TOWN OF CALEDON
PLANNING
RECEIVED

May 9, 2024

FUNCTIONAL SERVICING REPORT

MAYFIELD WEST PHASE 2 STAGE 3

PROPOSED RESIDENTIAL SUBDIVISION

Part Lot 21 and 22, Concession 1and 2 West of Township of Chinguacousy

Town of Caledon

REGISTERED PROFESSIONAL ENGINEER
S. D. LANG
APRIL 11, 2024
PROVINCE OF ONTARIO

APRIL 2024

File Number W23093

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

GTA WEST OFFICE
9358 GOREWAY DRIVE
BRAMPTON, ONTARIO L6P 0M7
T: (905) 794-0600 F: (905) 794-0611

PROVIDING CONSULTING SERVICES IN:
MUNICIPAL ENGINEERING
TRANSPORTATION PLANNING
TRAFFIC & PARKING STUDIES
ROADS & BRIDGES
STRUCTURAL ENGINEERING
DEVELOPMENT ENGINEERING SERVICES
WATER RESOURCES
ENVIRONMENTAL NOISE STUDIES
LAND USE & ENVIRONMENTAL PLANNING

Contents

FIGURES

DRAWINGS

Draft Plan	prepared by MGP dated March 28, 2024
Drawing SA1-SA4	Sanitary Drainage Plan
Drawing ST1-ST4	Storm Drainage Plan
Drawing WM1-WM4	Watermain Distribution Plan

APPENDICES

APPENDIX A	Sanitary design and
APPENDIX B	Storm Sewer Design Calculations
APPENDIX C	Geotech report
APPENDIX D	Hydrogeological report
APPENDIX E	Strom water Management Calculations
APPENDIX F	TMIG Servicing Report Drawings, January 2014

1. INTRODUCTION

Brookvalley is proposing a draft plan in the Mayfield West Phase 2 Stage 3 Lands in the Town of Caledon. The Mayfield West Phase 2 Stage 3 Lands are shown on Figure 1 and comprise a total area of approximately 270 hectares made up of two sections

Section 1 (herein after called the west side) is bounded by Old School Road to the north, Chincoussy Road to the west and agricultural lands to the south and east.

Section 2 (herein after called the east side) is bounded by Mclaughlin Road to the west, Old School Road to the north, Hurontario Road HWY 10) to the east and Etobicoke Creek to the south.

This study, which addresses water, wastewater and storm water management servicing, is one of several Technical Studies that have been prepared to support the draft plan that consists of the following;

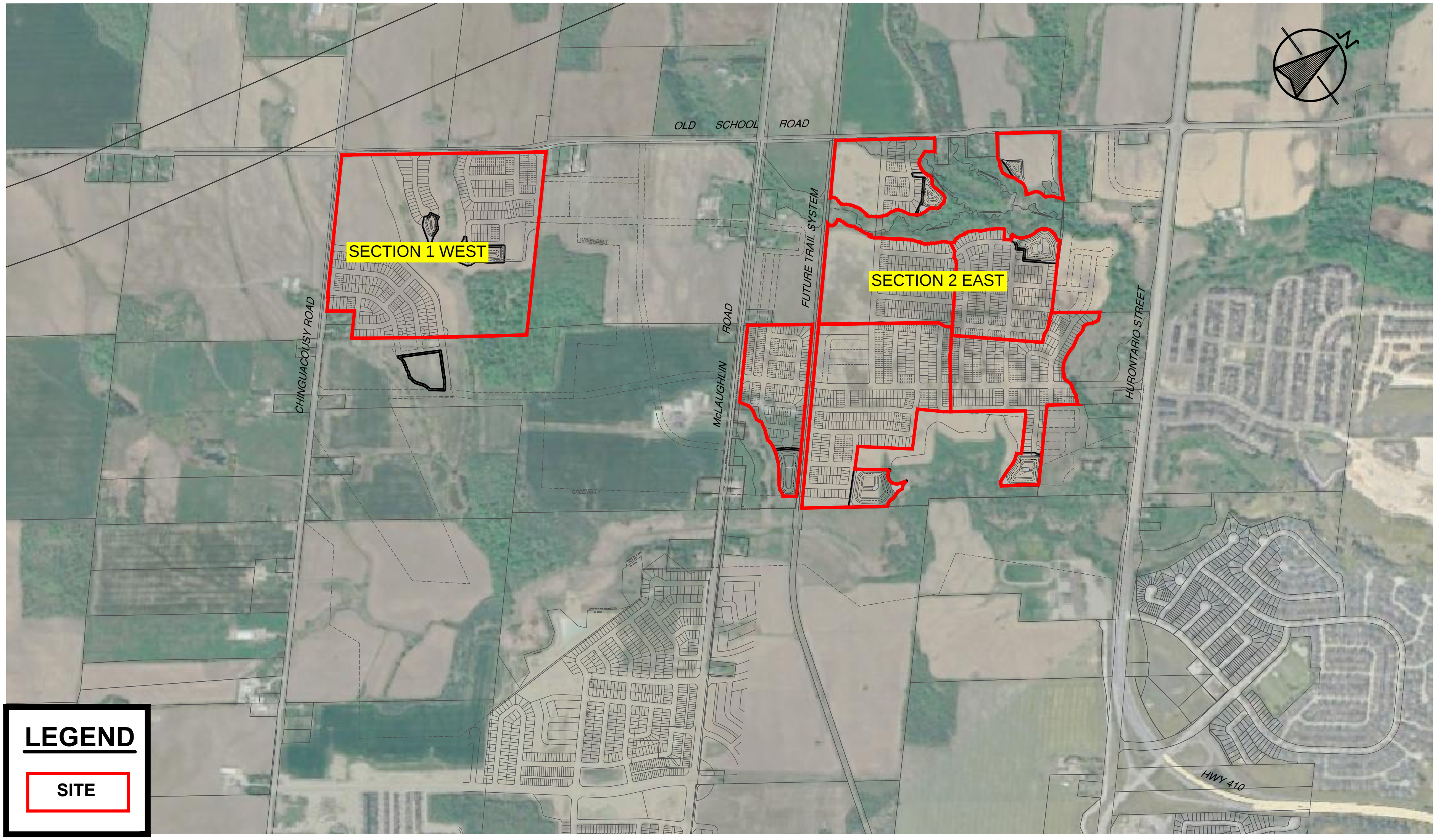
Section 1 West side

- 258 single detached units
- 126 Townhouse units
- 1 Medium density Blocks
- 1 park block
- 2 Storm water management blocks
- 1 Natural Heritage System bocks

Section 2 East side

- 767 single detached units
- 636 Townhouse units
- 2 Medium density Blocks
- 2 commercial blocks
- 1 elementary school block
- 3 park blocks
- 6 Storm water management blocks
- 4 vista/walkway blocks
- 7 Natural Heritage System bocks

- 1 future Natural Heritage System block
- 47 Future development/part lot blocks
- 7 roadway widening blocks
- 3 Arterial Road widening blocks



Part of Lot 21 and 22,
Concession 1 and 2,
West of Hurontario Street,
(Geographic Township of Chinguacousy)

TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

LOCATION PLAN

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

DATE	FEBRUARY 2024	JOB No	W23093
DRAWN	E.A.M	SKETCH No.	2.0
SCALE	N.T.S		

2. RELATED TECHNICAL STUDIES

The following Studies have been completed over the last fifteen years which relate to the servicing of the subject lands.

2.1 R.J. Burnside & Associates Limited

Mayfield West Phase 2 Secondary Plan Water and Wastewater Servicing Study
Town of Caledon

- Part A Report dated May 2009
- Part B Report dated October 8th 2010

The Study, which was commissioned by the Town of Caledon, was one of several component studies prepared in support of the Mayfield West Phase 2 (MW2) Secondary Plan.

The Study Area comprised the lands bounded by Chinguacousy Road to the west, Old School Road to the north, Dixie Road to the east and Mayfield Road to the south.

The Part B report evaluated water and wastewater servicing for three (3) Community Development Scenarios that were under consideration and also identified potential external regional servicing improvements that would be required to service the Community Development Scenarios.

2.2 The Municipal Infrastructure Group Ltd.

Mayfield West - Phase 2 Secondary Plan Water and Wastewater Servicing Study, January 2014

The Study, which was commissioned by the Mayfield Station Landowners Group, was prepared in support of the Mayfield West Phase 2 Secondary Plan, and was undertaken to address servicing requirements as a result of changes to the MW2 Plan through OPA 226 (dated September 11th 2012) and the Planning Report DP-2013-092 dated September 3rd 2013.

The purpose of the study was to:

- Identify existing and planned water and wastewater infrastructure;
- Provide a summary of proposed water and wastewater demands;
- Identify proposed water and wastewater infrastructure to support the Study Area;
- Identify possible interim servicing opportunities utilizing existing water and wastewater infrastructure, and
- Identify potential development planning limits based on planned and proposed Infrastructure timing.

The proposed water and wastewater network/routing design addressed the servicing requirements for three (3) areas as follows:

- Stage 1: Lands within the Town of Caledon Council Endorsed Framework Plan;
- Stage 2: Potential development lands beyond the Council Endorsed Framework Plan and south of the Etobicoke Creek
- North Lands: Potential development lands north of Etobicoke Creek having an approximate gross area of 325 ha.

Copies of Figures 4, 6 and 7 of the report showing the Servicing Areas and the Recommended Water and Wastewater Servicing Plans are included in Appendix F for reference.

2.3 Urbantech Consulting

Functional Servicing Reports - Mayfield West Phase 2

- May 2016 and August 2017

The Town of Caledon Council adopted the Mayfield West Phase 2 Secondary Plan (MW2) Official Plan Amendment OPA 222 on November 10th 2015. The approved MW2 Secondary Plan included the Stage 1 Area only.

The Study, which was prepared for the Mayfield West Landowners Group, along with companion reports (EIR, Transportation) was intended to support the individual Draft Plans of Subdivision within the MW2 Phase 2 Stage 1 lands and to demonstrate how the Stage 2 lands would be integrated into the Stage 1 development.

The Study report (August 2017) includes the preliminary design of the sanitary sewer system which included the MW2 Phase 2 Stage 1 and Stage 2 lands as well as future development north of the Etobicoke Creek/Green Belt to Old School Road (i.e. Mayfield West Phase 2 Stage 3 Lands). The relevant Sanitary Sewer Design Sheets are included in Appendix AB@ and a print of the Sanitary Sewer Plan (Drawing 801) is included as a Reference Drawing to this report. ***As shown on the Sanitary Sewer Design Sheets, the sanitary sewers in the Stage 1 and Stage lands are designed to accommodate the future development of the Stage 3 lands at a population density of 80 persons/ha.***

The Study report (August 2017) also included the future/planned trunk watermain infrastructure on Chinguacousy Road (600mm diameter) and on McLaughlin Road (400mm diameter) which will accommodate development of the Stage 3 lands.

