SIRATI & PARTNERS
Geotechnical Hydrogeological & Environmental Solutions

Project: SP19-462-30

June 26, 2020

Milani Group
11333 Dufferin Street
Maple, ON., L6A 1S5
Attention: Mr. Cam Milani

Email: cam.milani@milanigroup.ca

RE: SOIL PERCOLATION TESTS – 18314 HURONTARIO STREET, TOWN OF CALEDON, ONTARIO

Dear Mr. Cam:

Sirati and Partners Consultants Ltd. (SIRATI) is pleased to provide you the results of soil percolation tests conducted at the Subject Site located at 18314 Hurontario Street, Town of Caledon, Ontario. The field percolation testing was performed at the Site on June 19, 20 and 25, 2019.

1.0 Introduction and Project Understanding

The percolation test is widely used to assess the suitability of the soils for the implementation of Low Impact Development (LID) measures such as infiltration galleries, bio-swales, infiltration trenches etc. at the development site. The tests usually measure the length of time required for a quantity of water to infiltrate into the soil in an open hole, and is often defined as percolation rate. It should be noted that percolation rate is not the same as the infiltration rate, although both are related. The infiltration rate is a measure of the speed at which water moves downward into the sub-soil and is expressed in terms of the volume of water that infiltrates per unit of time (mm/min or mm/hour). Percolation rate measures not only downward movement of water but also the lateral progression through the soil as well. In other words, infiltration testing would include only the bottom surface area, while percolation tests include both the bottom surface area and the sidewalls of the test hole. The infiltration capacity of a soil decreases rapidly over time during the infiltration until it reaches a constant value almost equalling the saturated hydraulic conductivity of the soil.

Based on the "Porchet Method" described below, a relationship between the percolation rate and the infiltration rate is obtained using the equation:

Infiltration Rate, $I_t = \Delta H\ 60\ r / \Delta t\ (r+2Havg)$

Where:

I_t = tested infiltration rate, inches/hour

ΔH = change in head over the time interval, inches

Δt = time interval, minutes

r = effective radius of test hole, inches

H_{avg} = average head over the time interval, inches

It should be noted that the infiltration tests were requested to be carried out in test pits using double-ring infiltrometer or Guelph Permeameter. However, given the extensive amount of earth work required to carry out the above test pits and soil disturbance that they cause, it was proposed that the infiltration rates be measured at a depth of 1.5-2.0 m, using augured test holes equipped with perforated pipes and granular bed at the bottom. Accordingly, a total of eleven (11) test holes drilled to depths ranging from 1.5 m to 2.3 m and equipped with perforated pipes and granular bedding for infiltration testing. The locations of the test holes are shown in attached Figure 1-1.

Table below shows the details of soils encountered at each test hole.

Test Hole	Installed Depth (m)	Soils Encountered
TH1	2.0	Fill materials up to 0.8 m; Silty Sand, trace gravel 0.8 – 2.0 m.
TH2	2.0	Fill materials up to 0.8 m; Gravelly Sand, trace gravel 0.8 – 2.0 m.
TH3	2.1	Fill materials up to 2.3 m, gravel and sand, moist
TH4	2.0	Fill materials up to 1.5 m; Gravelly Sand 1.5 m - 2.0 m.
TH5	2.0	Fill materials up to 1.5 m; Silty Sand, trace gravel 1.5 – 2.0 m.
TH6	1.9	Fill materials up to 2.3 m, Sandy Silt, trace gravel, moist.
TH7	2.3	Fill materials up to 1.5 m; Sand and Silt 1.5– 2.3 m.
TH8	1.9	Fill materials up to 1.5 m; Sand and gravel 1.5 -1.9 m.
TH9	2.2	Fill materials up to 0.8 m; Silty to gravelly sand 0.8 – 2.2 m.
TH10	2.2	Fill materials up to 1.5 m; Gravelly Sand 1.5 – 2.2 m.
TH11	2.0	Fill materials up to 1.5 m; Silty Sand and gravel 0.8 – 2.0 m.

The results of the above investigation will be used to design septic tanks, infiltration design and provide geotechnical recommendations regarding foundations, roads, services, etc.

2.0 Soil Infiltration Rates

Theoretical constant infiltration rates and percolation rates (i.e. near saturated hydraulic conductivity) for various soil types are shown in the Table 2.1 and Table 2-2, respectively.

Table 2-1: Theoretical Infiltration Rates.

