531		<0.05	<0.05	NA	< 0.05	99%	80%	120%	99%	85%	115%	100%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T522875

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Sulphide	INOR-93-6054	SM 4500 S2- D	SPECTROPHOTOMETER

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BACTERIA RESAMPLING

AGAT Laboratories

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CLIENT NAME: GRACE & ASSOCIATES INC
16 GLENELG STREET EAST
LINDSAY, ON K9V1Y6
(705) 324-5408

ATTENTION TO: BEATRIZE VITORINO

PROJECT: R15-635

AGAT WORK ORDER: 19T554935

MICROBIOLOGY ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Dec 18, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
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Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 19T554935

PROJECT: R15-635

CLIENT NAME: GRACE & ASSOCIATES INC

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Total Coliforms & E.Coli and BCC (Using DC Agar)

DATE RECEIVED: 2019-12-12

DATE REPORTED: 2019-12-18

				SAMPLE DESCRIPTION:	TW-1.635	TW-2.635	TW-3.635
				SAMPLE TYPE:	Water	Water	Water
				DATE SAMPLED:	2019-12-11 10:05	2019-12-11 10:22	2019-12-11 10:44
Parameter	Unit	G / S	RDL		793595	793596	793597
Background Colony Count - DC Agar	CFU/100mL		1		ND	26	ND
Escherichia coli - DC Agar	CFU/100mL	0	1		ND	ND	ND
Total Coliforms - DC Agar	CFU/100mL	0	1		ND	ND	ND

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Ontario Drinking Water Quality Standards. Na value is derived from O. Reg. 248
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

793595-793597 ND - Not Detected.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

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Quality Assurance

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T554935

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

Microbiology Analysis

RPT Date: Dec 18, 2019			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Total Coliforms & E.Coli and BCC (Using DC Agar)															
Background Colony Count - DC Agar	793595	793595	ND	ND	NA	< 1									
Escherichia coli - DC Agar	793595	793595	ND	ND	NA	< 1									
Total Coliforms - DC Agar	793595	793595	ND	ND	NA	< 1									

Comments: ND - Not Detected, NA - % RPD Not Applicable.

Certified By: Divine Basily

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Method Summary

CLIENT NAME: GRACE & ASSOCIATES INC

AGAT WORK ORDER: 19T554935

PROJECT: R15-635

ATTENTION TO: BEATRIZE VITORINO

SAMPLING SITE:

SAMPLED BY:TG

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Microbiology Analysis			
Background Colony Count - DC Agar	MIC-93-7010	MOE Method E3407	MF-Incubator
Escherichia coli - DC Agar	MIC-93-7010	MOE Method E3407	MF/INCUBATOR
Total Coliforms - DC Agar	MIC-93-7010	EPA 1604	MF/INCUBATOR

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