2.4 GM Blueplan

Settlement Area boundary expansion (SABE)
Water and wastewater servicing Analysis.
August 12, 2021

The Region of Peel commissioned the SABE as a follow-up to the Region's 2020 Water and Wastewater Master Plan to review the servicing needs in the Caledon area including future growth north of Mayfield Road beyond the "2041 servicing boundary". The study confirmed the water and wastewater upgrades, required for the area, identified in the 2020 Water and Wastewater Masterplan

2.5 AMEC

Mayfield West Phase 2 Secondary Plan comprehensive Environmental Impact Study and Management Plan
August 2010

The plan was commissioned by the Town of Caledon in 2008 to review the hydrogeology, hydrology, water quality, fisheries and terrestrial resources in the Mayfield West Secondary Plan. The report reviewed possible impacts to the above noted resources due to proposed developments in the area and recommended constraints and opportunities within the subject lands.

3. EXISTING AND PLANNED WATER AND WASTEWATER INFRASTRUCTURE

3.1 Water

The subject Stage 3 lands are located in the existing Region of Peel Pressure Zone 7. The planned watermain infrastructure, based on the Region of Peel Water DC Map 2023, is shown on Figure 2 and includes the following trunk watermains which will service the Phase 2, Stage 3 lands.

- 750mm diameter main on Chinguacousy Road from the Tim Manley Road to Old School Road;
- 600mm diameter main on McLaughlin Road from Tim Manley Road to Old School Road;
- 750mm diameter main on Old School Road from Chinguacousy Road to Hurontario Road
- 600mm watermain on Hurontario Street

3.2 Wastewater

At present there is no wastewater infrastructure serving the Phase 2, Stage 3 lands. The planned wastewater infrastructure, based on the Region of Peel Wastewater DC Map 2023 is shown on Figure 3 and includes the following infrastructure which will service the Phase 2 Stage 3 lands:

- 450mm diameter trunk sanitary sewer on Chinguacousy Road from Tim Manley Road in the MW Phase 2 Stage 1/2 lands to Old School Road. *Note: Based on the Urbantech Functional Servicing Report (August 2017), this sewer is designed to accommodate a drainage area of 95.70 ha (at 80 p/ha) in the Phase 2 Stage 3 lands.*
- 525mm diameter trunk sanitary sewer on McLaughlin Road from the Tim Manley Road in the MW Phase 2 Stage 1/2 lands to the south side of Etobicoke creek. ***Note: Based on the Urbantech Functional Servicing Report (August 2017), this sewer is designed to accommodate a drainage area of 151.5 ha (at 80 p/ha) in the Stage 3 lands. A pumping station (and forcemain) will be required to service the Stage 3 lands.***
- 375mm diameter sanitary sewer serving the lands west of McLaughlin Road between Etobicoke Creek and Old School road, to the 450mm sanitary sewer on

Chinguacousy Road

- 525mm diameter sanitary sewer serving the lands east of McLaughlin Road between Old School Road and Etobicoke Creek to the proposed pumping station on Mclaughlin Road north of Etobicoke
- Sewage pumping station located on Mclaughlin Road north of Etobicoke Creek outletting to the 525mm sanitary sewer south of Etobicoke Creek

FIGURE 2

Water Development Charges 2023

Water Servicing Infrastructure
Water Production, Transmission Systems
and Distribution Systems
2023-2041 Development Charges

Draft – Not Approved by Council

Label Legend

2031 - Construction Year
30713 - Component Number
25-2199 - Project Number

Palgrave	
New Groundwater Well **20-1583**	EA-2023(55340) D-2023(55420) C-2025(52304)

Caledon East	
New Groundwater Well **19-1581**	EA-2023(55338)
23-1830	D-2023(52299) C-2025(52300)

Inglewood	
New Groundwater Well **22-1831**	D-2023(52801) C-2025(52302)

North Bolton Reservation and Pumping Station	
Booster Pumping Station **28-1999**	D-2038(30686) P-2038(32574) C-2040(32573)

West Caledon Elevated Tank	
New Elevated Tank **23-1941**	P-2023(24529) D-2024(20692) C-2026(20685)

Snelgrove Elevated Tank	
Decommissioning **21-1951**	D-2023(23415) C-2025(32270)

North Brampton Reservoir and Pumping Station	
Transient Protection Expansion **22-1987**	D-2024(54336) C-2026(54337)

Airport Reservoir and Pumping Station	
Transient Protection Expansion **22-1988**	C-2024(54339)
Transient Protection Expansion **28-1995**	D-2028(54294) C-2030(54295)

East Brampton Reservoir and Pumping Station	
Reservoir Improvements and Upgrades **23-1954**	C-2024(32269)
Transients Protection Expansion **28-1995**	D-2028(54302) C-2030(54303)

West Brampton Reservoir and Pumping Station	
Reservoir Expansion **28-1999**	D-2031(25259) C-2033(26196)
Pumping Station Expansion **25-1983**	D-2025(23391) C-2026(23392)
Pumping Station Expansion **28-1999**	D-2028(34485) C-2029(16350)
Pumping Station Expansion **28-1999**	D-2034(23389) C-2035(23390)

Meadowvale North Reservoir and Pumping Station	
Transient Protection Expansion **22-1986**	C-2023(54335)
Transient Protection Expansion **28-1995**	D-2028(54300) C-2030(54301)

Beckett Sproule Reservoir and Pumping Station	
Pumping Station Expansion **21-1974**	C-2023(33336)
Improvements and Upgrades **21-1978**	C-2023(54248)
Transient Protection Expansion **28-1995**	D-2028(54296) C-2030(54297)

Hanlan Reservoir and Pumping Station	
Transient Protection Expansion **28-1995**	D-2028(54298) C-2030(54299)

Hanlan West Pumping Station	
New Pumping Station **22-1992**	C-2023(54314) C-2024(54315)

Silverthorn Reservoir and Pumping Station	
Transient Protection Expansion **23-1994**	C-2023(54397)
Reservoir Expansion **26-1941**	D-2026(54120) C-2027(54121)

Arthur P. Kennedy Water Treatment Plant	
Reservoir Expansion **21-1923**	D-2040(23395) C-2026(23396)
Lake Ontario Monitoring System **22-1924**	C-2024(54097)
Transient/Protection Expansion **23-1989**	C-2023(54395)
Standby Power Expansion **27-1991**	D-2027(53560) C-2028(53561) C-2029(53562)
Waste Building Expansion **28-1997**	D-2031(23404) C-2033(23405)
New Intake **28-1599**	EA-2035(23451)
28-1997	D-2037(23452) C-2039(23453)

Lorne Park Water Treatment Plant	
Lake Ontario Monitoring System **22-1934**	C-2024(54099)
Transient Protection Expansion **23-1990**	C-2023(54396)
Transients/Protection Expansion **28-1995**	D-2028(54304) C-2030(54305)

Region of Peel
working with you

November 2022
Water & Wastewater Planning, Public Works
Map ID: 3189-W-DC Water Map
Data Source: Region of Peel
Scale: 1:30,000 | NAD83 UTM zone 17N

FIGURE 3

Wastewater Development Charges 2023

Wastewater Servicing Infrastructure
Treatment and Trunk Sewer System
2023-2041 Development Charges

Draft – Not Approved by Council

Label Legend

2031 - Construction Year
30713 - Component Number
25-2199 - Project Number

Approved Infrastructure 2023
- ⬟ Wastewater Treatment Plant

Proposed Infrastructure 2024-2041
- ▲ Sewer Pumping Station
- ⬢ Odour Control Facility
- ⬟ Wastewater Treatment Plant
- △ Future SPS not funded from DC

Existing Wastewater Infrastructure
- ▲ Sanitary Pumping Station
- — Existing Wastewater Main
- ▨ GTA West Corridor
- — Watercourse
- ▨ Greenbelt Boundary
- ▨ Urban Boundary
- ☐ Ward Boundary
- ☐ Municipal Boundary

McVean Sewer Pumping Station	
Pumping Station Expansion **18-2976**	C-2024 (55680) C-2023 (37396)

Church Street Odour Control Facility	
New Facility **25-2960**	D-2025 (35358) P-2025 (35223) C-2027 (34286)

Streetsville Odour Control Facility	
New Facility **25-2960**	D-2025 (35364) P-2025 (35221) C-2027 (34285)

Various Dosing Stations	
New Dosing Stations **25-2960**	D-2025 (35383) P-2025 (35224) C-2027 (34287)

Clarkson Wastewater Treatment Plant	
Primary Thickening Facility 20-2951	C-2023 (55748)
Automation Consolidation **19-2934**	C-2023 (54253) C-2024 (56108) C-2025 (56109)
Biosolids Expansion **20-2951**	D-2023 (51955) C-2025 (54572)
Treatment Expansion **22-2950**	D-2023 (35966) D-2024 (51956) C-2023 (51957) C-2025 (51958) C-2024 (51959) C-2026 (53368)
Standby Power Expansion **28-2999**	D-2028 (52214) C-2030 (52215)

Sanitary Pumping Stations	
Decommissioning **26-2978**	D-2026 (52841) C-2028 (52842)

Jack Darling 3 Sewer Pumping Station	
New Pumping Station **24-2980**	D-2024 (53565) C-2026 (53012)

Wastewater Facilities	
SCADA Upgrades **19-2981**	C-2022 (54254)

Beach Street Sanitary Pumping Station	
Upgrades **24-2971**	D-2024 (52754) C-2026 (52755)

G.E. Booth Wastewater Treatment Plant	
Automation Consolidation **19-2924**	C-2023 (54252) C-2024 (56106) C-2025 (56107)
Odour Control Improvements **20-2961**	C-2024 (38871)
Plant 2 Blower Replacement **22-2923**	C-2023 (52072)
New Outfall **22-2944**	C-2025 (51949)
Ash Management Facility **25-2942**	C-2025 (52833) C-2027(52834)
Administration Building **24-2943**	C-2024 (51946) C-2026 (51947)
Treatment Expansion **25-2945**	D-2025 (38620) D-2027 (38621) C-2027 (51944) C-2028 (51945) C-2029 (52838)
Biosolids Expansion **26-2946**	D-2026 (51950) D-2027 (51952) D-2028 (51951)
Standby Power Expansion **28-2999**	D-2028 (52214) C-2030 (52215)
Ash Management Facility **28-2999**	C-2032 (37812) C-2034 (37813)
Biosolids Expansion **28-2999**	C-2034 (51953) C-2036 (35964)
Treatment Expansion **28-2599**	EA-2036 (53240)
Treatment Expansion **28-2999**	D-2038 (53239)

Region of Peel
working with you

December 2022
Water & Wastewater Planning, Public Works
Map ID: 3190-WW-DC Wastewater Map
Data Source: Region of Peel
Scale: 1:68,000 | NAD83 UTM zone 17N

DISCLAIMER
The proposed capital projects shown on this map are subject to annual review and approval by Regional Council. As such, project schedules and project scopes are subject to change.

4. FUTURE/REQUIRED WATER, WASTEWATER AND STORM WATER MANAGEMENT INFRASTRUCTURE

4.1 Water

As noted in section 4.1 the Region of Peel has planned several trunk watermains in the area to serve the subject lands. The internal water distribution system will consist of a combination of 300mm and 150mm watermains. The conceptual configuration of the required water infrastructure to service the Phase 2 Stage 3 lands is shown on Drawing WM1 to WM4 and generally will comprise the following

Section 1 Lands west of Mclaughlin

- 150mm watermains on all internal streets

Section 2 Lands east of McLaughlin:

- 300mm diameter main on Street A from McLaughlin Road to Hurontario
- 300mm watermain on the Stret D to Old School Road
- 150mm watermain on all other streets

Anticipated water demands base on unit type are shown in tables 4.1a and 4.1b. A copy of the Region of Peel Connection Multi-Use Demand Table for the subdivision is included in Appendix “A”.