Soil Type	Infiltration Rate* (mm/hr.)
Sand	>30
Sandy Loam	20-30
Loam	10-20
Clayey Loam	5-10
Clay	1-5

*Bower (1986) and Ward & Robinson (1990)

Table 2-2: Theoretical Minimum Soil Percolation Rates

Soil Type	Percolation Rate (mm/hr.)
Sand	210
Loamy sand	60
Sandy Loam	25
Loam	15

The general factors affecting the infiltration capacity of the soils at the surface include; soil compaction caused by equipment traffic forming surface crusting and soil texture (i.e. percentage of sand, silt and clay). Compacted or impervious soil layers have less pore space and restrict water movement through soil profile. A high groundwater level will also cause stagnation of infiltrating water and the infiltration capacity will decrease, approaching a near zero.

3.0 Hydrogeology of the Study Area

The Subject Property is situated within the Caledon Creek subwatershed of Credit River Watershed. The Caledon Creek subwatershed is an integral part of the headwaters area of the Credit River. The surficial geology of the Caledon Creek is characterized by Caledon Meltwater Channel which is an

extensive sand and gravel outwash deposit ranging in thickness from 5 m to 25 m. This unit is highly permeable and will allow for rapid recharge of any water infiltrating into it (reference: Caledon Creek Subwatershed Study-Phase I Characterization Report, November 1999). Highly permeable sand and gravel outwash materials provide excellent areas for water to infiltrate into the ground and recharge the groundwater.

Caledon Town is situated within a significant groundwater recharge area (SGRA) with high sand and gravel deposits and the general recharge rate is considered as more than 250 mm/hr. Since, the Subject Property is situated within a SGRA, it is expected to have high rates of groundwater recharge.

4.0 Test Procedure

The test procedure is based on the method described in Design Handbook for Low Impact Development Best Management Practices" Riverside County, State of California, 2011.

As per the Design Handbook, a test hole should be drilled to the bottom of the proposed infiltration facility and is usually to about 3 m depth, called Shallow Percolation Test hole. The test hole dimension is usually between 6 and 12 inches (0.15 m and 0.30 m). The bottom of the test hole shall be covered with 5 cm (2 inches) of gravel. The sides of the test hole shall remain undisturbed after drilling. Test holes greater than 3 m depth are called the Deep Percolation test holes.

5.0 Test Methods

In sandy soils, when 2 consecutive measurements show that 15 cm (6 inches) of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. The drop that occurs during the final 10 minutes is used to calculate the percolation rate. Field data must show the two 25-minute readings and the six 10-minute readings.

In non-sandy soils, obtain at least twelve (12) measurements per hole over at least six hours and from a fixed reference point, measure the drop-in water level over a 30-minute period for at least 6 hours, refilling after every 30-minute reading. The total depth of the hole must be measured at every reading to verify that collapse of the borehole has not occurred. The drop that occurs during the final reading is used to calculate the percolation rate.

The soils encountered at the Site are sandy to gravelly in nature and hence sandy soils test procedure was used in the present scenario. The test's data was tabulated and presented in the Appendix A.

6.0 Test Results

Percolation tests were conducted at eleven (11) locations named as TH 1 to TH 11, as shown in Figure 1-1. Based on the information provided by the client, the test holes were augured to the recommended depths of between 1.9 and 2.3 m below ground surface.

The soil samples collected from the bottom of the test hole have indicated the presence of sandy to gravelly soils at most of the test holes completed on the site, indicating the highly pervious nature of soils at the Subject Property.

Data obtained during the final 10-minute reading was converted into infiltration rate as per the relationship between percolation rate and the infiltration rate utilizing "Porchet Method" described above.

Accordingly, as depicted in the Table 1-1, below, the calculated infiltration rates ranged between 79 mm/hr and 381 mm/hr. Detailed calculations were presented in the Appendix A.

TABLE 1-1: SUMMARY OF PERCOLATION TEST RESULTS

TEST HOLE #	INSTALLATION DEPTH (M)	SOILS ENCOUNTERED	PERCOLATION RATE	INFILTRATION RATE	
	(m)		(in/hr)	(in/hr)	(mm/hr)
TH1	2.0	Silty Sand and gravel	27.4	15	375
TH2	2.0	Gravelly Sand	22.5	11	267
TH3	2.1	Gravel and Sand	23.4	10	244
TH4	2.0	Gravelly Sand	14.2	11	268
TH5	2.0	Silty Sand	18.9	7	171
TH6	1.9	Sandy Silt	14.2	6	160
TH7	2.3	Sand and Silt	28.2	5	137
TH8	1.9	Sand and gravel	30.0	15	381
TH9	2.2	Silty to sandy	10.6	3	79
TH10	2.2	Sand and gravel	19.1	6	163
TH11	2.0	Silty Sand & Gravel	22.7	12	300