TABLE 4.1A WATER DEMAND BASED ON UNIT TYPE
SECTION 1 WEST OF MCLAUGHLIN ROAD

Developable area(ha)	23.71		
unit type	units	pop/unit	population
Single detached	258	4.2	1084
Medium density (ha)	5.2	175	910
Townhouse	126	3.1	391
	total population		2385
Average day (l/s)	7.73		
Max Day	15.45		
Peak hour	23.18		
Fire Flow	115.45		

TABLE 4.1B WATER DEMAND BASED ON UNIT TYPE SECTION 2 EAST OF MCLAUGHLIN

Developable area(ha)	66.3		
unit type	units	pop/unit	population
Single detached	767	4.2	3221
Medium density (ha)	2.7	175	472
Townhouse	636	3.1	1972
Elementary school	1	600	600
Commercial	4.92	50	246
Reserve (single detached)	.22	50	11
	total population		6523
Average day (l/s)	21.14		
Max day	42.28		
Peak hour	63.41		
Fire flow	142.28		

4.2 Wastewater

As noted in section 3.2 the Region of Peel has planned for several trunk sanitary sewers to service the subject lands. The configuration of the sub-trunk and local sanitary sewers to service the Phase 2 Stage 3 lands are shown on drawing SA1 to SA4.

A pumping station to be located on Mclaughlin Road, north of the Etobicoke Creek will pump wastewater from the lands to the east side of the site to the existing 525mm diameter sanitary sewer south of Etobicoke Creek on McLaughlin Road.

Wastewater from the lands to the west of McLaughlin Road will outlet to a proposed sanitary sewer to be constructed on Chinguacousy Road. The proposed sanitary sewers will connect to a trunk sanitary sewer to be constructed on Old School Road and connect to the proposed trunk on Chincoussy

The sewer system is designed in accordance with the Region of Peel Criteria and

Standards.

Sanitary flows shown in Appendix “A”. are based on the values shown in table 4.2. A copy of the Region of Peel Connection Multi-Use Demand Table for the subdivision is included in Appendix “A”.

TABLE 4.2 SANITARY DESIGN POPULATIONS PER HECTARE

Density	**Pop. /Hectare**
Single family (greater than 10m frontage)	50 persons/hectare
Single family (less than 10m frontage)	70 persons/hectare
Semi detached	70 persons/hectare
Row dwellings	175 persons/hectare
Apartments	475 persons/hectare
Commercial	50 persons/hectare
Junior Public Schools	1/3 x number of students (600 students minimum)
Senior Public Schools	1/2 x number of students (900 students minimum)
Secondary Schools	2/3 x number of students (1500 students minimum)

The anticipated sanitary flows from the development based on actual unit types and count are as shown in table 4.2A and 4.2B Populations per unit type are shown in table 4.2 and are based current Region of Peel standards

TABLE 4.2 SANITARY DESIGN POPULATIONS PER UNIT TYPE

Unit type		population
Single detached		4.2
Semi detached		4.2
townhouse		3.4
Condo		3.1
Apartment		3.1
Reserve		50.00

As noted earlier there are two (2) distinct sanitary drainage areas within the proposed site. The following is a breakdown of anticipated sanitary flows per drainage area.

TABLE 4.2A SANITARY FLOWS BASED ON UNIT TYPE SECTION 1 WEST OF MCLAUGHLIN ROAD

Developable area(ha)	23.71		
unit type	units	pop/unit	population
Single detached	258	4.2	1084
Medium density (ha)	5.2	175	910
Townhouse	126	3.1	391
	total population		2385
Average day (l/s)	8.36		
peak factor	3.53		
infiltration	4.74		
total peak sanitary flow (l/s)	34.2		

TABLE 4.2B SANITARY FLOWS BASED ON UNIT TYPE SECTION 2 EAST OF MCLAUGHLIN

Developable area(ha)	66.3		
unit type	units	pop/unit	population
Single detached	767	4.2	3221
Medium density (ha)	2.7	175	472
Townhouse	636	3.1	1972
Elementary school	1	600	600
Commercial	4.92	50	246
Reserve (single detached)	.22	50	11
	total population		6523
Average day (l/s)	22.86		
peak factor	3.14		
infiltration	13.26		
total peak sanitary flow (l/s)	84.9		

4.2.1 Sanitary Pumping Station and Forcemain

As noted above, a sanitary pumping station will be required to service the lands to the east of Mclauglin Road. The station is proposed to be located on McLaughlin Road, north of Etobicoke Creek as shown on drawing PS-1.

The pumping station will be designed to have a minimum ultimate pumping capacity of 107l/s. As per the Region of Peel Sanitary Pumping Station Design Guidelines, the above flow would be classified as a Type III pumping station. Therefore, the station will be designed as a dual wet well facility as per Region of Peel standard drawing SPS 104 (copy attached) in Appendix H

It is noted that the development of the lands draining to the station will be staged and the station will need to be designed to allow for upgrades to the pumps as development proceeds. A preliminary staging plan is discussed in greater detail in Section 6. It is also anticipated that dual forcemain will be required for the site. With one serving the station until flows velocities within the main require the second forcemain to be brought into service.

The station will require permanent on site back up power and shall be connected to the Region of Peel SCADA system

As noted, the station will pump under Etobicoke Creek and connect to the existing 525mm sanitary sewer located south of the Creek on McLaughlin Road.

5 STORMWATER MANAGEMENT DESIGN CRITERIA

The stormwater management design criteria pertinent to development within the Humber River Watershed were identified by the TRCA Stormwater Management Criteria Manual and Etobicoke Creek Stormwater Management Plan (2012). The stormwater management design within the FSR Study Area includes:

- **Water Quality:** Water quality control with an Enhanced Level (Level 1) of Protection or a minimum of 80% TSS (Total Suspended Solids) removal is mandated for the proposed development area, as outlined in the Stormwater Management Practices Planning and Design Manual (MECP, March 2003).
- **Water Quantity for Erosion Control:** 25mm Erosion Control Criteria outlined in the TRCA SWM Criteria specified the detention and gradual release the runoff generated from the 25mm storm event over a period of at least 24 hours, with a preference for a 48-hour duration for stormwater management ponds.
- **Water Quantity Control:** The proposed SWM Ponds are located within Etobicoke Creek Sub-watershed and the quantity control targets are established based on Etobicoke Creek Stormwater Management Quantity Control Release Rates. The Table I1 (Precited Unit Peak Runoff Rates on Catchment-by-Catchment Basis) provides unit target rates for 2 to 100-Year storm events. The peak discharges for the SWM ponds are set to meet the calculated target flows which were derived from the Etobicoke Creek unit flow values.
- **Water Balance:** Identification of stormwater management measures to be integrated into the development concept with the aim of preserving existing infiltration targets, wherever feasible.

5.1 Major/ Minor System Flows

In general, the storm sewer system will be designed to comply with the Town of Caledon Design Criteria i.e. "Storm sewer systems must be designed to accommodate a 10-year storm in cases where foundation drains are to be connected. Alternatively, for systems that do not permit foundation drains, a 5-year design will be permissible."

Overland flows will be directed to the SWM Ponds. Routing of the Regional Storm through the SWM Ponds will be determined as part of the final Engineering Design.

5.2 Stormwater Management Pond Design

To meet the SWM Criteria outlined above for the subject development, eight (8) wet ponds are proposed as illustrated in Draft Plan. The proposed locations of the stormwater management ponds, and the determination of the associated drainage areas are based on the following considerations:

a) Selection of the conceptual stormwater pond locations also considered the existing drainage patterns to minimize drainage diversions and maintain the drainage areas contributing to each of the watercourse systems to the extent possible. Post Development Drainage Area to each pond are summarized in Table I.

TABLE I

Post- Development Drainage Areas to Proposed SWM Ponds

Pond Nos.	Drainage Area to SWM Pond (Ha)*
1	2.30
2	9.34
3	8.79
4	33.72
5	18.01
6	7.94
7	2.99
8	11.66

**Includes SWM Pond Areas*

b) The ponds are generally located in or adjacent to topographical low areas to minimize the extent of cut and fill.

c) The ponds are designed to provide Enhanced Level quality control, erosion control as well as quantity control up to and including the 100-year storm event.

d) The proposed SWM ponds were reviewed from a natural heritage perspective to confirm implications to the NHS. All ponds are generally located adjacent to the NHS.

5.2.1 Stormwater Pond Locations

The proposed stormwater ponds will be designed to provide the required water quality, quantity and erosion control for development in the upstream catchments and future road improvements. These facility locations have been selected based on a cursory assessment of the general topography of the study area, existing drainage patterns, and the proposed development patterns.

The facilities will be designed with sediment forebays to receive inflows from the contributing drainage system, consisting of storm sewers, swales or other conveyance LID measures. Outlet structures will discharge to the adjacent stream/valley and will be sized to capture and release the necessary storage volumes, as described in **Section 1**. The basic components of a stormwater management pond and its typical location relative to a creek/headwater corridor are illustrated in **Drawing SD-1**.

5.2.2 Stormwater Pond Control Targets and Sizing

Stormwater management targets to be applied over the subdivision development area were developed through consultation with TRCA and Town of Caledon. The water quality control, erosion control, and flood control targets which were established are outlined below together with conceptual storage volumes required to meet these targets.

SWM Pond Water Quality Control

A significant portion of the nutrients and metals found in stormwater runoff are in the form of small particles attached to the suspended sediment. Therefore, removal of the sediment with stormwater management ponds will reduce the steam loadings for many contaminants. The 2003 MOE Stormwater Management Planning and Design Manual defines specific water quality control targets for stormwater facilities. The targets are based on:

- the type of facility (stormwater pond, infiltration practice, etc.).
- the land uses within the contributing area (in terms of an impervious component); and
- the level of control required.

Table II summarizes the Impervious levels used to represent various land uses.

TABLE II

TRCA Impervious Levels based on Land Use Type

Land Use Classification	**Total Impervious Area (%)**	**Directly Connected Impervious Area (%)**
Park/Open Space	10%	10%
Low/Medium Density Residential	60%	50%
High Density Residential	80%	75%
Commercial	95%	90%
Elementary School	80%	75%
SWM Pond	100%	90%

To achieve the target of Enhanced water quality control for a typical medium density residential development with an impervious component of 60%, for example, the MOE Manual specifies a target storage volume of 205 m3/hectare, of which:

- 165 m3/ha is permanent pool storage; and
- 40 m3/ha is extended detention, or "active" storage.

SWM Pond Extended Detention for Erosion Control

For this Development, an interim erosion control target using the most stringent criteria in TRCA' s jurisdiction is to be applied; detain and release runoff from a 25 mm storm event over 48 hours.

In addition to the extended detention requirements noted above, the 2012 TRCA Stormwater Criteria document requires a minimum of 5mm of retention be applied to all development lands to reduce runoff volumes, and to minimize impacts to groundwater recharge and the overall water balance.

SWM Pond Flood Control

For this Development, Consistent with current TRCA requirements in the West Humber River and Etobicoke Creeks Subwatershed, future development will also require flood (quantity) control facilities to attenuate post-development stormwater runoff rates to pre-development levels for the 2-year through 100-year storm events. TRCA defines the pre-development release rates for the Etobicoke watershed through a series of unit runoff rates (L/s/Ha) established for Etobicoke creek Watershed. The applicable unit flows for the development area are summarized in Table III.

TABLE III

Pre-Development Unit Flow Targets*

Catchment ID No.	231
Catchment Type **Visual Otthymo Hydrograph Command**	Rural NasHyd
Area	307.2 Ha
Storm Event	**Unit Runoff Rates (L/s/Ha)**
2-Year	5.6
5-Year	10.1
10-Year	13.6
25-Year	18.3
50-Year	22.2
100-Year	26.1

**Values extracted from Table I1 from TRCA's SWM Criteria*

Hydrologic analyses were completed using the Visual Otthymo Model to estimate the storage requirements to meet the above erosion and flood control targets for each of the proposed stormwater ponds. The model was run for TRCA AES 6, and 12 hours run. SWM Pond Storage Calculations and modelling parameters are summarized in SWM Appendix. Table IV below summarizes the Summary of Design details Volumes for each Pond.

TABLE IV

Summary of SWM Ponds Volume Design

	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5	Pond 6	Pond 7	Pond 8
Drainage Area (Ha)	2.30	9.34	8.79	33.72	18.01	7.94	2.99	11.66
Composite Imperviousness (%)	65%	62%	71%	58%	59%	78%	64%	66%
Permanent Pool Storage Required (m^3)*	491	1,562	1,998	6,615	3,597	1,579	631	2,520
Permanent Pool Storage Provided (m^3)	623	1,687	5,033	10,650	6,007	1,769	828	5,641
Permanent Pool WL	264.00	264.00	258.00	258.00	256.00	262.00	261.00	262.00
Erosion Control Storage Required (m^3)**	352	1,400	1,474	4,722	2,548	1,358	450	1,839
Erosion Control Storage Provided (m^3)	379	1,601	1,479	4,972	2,809	1,465	463	2,076
100-Yr Storage Required (m^3) **	1,116	4,485	4,502	14,991	8,070	4,033	1,427	5,615
100-Yr Storage Provided (m^3)	1,200	5,000	5,000	15,400	8,300	4,200	1,500	6,000

** Based on Table 3.2, Water Quality Storage Requirements based on Receiving Waters, MOE Design Manual dated March, 2003*
*** Based on VO Results Output*

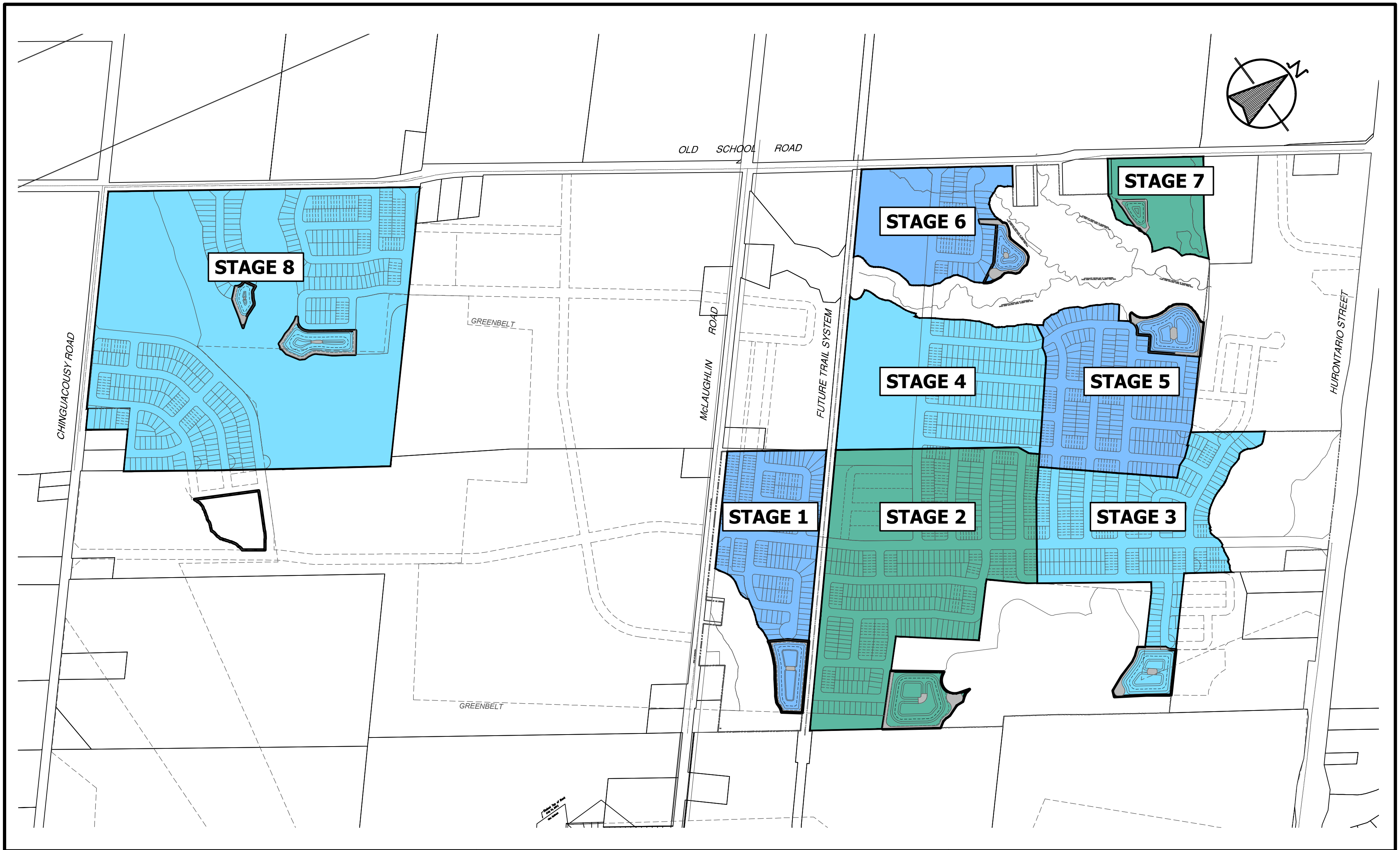
SWM Pond Design Elements

The preliminary configuration of the stormwater management ponds is provided on **Drawing SWM-1**. The preliminary design is based on the pond design guidelines provided in Town of Caledon Development Standards Manual (Version 5.0, 2019). The eight ponds are designed in accordance meet the Length to Width Ratio and Grading requirements.

6 STAGING

Proposed staging is shown on Figure 4. Staging is based on areas draining to the proposed SWM facilities.

In addition to the SWM facilities dictating staging it is noted that as part of Stage 1 The sewage pumping station will be constructed and a the 300mm watermain will be installed within the east west collector from Mclaughlin Road to Hurontario Street in order to provide two sources of supply.



Part of Lot 21 and 22,
Concession 1 and 2,
West of Hurontario Street,
(Geographic Township of Chinguacousy)
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

PRELIMINARY STAGING PLAN

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

DATE FEBRUARY 2024
JOB No W23093
DRAWN E.A.M
FIGURE 4
SCALE N.T.S

7 EROSION AND SEDIMENT CONTROL

Erosion and sedimentation are naturally occurring processes that involve particle detachment, sediment transport and deposition of soil particles. Construction activities commonly alter the landscapes where they are located, exacerbating these natural processes. One of the most significant alterations encountered during construction is the removal of the vegetation that stabilizes the subsoil. In the absence of the vegetation, the underlying soils are fully or partially exposed to various natural forces such as rain, flowing water, wind, and gravity

The discharge of high sediment loads to natural watercourses has significant impacts on receiving waters and aquatic habitat. Some specific examples include:

- Degradation of water quality;
- Damage or destruction of fish habitat;
- Increased flooding.

In consideration of the above, it is necessary as part of the Final Design and implementation of infrastructure and development servicing to incorporate a comprehensive Erosion and Sediment Control Plan. The objectives are:

(i) Minimize wherever possible the extent of vegetation removal;
(ii) Provide appropriate sediment control measures to minimize the off-site transport of sediment;
(iii) Minimize the extent of time that sites are devoid of stabilizing vegetation;
(iv) Provide interim erosion control measures where permanent restoration is not feasible.
(v) Provide permanent restoration to eliminate future erosion.

The Erosion and Sediment Control Plan should consider the specific characteristics of each development site and address the requirements relating to the following typical construction stages:

- Topsoil Stripping and Site Pre-Grading

- Infrastructure Servicing
- Building Construction

A “treatment train” approach is recommended in the development of an appropriate Erosion and Sediment Control Plan in compliance with the *Erosion and Sediment Control Guidelines for Urban Construction.* Typical sediment control measures include:

- Installation of double silt fencing along the boundary of work areas adjacent to the NHS;
- Construction of vegetated cut off swales including sediment traps and rock check dams;
- Stabilization of temporary sediment traps and provision of vegetated filter strips adjacent to the NHS;
- Provision of catch basin sediment controls.

Inherent in the Erosion and Sediment Control Plan is a monitoring program with an Action Plan to implement remedial measures in a timely manner where required.

As part of the final engineering design, the Sediment and Erosion Control Plan will be prepared including sizing of temporary sedimentation ponds and sediment traps.

8 SUMMARY AND COMPLIANCE DECLARATION

7.1 Summary

Based on the findings of this report, the conclusions and recommendations are as follows:

(i) For the east side, sanitary sewer servicing can be achieved by connecting to a proposed Sewage Pumping Station on McLaughlin Road that will outlet to an existing trunk sewer on Mclaughlin road

(ii) For the west side sanitary servicing can be achieved by connecting to a proposed sanitary trunk sewer to be constructed on Chinguacousy Rad

(iii) For the east side water supply can be provided via connections to the proposed trunk watermains to be constructed on Mclaughlin road and Hurontario Street

(iv) For the west side water supply water supply can be provided via connections to the proposed trunk watermains to be constructed on Old School Road and Chinguacousy Road

(v) Stormwater management objectives can be achieved through the proposed SWM Ponds 1-8

(vi) It should be noted that the details of the stormwater management system will be finalized during the detailed design stage of the Subdivision;

(vii) Erosion and sediment control measures will be installed as recommended.

7.2 Compliance Declaration

The undersigned hereby confirm that:

(i) The Functional Servicing/Stormwater Management Study complies with the Town of Caledon current edition of the Subdivision Design Manual

(ii) The drainage of the adjacent lands will not be adversely affected by the proposed stormwater management provisions.