7.0 Conclusion and Recommendations.

- Based on the infiltration tests conducted at the Subject Property, the test results have indicated infiltration rates ranging between as low as 79 mm/hr to a maximum infiltration rate of 381 mm/hr.
- Infiltration rates have demonstrated the presence of highly pervious sand and gravel deposits at most of the Site contributing to the groundwater recharge.
- The areas of active recharge into the groundwater in which septic beds are situated may create water quality problems due to more infiltration.
- Since, the soils at the Site are highly pervious in nature and therefore, the most important aspects of the development of the Subject Property may be to examine enhanced septic systems protecting the groundwater quality.

8.0 Limitation

This report was produced for the sole use of Milani Group (the Client), and may not be relied upon by any other person or entity without the written authorization of Sirati & Partners Consultants Limited (SIRATI). The conclusions presented in this report are professional opinions based on review of the publicly accessible data, the information provided by the Client, and the reports prepared by other consultant(s). As such, SIRATI cannot be held responsible for environmental conditions at the site that was not apparent from the available information.

Professional judgement was exercised in gathering and analyzing data and formulation of recommendations using current industry guidelines and standards. Similar to all professional persons rendering advice, SIRATI cannot act as absolute insurer of the conclusion we have reached. No additional warranty or representation, expressed or implied, is included or intended in this report other than stated herein the report.

Any use, copying or distribution of the report in whole or in part is not permitted without the express written permission of SIRATI and use of findings, conclusions and recommendations represented in this report, is at the sole risk of third parties.

In the event that during future work new information regarding the environmental condition of the site is encountered, or in the event that the outstanding responses from the regulatory agencies indicate

outstanding issues on file with respect to the site, SIRATI should be notified in order that we may re-evaluate the findings of this peer review and provide amendments, as required.

Should you have any questions regarding the information presented or limitation set in this report, please do not hesitate to contact our office.

Best Regards,

Sirati & Partners Consultants Limited

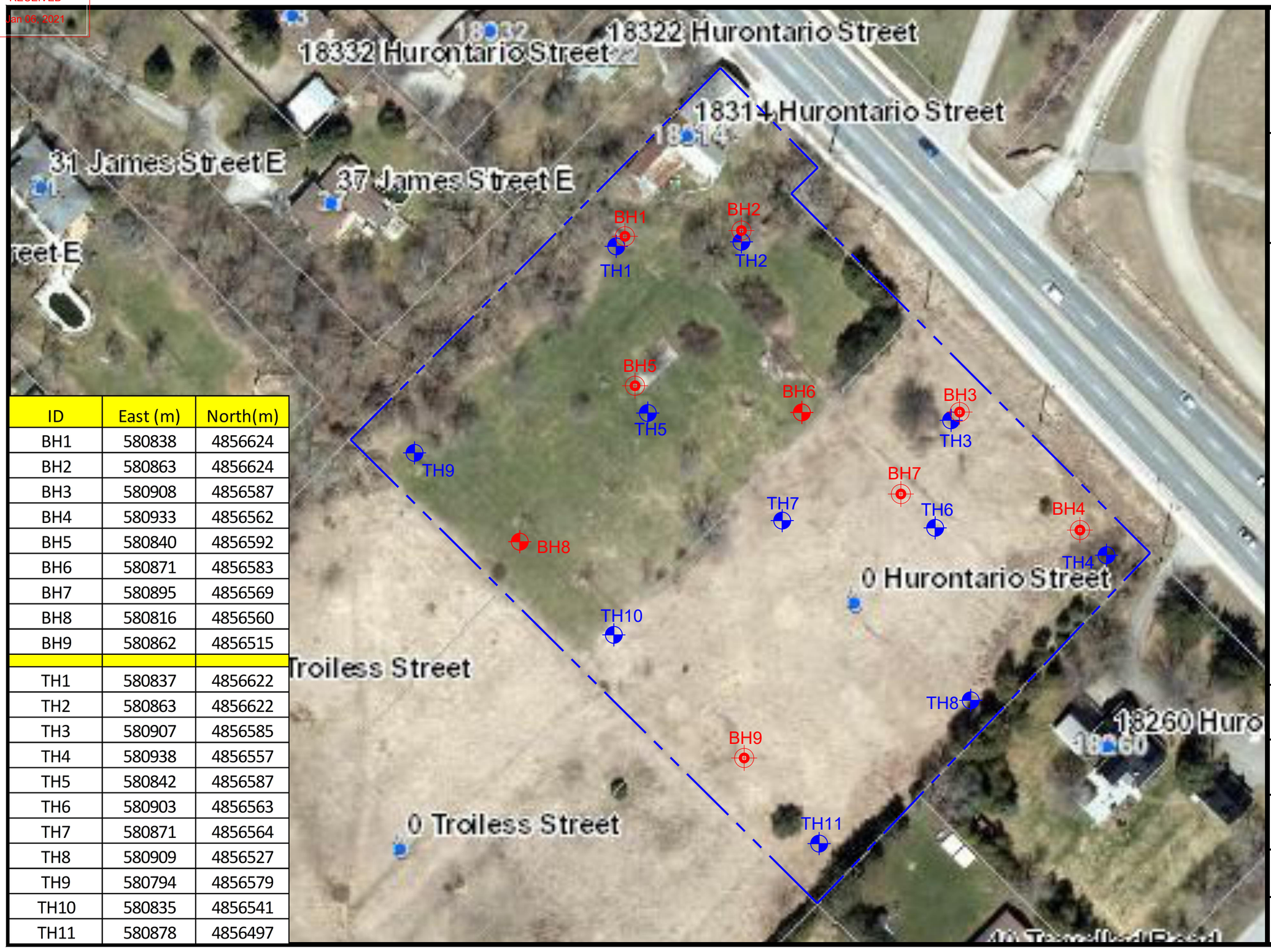
Sudhakar Kurli, M.Sc., P. Geo.
Hydrogeologist/Project Manager