Scott Lang, P. Eng

APPENDIX A

SANITARY SEWER CALCULATIONS AND MULTI USE TABLES

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION				**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET	AREA ID	MAINTANANCE HOLES		Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY**		DESIGN FLOW / FULL FLOW %
		Upstream	Downstream																								FULL FLOW (m/s)	ACT. FLOW (m/s)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	152	MH128.2	MH128		0.32								22	0.00	0.00	22	22		0.32	0.32	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	153	MH128	MH129		0.03								2	0.00	0.00	2	25		0.03	0.35	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	154	MH129	MH130				0.25						44	0.00	0.00	44	68		0.25	0.60	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	155	MH197	MH130		0.72								50	0.00	0.00	50	50		0.72	0.72	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	156	MH130	MH131		0.28								20	0.00	0.00	20	138		0.28	1.60	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	157	MH131	MH321A		0.14								10	0.00	0.00	10	148		0.14	1.74	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	159	MH132	MH133										0	0.00	0.00	0	148		0.00	1.74	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**		
	EXT3	EXT3	MH133													2132	2280		30.45	30.45									
	158	MH133	MH134				0.14						25	0.00	0.00	25	2453	3.52	0.14	32.33	0.028	0.006	**0.034**	250	0.50%	**0.042**	**0.86**	0.97	82
	160	MH134	MH135				0.17						30	0.00	0.00	30	2482	3.51	0.17	32.50	0.028	0.007	**0.035**	250	0.50%	**0.042**	**0.86**	0.97	83
	167	MH138	MH137		0.18								13	0.00	0.00	13	13		0.18	0.18	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
	166	MH137	MH136		0.22								15	0.00	0.00	15	28		0.22	0.40	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	161	MH136	MH144B		0.11								8	0.00	0.00	8	36		0.11	0.51	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	162	MH144B	MH144A		0.22								15	0.00	0.00	15	51		0.22	0.73	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	163	MH144A	MH144		0.13								9	0.00	0.00	9	60		0.13	0.86	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	164	MH144	MH145		0.77								54	0.00	0.00	54	114		0.77	1.63	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	165	MH145	MH146		0.16								11	0.00	0.00	11	125		0.16	1.79	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	168	MH139.2	MH139				0.35						61	0.00	0.00	61	61		0.35	0.35	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	169	MH139	MH140				0.32						56	0.00	0.00	56	117		0.32	0.67	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	170	MH140	MH141				0.09						16	0.00	0.00	16	133		0.09	0.76	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	171	MH141	MH142				0.45						79	0.00	0.00	79	212		0.45	1.21	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	172	MH136A	MH143				0.61						107	0.00	0.00	107	107		0.61	0.61	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	173	MH143	MH142				0.32						56	0.00	0.00	56	163		0.32	0.93	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	174	MH142	MH146				0.32						56	0.00	0.00	56	431		0.32	2.46	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.71	32
	175	MH146	MH147		0.23								16	0.00	0.00	16	572		0.23	4.48	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	176	MH147	MH135				0.14						25	0.00	0.00	25	596		0.14	4.62	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	177	MH135	MH135.2										0	0.00	0.00	0	3079	3.43	0.04	37.16	0.034	0.007	**0.042**	300	0.50%	**0.068**	**0.97**	1.05	61
	178	MH135.2	MH149				0.62						109	0.00	0.00	109	3187	3.42	0.62	37.78	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	179	MH149	MH150										0	0.00	0.00	0	3187	3.42	0.26	38.04	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	180	MH150	MH151										0	0.00	0.00	0	3187	3.42	0.16	38.20	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	181	MH151	MH152										0	0.00	0.00	0	3187	3.42	0.17	38.37	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	182	MH152	MH153										0	0.00	0.00	0	3187	3.42	0.17	38.54	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	183	MH153A	MH159										0	0.00	0.00	0	3187	3.42	0.14	38.68	0.035	0.008	**0.043**	300	0.50%	**0.068**	**0.97**	1.05	63
	184	MH155A	MH156A		0.27								19	0.00	0.00	19	19		0.27	0.27	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION				**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET	AREA ID	MAINTANANCE HOLES		Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY**		DESIGN FLOW / FULL FLOW %
		Upstream	Downstream																								FULL FLOW (m/s)	ACT. FLOW (m/s)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	185	MH156A	MH157A		0.18								13	0.00	0.00	13	32		0.18	0.45	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	186	MH157A	MH158A		0.48								34	0.00	0.00	34	65		0.48	0.93	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	187	MH158A	MH159		0.70								49	0.00	0.00	49	114		0.70	1.63	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	189	MH159	MH160										0	0.00	0.00	0	3301	3.41	0.17	38.85	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	190	MH160	MH161										0	0.00	0.00	0	3301	3.41	0.16	39.01	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	191	MH161	MH162										0	0.00	0.00	0	3301	3.41	0.15	39.16	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	192	MH162	MH163										0	0.00	0.00	0	3301	3.41	0.15	39.31	0.036	0.008	**0.044**	300	1.00%	**0.097**	**1.37**	1.32	46
	193	MH163	MH164										0	0.00	0.00	0	3301	3.41	0.16	39.47	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	195	MH164	MH165										0	0.00	0.00	0	3301	3.41	0.20	39.67	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	196	MH165	MH166										0	0.00	0.00	0	3301	3.41	0.20	39.87	0.036	0.008	**0.044**	300	0.50%	**0.068**	**0.97**	1.06	65
	197	MH167	MH169		0.41								29	0.00	0.00	29	29		0.41	0.41	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	198	MH169	MH170		0.20								14	0.00	0.00	14	43		0.20	0.61	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	199	MH170	mh171		0.48								34	0.00	0.00	34	76		0.48	1.09	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	200	mh171	MH172		0.42								29	0.00	0.00	29	106		0.42	1.51	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	201	MH172	MH173		0.21								15	0.00	0.00	15	120		0.21	1.72									
	202	MH173	MH174		0.17								12	0.00	0.00	12	132		0.17	1.89	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	204	MH168	MH175		0.34								24	0.00	0.00	24	24		0.34	0.34	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	205	MH175	MH176		0.18								13	0.00	0.00	13	36		0.11	0.45	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	206	MH176	MH177		0.31								22	0.00	0.00	36	72		0.31	0.76	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	207	MH177	MH178		0.56								39	0.00	0.00	39	124		0.56	1.49	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	208	MH178	MH179		0.46								32	0.00	0.00	32	156			1.49									
	209	MH179	MH180		0.21								15	0.00	0.00	15	170		0.21	1.70	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	210	MH180	MH181		0.21								15	0.00	0.00	15	185		0.21	0.21	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
212	212	MH175	MH183		0.53								37	0.00	0.00	37	37		0.53	0.53	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	213	MH182	MH183		0.17								12	0.00	0.00	12	49		0.17	0.70	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	214	MH183	MH184		0.10								7	0.00	0.00	7	7		0.10	0.10	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
	215	MH184	MH185		0.31								22	0.00	0.00	22	29		0.31	0.41	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	216	MH185	MH186		0.23								16	0.00	0.00	16	45		0.23	0.64	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	217	MH186	MH178				0.44						77	0.00	0.00	77	77		0.44	0.44	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	218	MH186	MH187		0.33								23	0.00	0.00	23	100		0.33	0.77	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	218A	MH187	mh188		0.18								13						0.18										
	219	MH187	MH192A		0.08								6	0.00	0.00	6	106		0.08	0.85									
	223	MH190	MH191		0.65								46	0.00	0.00	46	151		0.65	1.50	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	224	MH191	MH192		0.40								28						0.40										
	225	MH192	MH188		0.37								26	0.00	0.00	26	222		0.37	2.51	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION				**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET	AREA ID	MAINTANANCE HOLES Upstream	Downstream	Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW* (m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY** FULL FLOW (m/s)	ACT. FLOW (m/s)	DESIGN FLOW / FULL FLOW %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	219	MH188	MH193		0.17								12	0.00	0.00	12	340		0.17	2.68	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	220	MH193	MH195-2		0.29								20	0.00	0.00	20	360			2.68									
	221	MH195A	MH195-2		0.08								6	0.00	0.00	6	365		0.08	2.76	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	222	MH195A	MH181		0.41								29	0.00	0.00	29	394		0.41	3.17	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	211	MH181	MH174										0	0.00	0.00	0	579		0.11	3.49	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	33
	203	MH174	MH166		0.41								29	0.00	0.00	29	740		0.11	5.49	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	226	MH166	MHXX										0	0.00	0.00	0	4042	3.33	0.16	45.52	0.044	0.009	**0.053**	300	0.50%	**0.068**	**0.97**	1.10	77

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:** W19174
File No.:		**SANITARY DRAINAGE**	**Date:** 2023-04-19
Consultant:	**Candevcon Limited**		**Prepared By:** JRE
Drainage Area Plan:	**SA-1-3**		**Checked By:** SDL

LOCATION				SECTION AREA (Ha)									POPULATION					FLOWS											REMARKS
STREET	AREA ID	MAINTANANCE HOLES		Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY**		DESIGN FLOW / FULL FLOW %
		Upstream	Downstream																								FULL FLOW (m/s)	ACT. FLOW (m/s)	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	1	1A	2A		0.32								22	0.00	0.00	22	22		0.32	0.32	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	2	2A	3A		0.08								6	0.00	0.00	6	28		0.08	0.40	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	3	3A	4A		0.33								23	0.00	0.00	23	51		0.33	0.73	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	4	5A	4A		0.76								53	0.00	0.00	53	53		0.76	0.76	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	5	4A	6A		0.16								11	0.00	0.00	11	116		0.16	1.65	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	6	6A	7A		0.13								9	0.00	0.00	9	125		0.13	1.78	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	EXT1	EXT1	MH10A																										
	7	10A	11A		0.23											307	307		4.39	4.39									
	8	11A	12A		0.30		0.25						65	0.00	0.00	65	372		0.55	4.94	0.013	0.001	**0.014**	250	1.00%	**0.060**	**1.21**	0.82	23
	9	12A	13A		0.32								22	0.00	0.00	22	394		0.32	5.26	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	10	13A	14A		0.16								11	0.00	0.00	11	405		0.16	5.42	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	11	14A	15A		0.35								25	0.00	0.00	25	430		0.35	5.77	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	34
	12	16A	15A				0.36						63	0.00	0.00	63	63		0.36	0.36	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	13	15A	9A				0.44						77	0.00	0.00	77	570		0.44	6.57	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	34
	14	17A	9A		0.50								35	0.00	0.00	35	35		0.50	0.50	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	15	9A	7A		0.20								14	0.00	0.00	14	619		50.10	57.17	0.013	0.011	**0.024**	250	0.50%	**0.042**	**0.86**	0.92	58
	16	7A	18A		0.35								25	0.00	0.00	25	768		0.35	59.30	0.013	0.012	**0.025**	250	0.50%	**0.042**	**0.86**	0.92	59
	17	26A	18A				0.44						77	0.00	0.00	77	77		0.18	0.18	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
	18	18A	19A		0.36								25	0.00	0.00	25	870		0.36	59.84	0.013	0.012	**0.025**	250	0.50%	**0.042**	**0.86**	0.92	59
	19	19A	20A		0.42								29	0.00	0.00	29	900		0.11	59.95	0.013	0.012	**0.025**	250	0.50%	**0.042**	**0.86**	0.92	59
	20	20A	21A				0.09						16	0.00	0.00	36	936		0.09	60.04	0.013	0.012	**0.025**	250	0.50%	**0.042**	**0.86**	0.92	59
	21	21A	22A				0.41						72	0.00	0.00	72	1007	3.80	0.41	60.45	0.012	0.012	**0.024**	250	0.50%	**0.042**	**0.86**	0.92	58
	22	13A	22A		0.13								9	0.00	0.00	9	9		0.13	0.13	0.013	0.000	**0.013**	375	0.50%	**0.124**	**1.12**	0.46	10
	23	22A	23A		0.21								15	0.00	0.00	15	1031	3.79	0.21	60.79	0.013	0.012	**0.025**	375	0.50%	**0.124**	**1.12**	0.71	20
	24	23A	24A		0.29										0.00	0	1031	3.79	0.29	61.08	0.013	0.012	**0.025**	375	0.50%	**0.124**	**1.12**	0.71	20
	25	24A	25A		0.35		0.25						68	0.00	0.00	68	1099	3.77	0.60	61.68	0.013	0.012	**0.026**	250	0.50%	**0.042**	**0.86**	0.93	61
	26	15A	25A		0.24								17	0.00	0.00	17	17		0.24	61.92	0.013	0.012	**0.025**	250	0.50%	**0.042**	**0.86**	0.93	60
	27	25A	26A		0.24								17	0.00	0.00	17	1133	3.76	0.24	62.16	0.014	0.012	**0.026**	250	0.50%	**0.042**	**0.86**	0.93	62
	28	27A	28A		0.45								32	0.00	0.00	32	32		0.45	0.45	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	29	28A	26A		0.10		0.42						81	0.00	0.00	81	112		0.52	0.97	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	30	26A	29A		0.10		0.20						42	0.00	0.00	42	1287	3.73	0.30	63.43	0.016	0.013	**0.028**	250	0.50%	**0.042**	**0.86**	0.95	67
	31	30A	31A		0.46								32	0.00	0.00	32	32		0.46	0.46	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	32	31A	29A		0.17		0.40						82	0.00	0.00	82	114		0.57	1.03	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	33	29A	32A		0.39								27	0.00	0.00	27	1428	3.69	0.39	64.85	0.017	0.013	**0.030**	375	0.50%	**0.124**	**1.12**	0.78	24