Bujing Guan, M. A.Sc., P. Geo.
Senior Hydrogeologist/Environmental Specialist

Enclosures:

Figure 1-1: Percolation Test Location Plan

Appendix A: Record for Percolation Tests at Test Locations 1 to 11



ID	East (m)	North(m)
BH1	580838	4856624
BH2	580863	4856624
BH3	580908	4856587
BH4	580933	4856562
BH5	580840	4856592
BH6	580871	4856583
BH7	580895	4856569
BH8	580816	4856560
BH9	580862	4856515
TH1	580837	4856622
TH2	580863	4856622
TH3	580907	4856585
TH4	580938	4856557
TH5	580842	4856587
TH6	580903	4856563
TH7	580871	4856564
TH8	580909	4856527
TH9	580794	4856579
TH10	580835	4856541
TH11	580878	4856497

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North:

Legend:

- Property Boundary
- Borehole Location
- Percolation Test Location
- Monitoring Well Location

Project Title:
Percolation Tests Investigation

Site Location:
18314 Hurontario Street,
Caledon Village, ON,

Figure Title:
Boreholes / Monitoring Wells/Percolation Test Location Plan

Scale: 0m 20m

Project Number: SP19-462-30

Date: June 2020

Figure Number: 1-1

APPENDIX A

SIRATI & PARTNERS

Geotechnical Hydrogeological & Environmental Solutions

Percolation Test Data Sheet - TH1

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: P19-462-30**		**Date:**	**06-Jun-19**
Test Hole No:	**TH1**	**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**2.0 m**	**USCS Soil Classification:**	**Silty Sand and Gravel**		
Test Hole Dimensions (mm)			**Length**	**Width**	
Diameter (if round)	**100**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15 cm (6")? (y/n)
1	12:42	1:07	25	0.75	1.89	1.14	Y
2	1:07	1:32	25	0.75	1.92	1.17	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.6 cm (0.25'').

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate (in/hr)	(mm/hr)
			Time Interval (min.)	Initial Depth to Water (m)	Final Depth to Water(m)	Change in Water Level (m)		
1	1:32	1:42	10	0.75	1.99	1.24	29.3	745
2	1:42	1:52	10	0.75	1.99	1.24	29.3	745
3	1:52	0:02	10	0.75	1.9	1.15	27.2	691
4	2:02	2:12	10	0.75	1.91	1.16	27.4	697
5	2:12	2:22	10	0.75	1.91	1.16	27.4	697
6	2:22	2:32	10	0.75	1.91	1.16	27.4	697
7								
8								
9								
10								

Comments: Data used for calculating infiltration rate

PERCOLATION RATE CONVERSION-TH1

The bottom of a proposed infiltration basin would be at 1.5 m (5.0 feet) below natural grade. Percolation tests are performed within the boundaries of the proposed development with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0	29.53	inches
Final Depth to Water, Df =	75.2	inches	Total Depth of Test Hole, Dt	78.74	inches
Test Hole Radius, r =	3	inches			

The conversion equation used is:			
	It = ΔH 60 r/Δt (r+2Havg)		
"H0" is the initial height of water at the selected time interval.			
	Ho = Dt - Do	49.21	inches
"Hf" is the final height of water at the selected time interval.			
	Hf = Dt - Df	3.54	inches
"ΔH" is the change in height over the time interval.			
	ΔH = ΔD = Ho - Hf	45.67	inches
"Havg" is the average head height over the time interval.			
	Havg = (Ho + Hf)/2	26.38	inches
"It" is the tested infiltration rate.			
	It = ΔH 60 r/Δt (r+2Hav	14.75	inches/hr
		375	mm/hr

Percolation Test Data Sheet -TH2

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: P19-462-30**		**Date:**	**06-Jun-19**
Test Hole No: TH2		**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**2.0 m**	**USCS Soil Classification:**	**Gravelly Sand**		
Test Hole Dimensions (mm)				**Length**	**Width**
Diameter (if round)	**150 mm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (cm)	Change in Water Level (m)	Greater than or Equal to 15 cm (6")? (y/n)
1	12:28	12:53	25	0.50	1.9	1.40	Y
2	12:53	1:18	25	0.50	1.9	1.40	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.6 cm (0.25").

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (m)	Final Depth to Water(m)	Change in Water Level (m)	(in/hr)	(mm/hr)
1	1:18	1:28	10	0.75	1.95	1.20	28.4	720
2	1:28	1:38	10	0.75	1.88	1.13	26.7	678
3	1:38	1:48	10	0.75	1.81	1.06	25.1	636
4	1:48	1:58	10	0.75	1.76	1.01	23.9	606
5	1:58	2:08	10	0.75	1.7	0.95	22.5	570
6	2:08	2:18	10	0.75	1.7	0.95	22.5	570
7								
8								
9								
10								

Comments: Data used for conversion to Infiltration rate

PERCOLATION RATE CONVERSION-TH2

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10 minutes	Initial Depth to Water, D0 =	29.50 inches
Final Depth to Water, Df =	67 inches	Total Depth of Test Hole, Dt =	78.90 inches
Test Hole Radius, r =	3 inches		

The conversion equation used is:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 49.4

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 11.9

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf 37.5

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 30.65

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 10.5 inches/hr

267 mm/hr

Percolation Test Data Sheet - TH3

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**			**Date:**	**07-Jun-19**
Test Hole No: TH3		**Tested By: Sudhakar Kurli/Tecle**				
Depth of Test Hole, DT:	**2.12 m**	**USCS Soil Classification:**	**Sandy Soils**			
Test Hole Dimensions (cm)				**Length**	**Width**	
Diameter (if round)	**10 cm**	**Sides (if rectangular)=**				

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 15 cm (6"?) (y/n)
1	10:56	11:21	25	0.65	2.12	1.47	Y
2	11:21	11:46	25	0.75	2.12	1.37	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.6 cm (0.25").

Trail No.	Start Time	Stop Times	Δt	Do	Dt	Δd	Percolation Rate (In/hr) (mm/hr)	
			Time Interval (min.)	Initial Depth to Water (m)	Final Depth to Water(m)	Change in Water Level (m)		
1	11:46	11:56	10	0.75	1.82	1.07	25.3	642
2	11:56	12:06	10	0.75	1.85	1.10	26.0	660
3	12:06	12:16	10	0.75	1.8	1.05	24.8	630
4	12:16	12:26	10	0.75	1.75	1.00	23.6	600
5	12:26	12:36	10	0.75	1.74	0.99	23.4	594
6	12:36	12:46	10	0.75	1.74	0.99	23.4	594
7								
8								
9								
10								

Comments: Data used to calculate the infiltration rate

PERCOLATION RATE CONVERSION-TH3

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10 minutes	Initial Depth to Water, D0 =	29.50 inches
Final Depth to Water, Df =	68.5 inches	Total Depth of Test Hole, Dt =	84.00 inches
Test Hole Radius, r =	3 inches		

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 — 54.5

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df — 15.5

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf — 39

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 — 35

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) — 9.62 inches/hr

244 mm/hr

Percolation Test Data Sheet - TH4

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**		**Date:**	**07-Jun-19**
Test Hole No: TH4		**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**2.03 m**	**USCS Soil Classification:**	**Gravelly sand**		
Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**10cm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15 cm (0.6")? (y/n)
1	11:00	11:25	25	0.80	2.03	1.23	Y
2	11:25	11:50	25	0.80	2.03	1.23	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25''.