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION				**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET	AREA ID	MAINTANANCE HOLES Upstream	Downstream	Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY** FULL FLOW (m/s)	ACT. FLOW (m/s)	DESIGN FLOW / FULL FLOW %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	34	33A	34A		0.24		0.24						59	0.00	0.00	59	59		0.48	0.48	0.013	0.000	0.013	375	0.50%	0.124	1.12	0.46	11
	35	34A	32A		0.10		0.49						93	0.00	0.00	93	152		0.59	1.07	0.013	0.000	0.013	375	0.50%	0.124	1.12	0.46	11
	36	32A	22AA		0.20		0.20						49	0.00	0.00	49	1629	3.65	0.18	66.10	0.019	0.013	0.033	375	0.50%	0.124	1.12	0.82	26
	37	35A	36A		0.25		0.25						61	0.00	0.00	61	61		0.50	0.50	0.013	0.000	0.013	375	0.50%	0.124	1.12	0.46	11
	38	36A	22AA		0.40		0.22						67	0.00	0.00	67	128		0.62	1.12	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	39	22AA	37A										0	0.00	0.00	0	1757	3.63	0.00	67.22	0.021	0.013	0.034	250	0.50%	0.042	0.86	0.98	81
	40	38A	39A		0.51								36	0.00	0.00	36	1792	3.62	0.51	67.73	0.021	0.014	0.035	250	0.50%	0.042	0.86	0.97	82
	41	39A	37A		0.65								46	0.00	0.00	46	1838	3.61	0.65	68.38	0.022	0.014	0.035	250	0.50%	0.042	0.86	0.97	84
	42	37A	40A		0.42								29	0.00	0.00	29	3624	3.37	0.42	68.80	0.040	0.014	0.053	300	0.50%	0.068	0.97	1.10	78
	43	41A	42A		0.57								40	0.00	0.00	40	40		0.57	0.57	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	44	42A	40A		0.67								47	0.00	0.00	47	87		0.67	1.24	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	45	40A	43A		0.34								24	0.00	0.00	24	3735	3.36	0.34	70.38	0.041	0.014	0.055	300	0.50%	0.068	0.97	1.10	80
	46	12A	44A		0.37								26	0.00	0.00	26	26		0.37	0.37	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	47	44A	45A		0.85								60	0.00	0.00	60	85		0.85	1.22	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	48	46A	47A		0.14								10	0.00	0.00	10	10		0.14	0.14	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.69	31
	49	47A	48A		0.29								20	0.00	0.00	20	30		0.29	0.43	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	50	48A	49A		0.75								53	0.00	0.00	53	83		0.12	0.55	0.013	0.000	0.013	450	0.50%	0.202	1.27	0.39	6
	51	50A	49A		0.15								11	0.00	0.00	11	11		0.15	0.15	0.013	0.000	0.013	450	0.50%	0.202	1.27	0.39	6
	52	49A	45A		0.23								16	0.00	0.00	16	109		0.23	0.93	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	53	45A	52A				0.53						93	0.00	0.00	93	287		0.53	1.46	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	32
	54	51A	52A		0.66								46	0.00	0.00	46	334		0.66	2.12	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	32
	55	52A	65A				0.44						77	0.00	0.00	77	411		0.44	2.56	0.013	0.001	0.014	250	0.50%	0.042	0.86	0.71	32
	56	54AA	54A		0.17								12	0.00	0.00	12	12		0.17	0.17	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.69	31
	57	53A	54A		0.32								22	0.00	0.00	22	22		0.32	0.32	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	58	54A	55A		0.72								50	0.00	0.00	50	85		0.72	3.01	0.013	0.001	0.014	250	0.50%	0.042	0.86	0.71	32
	59	56A	57A		0.42								29	0.00	0.00	29	114		0.42	3.43	0.013	0.001	0.014	250	0.50%	0.042	0.86	0.71	33
	60	58A	57A		0.36								25	0.00	0.00	25	139		0.36	3.79	0.013	0.001	0.014	250	0.50%	0.042	0.86	0.71	33
	61	57A	55A		0.20								14	0.00	0.00	14	153		0.20	4.0	0.013	0.001	0.014	250	0.50%	0.042	0.86	0.71	33
	62	55A	59A				0.62						109	0.00	0.00	109	347		0.62	0.62	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	63	60A	59A		0.60		0.10						60	0.00	0.00	60	60		0.70	0.70	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	64	59A	61A				0.27						47	0.00	0.00	47	453		0.27	0.97	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	65	62A	63A		0.23								16	0.00	0.00	16	16		0.23	0.23	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.69	31
	66	63A	61A		0.25		0.12						39	0.00	0.00	39	55		0.37	0.60	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	31
	67	61A	64A		0.20		0.18						46	0.00	0.00	46	553		0.38	1.95	0.013	0.000	0.013	250	0.50%	0.042	0.86	0.70	32

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION				**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET	AREA ID	MAINTANANCE HOLES Upstream	Downstream	Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY** FULL FLOW (m/s)	ACT. FLOW (m/s)	DESIGN FLOW / FULL FLOW %
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	68	64A	65A		0.13		0.25						53	0.00	0.00	53	606		0.38	2.33	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	69	65A	66A		0.28		0.28						69	0.00	0.00	69	1085	3.78	0.56	2.89	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	33
	70	66A	67A										0	0.00	0.00	0	1085	3.78	0.00	2.89	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	33
	71	67A	68A		0.46								32	0.00	0.00	32	1118	3.77	0.46	3.35	0.014	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.73	34
	72	69A	70A		0.48								34	0.00	0.00	34	34		0.48	0.48	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	73	70A	71A		0.73								51	0.00	0.00	51	85		0.73	1.21	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	74	71A	72A		0.35								25	0.00	0.00	25	109		0.35	1.56	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	75	72A	73A		0.28								20	0.00	0.00	20	129		0.28	1.84	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	76	73A	74A		0.57								40	0.00	0.00	40	169		0.57	2.41	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.71	32
	77	74A	75A		0.66								46	0.00	0.00	46	215		0.66	3.07	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	78	75A	76A		0.35								25	0.00	0.00	25	239		0.35	3.42	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	79		76A				0.29						51	0.00	0.00	51	51		0.29	0.29	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	80	76A	77A				0.30						53	0.00	0.00	53	343		0.30	4.01	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	33
	81	78A	79A		0.66								46	0.00	0.00	46	46		0.07	0.07	0.013	0.000	**0.013**	450	0.50%	**0.202**	**1.27**	0.39	6
	82	79A	80A		0.61								43	0.00	0.00	43	89		0.61	0.68	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	83	80A	77A		0.48								34	0.00	0.00	119	119		0.97	0.97	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	84	77A	81A										0	0.00	0.00	0	462		0.00	4.98	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.72	33
	85	82A	83A		0.67								47	0.00	0.00	47	47		0.67	0.67	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	86	83A	84A		0.61								43	0.00	0.00	43	90		0.61	1.28	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	87	84A	81A		0.46								32	0.00	0.00	32	122		0.46	1.74	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	88	81A	68A				0.30						53	0.00	0.00	53	636		0.30	2.04	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	89	68A	68AA				0.17						30	0.00	0.00	30	1783	3.62	0.17	2.21	0.021	0.000	**0.021**	250	0.50%	**0.042**	**0.86**	0.86	51
	90	68AA	85A				0.47						82	0.00	0.00	82	1866	3.61	0.47	2.68	0.022	0.001	**0.022**	250	0.50%	**0.042**	**0.86**	0.88	53
	91	85A	43A				0.40						70	0.00	0.00	70	1936		0.40	3.08	0.000	0.001	**0.001**	250	0.50%	**0.042**	**0.86**	0.05	1
	92	43A	86A		0.31								22	0.00	0.00	22	5692	3.19	9.10	82.56	0.059	0.017	**0.075**	375	0.50%	**0.124**	**1.12**	1.21	61
	93	37A	87A				0.25						44	0.00	0.00	44	44		0.25	0.25	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
	94	87A	88A				0.28						49	0.00	0.00	49	93		0.28	0.53	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	95	88A	89A		0.31								22	0.00	0.00	22	114		0.31	0.84	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	96	89A	90A		1.05								74	0.00	0.00	74	188		0.17	1.01	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	97	88A	91A				0.28						49	0.00	0.00	49	49		0.28	0.28	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	98	91A	92A		0.70		0.08						63	0.00	0.00	63	112		0.78	1.06	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	99	92A	93A		0.74								52	0.00	0.00	52	164		0.74	1.80	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
	100	95A	96A				0.24						42	0.00	0.00	42	42		0.24	0.24	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
	101	96A	93A				0.21						37	0.00	0.00	37	79		0.21	0.45	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
	102	93A	102A				0.32						56	0.00	0.00	56	299		0.32	2.57	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	32
	103	94A	95A		0.25								18	0.00	0.00	18	18		0.25	0.25	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31

CANDEVCON LIMITED
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE *TEL (905) 794-0600*
BRAMPTON ON. L6P-0M7 *FAX (905) 794-0611*

Subdivision:	**Mayfield West**	**CITY OF BRAMPTON**	**Project No.:**	**W19174**
File No.:		**SANITARY DRAINAGE**	**Date:**	**2023-04-19**
Consultant:	**Candevcon Limited**		**Prepared By:**	**JRE**
Drainage Area Plan:	**SA-1-3**		**Checked By:**	**SDL**