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate (in/hr) (mm/hr)	
			Time Interval (min.)	Initial Depth to Water (cm.)	Final Depth to Water(cm.)	Change in Water Level (cm.)		
1	11:50	12:00	10	0.75	1.45	0.70	16.5	420
2	12:00	12:10	10	0.75	1.4	0.65	15.4	390
3	12:10	12:20	10	0.75	1.38	0.63	14.9	378
4	12:20	12:30	10	0.75	1.36	0.61	14.4	366
5	12:30	12:40	10	0.75	1.35	0.60	14.2	360
6	12:40	12:50	10	0.75	1.35	0.60	14.2	360
7								
8								
9								
10								

Comments: Data used to calculate the iinfiltration rate

PERCOLATION RATE CONVERSION-TH4

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	29.53	inches
Final Depth to Water, Df =	53.15	inches	Total Depth of Test Hole, Dt =	60.00	inches
Test Hole Radius, r =	3	inches			

The conversion equation used is:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 30.47 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 6.85 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf 23.62 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 18.66 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 10.54 inches/hr

268 mm/hr

Percolation Test Data Sheet - TH5

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**		**Date:**	**06-Jun-19**
Test Hole No: TH5		**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**2.04 m**	**USCS Soil Classification:**	**Silty Sand**		
Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**10cm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m.)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 15 cm (6'')? (y/n)
1	1:08	1:33	25	0.60	1.97	1.37	Y
2	1:33	1:58	25	0.60	1.96	1.36	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.06 cm (0.25'').

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate (In/hr)	
			Time Interval (min.)	Initial Depth to Water (m)	Final Depth to Water(m)	Change in Water Level (m)		
1	1.58	1:55	10	0.60	1.55	0.95	22.5	57.0
2	2.08	4:19	10	0.60	1.5	0.90	21.3	54.0
3	2.18	6:43	10	0.60	1.48	0.88	20.8	52.8
4	2.28	9:07	10	0.60	1.45	0.85	20.1	51.0
5	2.38	11:31	10	0.60	1.4	0.80	18.9	48.0
6	2.48	13:55	10	0.60	1.4	0.80	18.9	48.0
7								
8								
9								
10								

Comments: Data used for calculating the infiltration rate

PERCOLATION RATE CONVERSION-TH5

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	23.60	inches
Final Depth to Water, Df =	55.1	inches	Total Depth of Test Hole, Dt =	80.00	inches
Test Hole Radius, r =	3	inches			

The conversion equation is used:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 56.4 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 24.9 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf 31.5 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 40.65 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 6.73 inches/hr

171 mm/hr

Percolation Test Data Sheet - TH6

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**	**Date: 07-Jun-19**
Test Hole No: TH6		**Tested By: Sudhakar Kurli/Tecle**	
Depth of Test Hole, DT:	1.87 m	**USCS Soil Classification: Sandy Silt**	
Test Hole Dimensions (cm)			**Length** / **Width**
Diameter (if round)	**10cm**	**Sides (if rectangular)=**	

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m.)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 6''? (y/n)
1	2:21	2:46	25	0.56	1.87	1.31	Y
2	2:46	3:11	25	0.75	1.87	1.12	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25''.

Trail No.	Start Time	Stop Times	Δt Time Interval (min.)	Do Initial Depth to Water (cm.)	Dt Final Depth to Water(cm.)	ΔD Change in Water Level (cm.)	Percolation Rate (min./In.)	
1	3:11	3:21	10	0.75	1.55	0.80	18.9	48
2	3:21	3:31	10	0.75	1.45	0.70	16.5	42
3	3:31	3:41	10	0.75	1.41	0.66	15.6	39.6
4	3:41	3:51	10	0.75	1.36	0.61	14.4	36.6
5	3:51	4:01	10	0.75	1.35	0.60	14.2	36
6	4:01	4:11	10	0.75	1.35	0.60	14.2	36
7								
8								
9								
10								

Comments: Data used for calculating the infiltration rate

PERCOLATION RATE CONVERSION-TH6

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	29.50	inches
Final Depth to Water, Df =	53.15	inches	Total Depth of Test Hole, Dt =	73.60	inches
Test Hole Radius, r =	3	inches			

The conversion equation is used:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 44.1 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 20.45 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf 23.65 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 32.28 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 6.30 inches/hr

160 mm/hr

Percolation Test Data Sheet - TH7

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**			**Date:**	**12-Jun-19**
Test Hole No: TH7		**Tested By: Sudhakar Kurli/Tecle**				
Depth of Test Hole, DT:	**2.30 m**	**USCS Soil Classification:**	**Sand and Silt**			
Test Hole Dimensions (cm)				**Length**	**Width**	
Diameter (if round)	**10cm**	**Sides (if rectangular)=**				