LOCATION					**SECTION AREA (Ha)**									**POPULATION**					**FLOWS**											**REMARKS**
STREET		AREA ID	MAINTANANCE HOLES Upstream	Downstream	Executive Residential	Low Density	Low / Medium Density	Medium Density	High density	Commercial /Retail	Junior School	Senior School	High School	Residential	Commercial	School	TOTAL POP	ACCUM. POP.	PEAK FACTOR	AREA (ha)	ACCUM. AREA (ha)	PK. DAY FLOW (m^3/s)	INFILT. (m^3/s)	***TOTAL FLOW*** **(m^3/s)**	SIZE (mm)	SLOPE (%)	**CAPACITY** (m^3/s)	**VELOCITY** FULL FLOW (m/s)	ACT. FLOW (m/s)	DESIGN FLOW / FULL FLOW %
1		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
		105	95A	101A		0.39								27	0.00	0.00	27	45		0.39	0.64	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		106	101A	102A		0.34		0.35						85	0.00	0.00	85	130		0.69	1.33	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
		107	102A	103A		0.22								15	0.00	0.00	15	444		0.22	4.12	0.013	0.001	**0.014**	250	0.50%	**0.042**	**0.86**	0.71	33
		108	94A	97A		0.09								6	0.00	0.00	6	6		0.08	0.08	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
		109	97A	98A		0.37								26	0.00	0.00	26	32		0.37	0.45	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		110	98A	99A		0.46								32	0.00	0.00	32	64		0.46	0.91	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		111	99A	100A				0.42						74	0.00	0.00	74	138		0.42	1.33	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
		112	100A	103A		0.35								25	0.00	0.00	25	162		9.73	11.06	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	36
		113	103A	104A				0.25						44	0.00	0.00	44	650		0.04	11.10	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	36
		114	104A	105A										0	0.00	0.00	0	650		0.02	11.12	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	36
		115	105A	127A		0.39								27	0.00	0.00	27	677		0.39	11.51	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	36
		116	127A	90A		0.24								17	0.00	0.00	17	694		0.24	11.75	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	36
		117	90A	86A		0.44								31	0.00	0.00	31	913		0.44	12.19	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.75	37
		118	86A	106A							1.00			0	0.00	200.00	200	6805	3.12	0.12	94.87	0.069	0.019	**0.088**	375	0.50%	**0.124**	**1.12**	1.26	71
		119	106A	128A		0.20								14	0.00	0.00	14	6819	3.12	0.20	95.07	0.069	0.019	**0.088**	375	0.50%	**0.124**	**1.12**	1.26	71
		120	108A	109A		0.21								15	0.00	0.00	15	15		0.21	0.21	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
		121	109A	110A		0.29								20	0.00	0.00	20	35		0.06	0.27	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		122	110A	107A		0.31								22	0.00	0.00	22	57		0.31	0.58	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		123	107A	114A		0.35		0.24						67	0.00	0.00	67	123		0.07	0.65	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		124	108A	112A		0.64								45	0.00	0.00	45	45		0.08	0.08	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31
		EXT2	EXT2	MH111A														785		8.31	8.31									
		125	111A	112A				0.15						26	0.00	0.00	26	811		0.11	8.42	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.73	35
		126	112A	113A				0.52						91	0.00	0.00	91	902		0.09	8.51	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.73	35
		127	113A	114A				0.51						89	0.00	0.00	89	992		0.51	9.02	0.013	0.002	**0.015**	250	0.50%	**0.042**	**0.86**	0.74	35
		128	115A	116A		0.54								38	0.00	0.00	38	38		0.54	0.54	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		129	116A	117A		0.31								22	0.00	0.00	22	60		0.31	0.85	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		130	117A	118A		0.16								11	0.00	0.00	11	49		1.33	1.87	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	32
		131	118A	119A		0.61								43	0	0.00	43	92		0.61	2.48	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.71	32
		132	116A	120A		0.38		0.20						62	0	0.00	62	62		0.58	0.58	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		133	120A	119A										0	0.00	0.00	0	62		0.10	0.68	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		134	119A	114A				0.56						98	0.00	0.00	98	251		0.56	1.14	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.70	31
		135	114A	121A										0	0.00	0.00	0	1366	3.71	0.00	10.81	0.016	0.002	**0.019**	250	0.50%	**0.042**	**0.86**	0.82	44
		136	130A	131A		0.1								7	0.00	0.00	7	7		0.10	0.10	0.013	0.000	**0.013**	250	0.50%	**0.042**	**0.86**	0.69	31

Mayfield west Phase 2 Stage 3

WEST SIDE

Connection Multi use Demand Table

WATER CONNECTION

Connection point 3)				
Pressure zone of connection point			7	
Total equivalent population to be serviced 1)			2384	
Total lands to be serviced			23.71	
Hydrant flow test			N/A	
	Hydrant flow test location			
		Pressure (kPa)	Flow (in l/s)	Time
	Minimum water pressure	N/A		
	Maximum water pressure	N/A		
No.	**Water demands**			
	Demand type	**Demand (in l/s)**		
		Use 1 5)	**Use 2 5)**	**Total**
1	Average day flow	7.73		7.73
2	Maximum day flow	15.45		15.45
3	Peak hour flow	23.18		23.18
4	Fire flow 2)	100.00		100.00
Analysis				
5	Maximum day plus fire flow	115.45		115.45

WASTEWATER CONNECTION

				Total
Connection point 4)				
Total equivalent population to be serviced 1)		2384		2384
Total lands to be serviced		23.71		23.710
6	Wastewater sewer effluent (in l/s)	34.2		34.2

population

area (Ha)	23.71
land use	residential
population /Ha	
total population	2384

unit type	units	pop/unit	population
Single detached	258	4.2	1084
town house	126	3.1	390.6
Medium density (ha)	5.2	175	910
elementary school	0	200	0
Reserve	0	50.00	0
		total population	2384

Water demand

demand type	factor	demand
ave day		7.73
max day	2	15.45
peak hour	3	23.18

per capita water demand (l/day)	280

Sanitary demand

Average day (l/s)	8.36
peak factor	3.53
infiltration	4.74
total peak sanitary flow (l/s)	34.2

per capita sanitary demand(lpcd)	302.8
infiltration (l/sec/ha)	0.2

fire flow

unit type	floor area (sm)	
townhouse		
total	0	
fire flow (l/s)	133.00	per note J

F = (220CA^$^{.5}$)/60

F = the required fire flow in litres per secound

C = coefficient related to the type of construction.

= 1.5 for wood frame construction (structure essentially all combustible).

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).

= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

1. To the value obtained above a percentage should be added for structures exposed within 45 metres by the fire area under consideration. This percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

The charge for any one side generally should not exceed the following limits for the separation:

Separation Charge	Separation Charge
0 to 3m 25%	20.1 to 30 m 10%
3.1 to 10m 20%	30.1 to 45m 5%

The total percentage shall be the sum of the percentage for all sides, but shall not exceed 75 %.
The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

Note A: The guide is not expected to necessarily provide an adequate value for lumber

Note B: Judgement must be used for business, industrial, and other occupancies not

Note C: Consideration should be given to the configuration of the building(s) being

Note D: Wood frame structures separated by less than 3 metres shall be considered as one

Note E: Fire Walls: - In determining floor areas, a fire wall that meets or exceeds the
Normally any unpierced party wall considered to form a boundary when determining floor
Note F: High one storey buildings: When a building is stated as 1=2, or more storeys, the
However, if the building is being used for steel fabrication and the extra height is provided

Note G: If a building is exposed within 45 metres, normally some surcharge for exposure will

Note H: Where wood shingle or shake roofs could contribute to spreading fires, add 2,000 L/min to 4,000 L/min in accordance with extent and condition.

Note I: Any non-combustible building is considered to warrant a 0.8 coefficient.

Note J: Dwellings: For groupings of detached one family and small two family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

sugested fire flow

Exposure distances		Masonry or Brick
Less than 3m	See Note "D" 4,000 L/min	6,000 L/min
3 to 10m	3,000 L/min	4,000 L/min
10.1 to 30m	2,000 L/min	3,000 L/min

Over 30m		2,000 L/min

If the buildings are contiguous, use a minimum of 8,000 L/min. Also consider Note H.

OUTLINE OF PROCEDURE

A. Determine the type of construction.

B. Determine the ground floor area.

C. Determine the height in storeys.

Using the fire flow formula, determine the required fire flow to the nearest 1,000 L/min.

E. Determine the increase or decrease for occupancy and apply to the value obtained in D above. Do not round off the answer.

F. Determine the decrease, if any, for automatic sprinkler protection. Do not round off the value.

G. Determine the total increase for exposures, Do not round off the value.

H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G. The final figure is customarily rounded off to the nearest 1,000 L/min.

Mayfield west Phase 2 Stage 3

EAST SIDE

Connection Multi use Demand Table

WATER CONNECTION

Connection point $^{3)}$				
Pressure zone of connection point			7	
Total equivalent population to be serviced $^{1)}$			6523	
Total lands to be serviced			66.3	
Hydrant flow test			N/A	
	Hydrant flow test location			
		Pressure (kPa)	Flow (in l/s)	Time
	Minimum water pressure	N/A		
	Maximum water pressure	N/A		
No.	**Water demands**			
	Demand type	**Demand (in l/s)**		
		Use 1 $^{5)}$	**Use 2 $^{5)}$**	**Total**
1	Average day flow	21.14		21.14
2	Maximum day flow	42.28		42.28
3	Peak hour flow	63.41		63.41
4	Fire flow $^{2)}$	100.00		100.00
Analysis				
5	Maximum day plus fire flow	142.28		142.28

WASTEWATER CONNECTION

				Total
Connection point $^{4)}$				
Total equivalent population to be serviced $^{1)}$		6523		6523
Total lands to be serviced		66.3		66.300
6	Wastewater sewer effluent (in l/s)	84.9		84.9

population

area (Ha)	66.3
land use	residential
population /Ha	
total population	6523

unit type	units	pop/unit	population
Single detached	767	4.2	3221
Semi detached	0	4.2	0
townhouse	636	3.1	1972
Medium Density	2.7	175	472.5
elementary school	1	600	600
commercial block	4.92	50	246
Reserve	0.22	50.00	11
		total population	6523

Water demand

demand type	factor	demand
ave day		21.14
max day	2	42.28
peak hour	3	63.41

per capita water demand (l/day)	280

Sanitary demand

Average day (l/s)	22.86
peak factor	3.14
infiltration	13.26
total peak sanitary flow (l/s)	84.9

per capita sanitary demand(lpcd)	302.8
infiltration (l/sec/ha)	0.2

fire flow

unit type	floor area (sm)	
townhouse		
total	0	
fire flow (l/s)	133.00	per note J

F = (220CA^$^{.5}$)/60

F = the required fire flow in litres per secound

C = coefficient related to the type of construction.

= 1.5 for wood frame construction (structure essentially all combustible).

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).

= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical

openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

1. To the value obtained above a percentage should be added for structures exposed within 45 metres by the fire area under consideration. This percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

The charge for any one side generally should not exceed the following limits for the separation:

Separation Charge	Separation Charge
0 to 3m 25%	20.1 to 30 m 10%
3.1 to 10m 20%	30.1 to 45m 5%

The total percentage shall be the sum of the percentage for all sides, but shall not exceed 75 %.
The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

Note A: The guide is not expected to necessarily provide an adequate value for lumber

Note B: Judgement must be used for business, industrial, and other occupancies not

Note C: Consideration should be given to the configuration of the building(s) being

Note D: Wood frame structures separated by less than 3 metres shall be considered as one

Note E: Fire Walls: - In determining floor areas, a fire wall that meets or exceeds the
Normally any unpierced party wall considered to form a boundary when determining floor
Note F: High one storey buildings: When a building is stated as 1=2, or more storeys, the
However, if the building is being used for steel fabrication and the extra height is provided

Note G: If a building is exposed within 45 metres, normally some surcharge for exposure will

Note H: Where wood shingle or shake roofs could contribute to spreading fires, add 2,000 L/min to 4,000 L/min in accordance with extent and condition.