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15 cm (6")? (y/n)
1	10:15	10:40	25	1.35	2.2	0.85	Y
2	10:40	11:05	25	1.32	2.15	0.83	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (cm.)	Final Depth to Water(cm.)	Change in Water Level (cm.)	(In/hr)	(mm/hr)
1	11:05	11:15	10	1.35	1.85	0.50	32.8	833.3
2	11:15	11:25	10	1.35	1.88	0.53	34.8	883.3
3	11:25	11:35	10	1.35	1.82	0.47	30.9	783.3
4	11:35	11:45	10	1.35	1.79	0.44	28.9	733.3
5	11:45	11:55	10	1.35	1.78	0.43	28.2	716.7
6	11:55	12:10	10	1.35	1.78	0.43	28.2	716.7
7								
8								
9								
10								

Comments: Data used for calculating field infiltration rate

PERCOLATION RATE CONVERSION-TH7

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	53.15	inches
Final Depth to Water, Df =	70.8	inches	Total Depth of Test Hole, Dt =	90.00	inches
Test Hole Radius, r =	3	inches			

The conversion equation is used:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 — 36.9 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df — 19.2 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf — 17.7 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 — 28 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) — 5.38 inches/hr

137 mm/hr

Percolation Test Data Sheet - TH8

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**		**Date:**	**07-Jun-19**
Test Hole No: TH8		**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**1.86 m**	**USCS Soil Classification:**	**Sand and Gravel**		
Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**10cm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15 cm (6")? (y/n)
1	1:10	1:20	10	0.50	1.86	1.36	Y
2	1:20	1:30	10	0.50	1.86	1.36	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.06 cm (0.25'').

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (cm.)	Final Depth to Water(cm.)	Change in Water Level (cm.)	(In/hr)	(mm/hr)
1	1:35	1:45	10	0.50	1.85	1.35	31.9	810
2	1:45	1:55	10	0.50	1.84	1.34	31.7	804
3	1:55	2:05	10	0.50	1.8	1.30	30.7	780
4	2:05	2:15	10	0.50	1.77	1.27	30.0	762
5	2:15	2:25	10	0.50	1.77	1.27	30.0	762
6	2:25	2:35	10	0.50	1.77	1.27	30.0	762
7								
8								
9								
10								

Comments: Data used for calculating the infiltration rate

PERCOLATION RATE CONVERSION-TH8

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, Do =	20.00	inches
Final Depth to Water, Df =	69.7	inches	Total Depth of Test Hole, Dt =	73.20	inches
Test Hole Radius, r =	3	inches			

The conversion equation used is:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - Do 53.2 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 3.5 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = Ho - Hf 49.7 inches

"Havg" is the average head height over the time interval.

Havg = (Ho + Hf)/2 28.35 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 14.98 inches/hr

381 mm/hr

Percolation Test Data Sheet - TH9

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**	**Date:**	**07-Jun-19**
Test Hole No: TH9		**Tested By: Sudhakar Kurli/Tecle**		
Depth of Test Hole, DT:	**2.23 m**	**USCS Soil Classification:**	**Silty tro Sandy**	

Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**10cm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15 cm (6")? (y/n)
1	2:35	3:00	25	0.75	1.55	0.80	Y
2	3:00	3:30	25	0.75	1.52	0.77	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25''.

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (m.)	Final Depth to Water(m.)	Change in Water Level (m.)	(In/hr)	(mm/hr)
1	3:30	3:40	10	0.75	1.29	0.54	12.8	324.0
2	3:40	3:50	10	0.75	1.25	0.50	11.8	300.0
3	3:50	4:00	10	0.75	1.22	0.47	11.1	282.0
4	4:00	4:10	10	0.75	1.2	0.45	10.6	270.0
5	4:10	4:20	10	0.75	1.2	0.45	10.6	270.0
6	4:20	4:30	10	0.75	1.2	0.45	10.6	270.0
7								
8								
9								
10								

Comments: Data used for calculating the infiltration rate

PERCOLATION RATE CONVERSION-TH9

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	29.50	inches
Final Depth to Water, Df =	47.2	inches	Total Depth of Test Hole, Dt =	88.00	inches
Test Hole Radius, r =	3	inches			

The conversion equation is used:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 — 58.5 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df — 40.8 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf — 17.7 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 — 49.65 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) — 3.11 inches/hr

79 mm/hr

Percolation Test Data Sheet- TH10

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**		**Date:**	**07-Jun-19**
Test Hole No: TH10		**Tested By: Sudhakar Kurli/Tecle**			
Depth of Test Hole, DT:	**2.20 m**	**USCS Soil Classification:**	**Sand and Gravel**		
Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**100 mm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m.)	Final Depth to Water (cm)	Change in Water Level (cm)	Greater than or Equal to 15 cm (6")? (y/n)
1	2:57	3:27	25	1.00	2.1	1.10	Y
2	3:27	3:53	25	1.00	2.1	1.10	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.06 cm (0.25'').

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (m)	Final Depth to Water(m)	Change in Water Level (m)	(In/hr)	(mm/hr)
1	3:53	4:03	10	0.70	1.65	0.95	22.5	570
2	4:03	4:13	10	0.70	1.62	0.92	21.7	552
3	4:13	4:23	10	0.70	1.60	0.90	21.3	540
4	4:23	4:33	10	0.70	1.55	0.85	20.1	510
5	4:33	4:43	10	0.70	1.51	0.81	19.1	486
6	4:43	4:53	10	0.70	1.51	0.81	19.1	486
7								
8								
9								
10								

Comments: Data used to calculate the infiltration rate

PERCOLATION RATE CONVERSION-TH10

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	27.60	inches
Final Depth to Water, Df =	59.45	inches	Total Depth of Test Hole, Dt =	86.60	inches
Test Hole Radius, r =	3	inches			

The conversion equation is used:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - D0 59 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df 27.15 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = H0 - Hf 31.85 inches

"Havg" is the average head height over the time interval.

Havg = (H0 + Hf)/2 43.08 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) 6.43 inches/hr

163 mm/hr

Percolation Test Data Sheet - TH11

Project:	**18309 & 18314 Hurontario St. Caledon**	**Project No: SP19-462-30**	**Date: 07-Jun-19**
Test Hole No: TH11		**Tested By: Sudhakar Kurli/Tecle**	
Depth of Test Hole, DT:	**1.96 m**	**USCS Soil Classification:**	**Silty Sand and Gravel**

Test Hole Dimensions (cm)			**Length**	**Width**	
Diameter (if round)	**100 mm**	**Sides (if rectangular)=**			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (m)	Final Depth to Water (m)	Change in Water Level (m)	Greater than or Equal to 15.25 cm (6'')? (y/n)
1	1:20	1:50	20	0.50	1.95	1.45	Y
2	1:55	2:20	25	0.50	1.90	1.40	y

* If two consecutive measurements show that six inches (15.25 cm) of water seeps away in less than 25 minutes, the test shall be run for an additional hour wth measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.06 cm (0.25'').

Trail No.	Start Time	Stop Times	Δt	Do	Dt	ΔD	Percolation Rate	
			Time Interval (min.)	Initial Depth to Water (cm.)	Final Depth to Water(cm.)	Change in Water Level (cm.)	(In/h)	(mm/hr)
1	2:20	2:30	10	0.83	1.96	1.13	26.7	678
2	2:30	2:40	10	0.80	1.90	1.10	26.0	660
3	2:40	2:50	10	0.80	1.86	1.06	25.1	636
4	2:50	3:00	10	0.80	1.80	1.00	23.6	600
5	3:00	3:10	10	0.80	1.76	0.96	22.7	576
6	3:10	3:20	10	0.80	1.76	0.96	22.7	576
7								
8								
9								
10								

Comments: Data used to calculate the infiltration rate

PERCOLATION RATE CONVERSION-TH11

The bottom of a proposed infiltration basin would be at 5.0 feet below natural grade. Percolation tests are performed within the boundaries of the proposed development location with the depth of the test hole set at the infiltration surface level (bottom of the basin). The Percolation Test Data Sheet is prepared as the test is being performed. After the minimum required number of testing intervals, the test is complete.

Time Interval, Δt =	10	minutes	Initial Depth to Water, D0 =	31.50	inches
Final Depth to Water, Df =	68.9	inches	Total Depth of Test Hole, Dt =	77.20	inches
Test Hole Radius, r =	3	inches			

The conversion equation used is:

It = ΔH 60 r/Δt (r+2Havg)

"H0" is the initial height of water at the selected time interval.

Ho = Dt - Do — 45.7 inches

"Hf" is the final height of water at the selected time interval.

Hf = Dt - Df — 8.3 inches

"ΔH" is the change in height over the time interval.

ΔH = ΔD = Ho - Hf — 37.4 inches

"Havg" is the average head height over the time interval.

Havg = (Ho + Hf)/2 — 27 inches

"It" is the tested infiltration rate.

It = ΔH 60 r/Δt (r+2Havg) — 11.81 inches/hr

300 mm/hr