Note I: Any non-combustible building is considered to warrant a 0.8 coefficient.

Note J: Dwellings: For groupings of detached one family and small two family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

suggested fire flow

Exposure distances		Masonry or Brick
Less than 3m	See Note "D" 4,000 L/min	6,000 L/min

3 to 10m	3,000 L/min	4,000 L/min
10.1 to 30m	2,000 L/min	3,000 L/min
Over 30m		2,000 L/min

If the buildings are contiguous, use a minimum of 8,000 L/min. Also consider Note H.

OUTLINE OF PROCEDURE

A. Determine the type of construction.

B. Determine the ground floor area.

C. Determine the height in storeys.

Using the fire flow formula, determine the required fire flow to the nearest 1,000 L/min.

E. Determine the increase or decrease for occupancy and apply to the value obtained in D above. Do not round off the answer.

F. Determine the decrease, if any, for automatic sprinkler protection. Do not round off the value.

G. Determine the total increase for exposures, Do not round off the value.

H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G. The final figure is customarily rounded off to the nearest 1,000 L/min.

APPENDIX B

STORM SEWER CALCULATIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OF CALEDON**	**FILE NUMBER**	**W23093**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**March 5, 2024**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

EAST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
POND 3																													
	1	MH58	MH59	0.05	0.00	0.05				0.05	0.00	0.00	0.00	0.05	0.90	0.05	0.05	10.0	10.8		115.7	**0.014**	35.20	300	0.30	**0.053**	0.75	0.78	27%
	2	MH59	MH60	0.86	0.05	0.91		0.86			0.00	0.43	0.00	0.00	0.50	0.43	0.48	10.8	11.9		107.8	**0.142**	75.80	525	0.30	**0.235**	1.09	1.16	60%
	3	MH60	MH62	0.77	0.91	1.68		0.77			0.00	0.39	0.00	0.00	0.50	0.39	0.86	11.9	13.0		101.4	**0.242**	77.90	600	0.30	**0.336**	1.19	1.09	72%
	4	MH61	MH62	0.17	0.00	0.17				0.17	0.00	0.00	0.00	0.15	0.90	0.15	0.15	10.0	11.3		112.0	**0.048**	67.80	375	0.30	**0.096**	0.87	1.30	50%
	5	MH59	MH66	0.74	0.00	0.74		0.74			0.00	0.37	0.00	0.00	0.50	0.37	0.37	10.0	11.7		109.1	**0.112**	102.00	450	0.30	**0.156**	0.98	1.73	72%
	6	MH66	MH67	0.41	0.74	1.15		0.41			0.00	0.21	0.00	0.00	0.50	0.21	0.58	11.7	12.9		102.4	**0.164**	73.30	525	0.30	**0.235**	1.09	1.12	70%
	7	MH60	MH67	0.51	0.00	0.51		0.51			0.00	0.26	0.00	0.00	0.50	0.26	0.26	10.0	12.1		106.8	**0.076**	109.70	375	0.30	**0.096**	0.87	2.10	79%
	8	MH67	MH69	0.31	1.66	1.97		0.31			0.00	0.16	0.00	0.00	0.50	0.16	0.99	12.9	13.9		97.2	**0.266**	77.80	675	0.30	**0.460**	1.29	1.01	58%
	9	MH68	MH69	0.20	0.00	0.20		0.20			0.00	0.10	0.00	0.00	0.50	0.10	0.26	10.0	10.7		116.6	**0.083**	38.90	450	0.30	**0.156**	0.98	0.66	53%
	10	MH69	MH62	0.55	2.17	2.72		0.55			0.00	0.28	0.00	0.00	0.50	0.28	1.52	13.9	15.2		91.1	**0.384**	111.10	750	0.30	**0.610**	1.38	1.34	63%
	11	MH62	MH63	0.68	4.57	5.25		0.68			0.00	0.34	0.00	0.00	0.50	0.34	2.87	15.2	16.0		88.0	**0.702**	76.90	975	0.30	**1.227**	1.64	0.78	57%
	12	MH63	MH64	0.27	5.25	5.52		0.27			0.00	0.14	0.00	0.00	0.50	0.14	3.00	16.0	16.7		85.3	**0.712**	71.70	975	0.30	**1.227**	1.64	0.73	58%
	13	MH64	MH65	0.60	0.00	0.60		0.60			0.00	0.30	0.00	0.00	0.50	0.30	3.30	16.7	17.6		82.3	**0.756**	92.10	1050	0.30	**1.495**	1.73	0.89	51%
	14	MH63	MH70	0.61	0.00	0.61		0.61			0.00	0.31	0.00	0.00	0.50	0.31	0.31	10.0	11.7		109.1	**0.093**	102.10	450	0.30	**0.156**	0.98	1.73	59%
	15	MH70	MH71	0.11	0.61	0.72		0.11			0.00	0.06	0.00	0.00	0.50	0.06	0.36	11.7	11.9		108.1	**0.108**	9.50	450	0.30	**0.156**	0.98	0.16	69%
	16	MH71	MH65	0.32	0.72	1.04		0.32			0.00	0.16	0.00	0.00	0.50	0.16	0.52	11.9	13.0		101.7	**0.147**	64.30	450	0.30	**0.156**	0.98	1.09	94%
	17	MH65	MH66	0.36	1.64	2.00		0.36			0.00	0.18	0.00	0.00	0.50	0.18	3.82	10.0	10.6		117.2	**1.246**	66.10	1200	0.30	**2.134**	1.89	0.58	58%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: **Mayfield West** **CITY OF CALEDON** **FILE NUMBER** **W23093**
File No.: **REGION:21T-XX / CITY:CXX** **STORM DRAINAGE** **DATE** **March 5, 2024**
Consultant: **Candevcon Limited** **PREPARED BY** **SDL**
Drainage Area Plan: **STM 1-3**

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream Node	Down-stream Node	Contributing Area (ha) In Area	Control	Total	Breakdown of Areas 0.25	0.50	0.75	0.90	Area x Storm Co-eff 0.25	0.50	0.75	0.90	C	Total A x C	Cummulative AxC	Time (min) In Area	Total	I_2	I_{10}	FLOW Q= 2.78AC I/1000 Q_{design}	PIPE Length (m)	Size (mm)	Grade (%)	Capacity (m^3/sec)	Velocity (m/s)	Time (min)	% Full
pond 4	1	MH1	MH2	0.19	0.00	0.19		0.19			0.00	0.10	0.00	0.00	0.50	0.10	0.10	10.0	10.8		115.3	**0.030**	43.50	375	0.30	**0.096**	0.87	0.83	32%
	2	MH3	MH4	0.28	0.00	0.28		0.28			0.00	0.14	0.00	0.00	0.50	0.14	0.14	10.0	10.7		116.3	**0.045**	36.60	375	0.30	**0.096**	0.87	0.70	47%
	3	MH4	MH5	0.57	0.28	0.85		0.57			0.00	0.29	0.00	0.00	0.50	0.29	0.43	10.7	11.8		108.4	**0.128**	74.70	525	0.30	**0.235**	1.09	1.14	54%
	4	MH4	MH6	0.66	0.85	1.51		0.66			0.00	0.33	0.00	0.00	0.50	0.33	0.76	11.8	13.0		101.7	**0.213**	81.00	600	0.30	**0.336**	1.19	1.13	64%
	5	MH6	MH2	0.50	1.51	2.01		0.50			0.00	0.25	0.00	0.00	0.50	0.25	1.01	13.0	14.0		96.5	**0.270**	73.10	600	0.30	**0.336**	1.19	1.02	80%
	6	MH2	MH7	0.30	2.20	2.50		0.30			0.00	0.15	0.00	0.00	0.50	0.15	1.25	10.0	11.0		114.4	**0.398**	79.70	750	0.30	**0.610**	1.38	0.96	65%
	7	MH8	MH9	0.71	0.00	0.71		0.71			0.00	0.36	0.00	0.00	0.50	0.36	0.36	10.0	11.6		110.0	**0.109**	93.90	450	0.30	**0.156**	0.98	1.59	70%
	8	MH9	MH10	0.66	0.71	1.37		0.66			0.00	0.33	0.00	0.00	0.50	0.33	0.69	11.6	12.9		102.3	**0.195**	90.80	600	0.30	**0.336**	1.19	1.27	58%
	9	MH10	MH7	0.40	1.37	1.77		0.40			0.00	0.20	0.00	0.00	0.50	0.20	0.89	12.9	14.1		95.9	**0.236**	90.60	600	0.30	**0.336**	1.19	1.27	70%
	10	MH7	MH11	0.30	4.27	4.57			0.30		0.00	0.00	0.23	0.00	0.75	0.23	2.36	14.1	15.0		92.1	**0.604**	74.20	825	0.30	**0.786**	1.47	0.84	77%
	11	MH12	MH13	0.72	0.00	0.72		0.72			0.00	0.36	0.00	0.00	0.50	0.36	1.61	10.0	11.1		113.7	**0.507**	93.30	825	0.30	**0.786**	1.47	1.06	65%
	12	MH13	MH14	0.65	0.72	1.37		0.65			0.00	0.33	0.00	0.00	0.50	0.33	1.93	11.1	12.1		106.7	**0.573**	92.90	825	0.30	**0.786**	1.47	1.05	73%
	13	MH14	MH11	0.50	1.37	1.87		0.50			0.00	0.25	0.00	0.00	0.50	0.25	2.18	12.1	13.1		101.1	**0.612**	87.50	825	0.30	**0.786**	1.47	0.99	78%
	14	MH11	MH15	0.30	6.44	6.74		0.30			0.00	0.15	0.00	0.00	0.50	0.15	4.69	15.0	15.8		88.8	**1.158**	78.40	975	0.30	**1.227**	1.64	0.79	94%
	15	MH16	MH17	0.62	0.00	0.62		0.42	0.20		0.00	0.21	0.15	0.00	0.58	0.36	0.36	10.0	11.6		110.3	**0.110**	91.80	450	0.30	**0.156**	0.98	1.56	71%
	16	MH17	MH18	0.58	0.62	1.20		0.30	0.28		0.00	0.15	0.21	0.00	0.62	0.36	0.72	11.6	12.8		102.6	**0.205**	89.90	600	0.30	**0.336**	1.19	1.26	61%
	17	MH18	MH15	0.50	1.20	1.70		0.40	0.10		0.00	0.20	0.08	0.00	0.55	0.28	3.50	12.8	13.8		97.5	**0.949**	91.70	900	0.30	**0.991**	1.56	0.98	96%
	18	MH15	MH19	0.07	8.44	8.51				0.07	0.00	0.00	0.00	0.06	0.90	0.06	8.26	15.8	16.1		87.7	**2.012**	37.30	1350	0.30	**2.922**	2.04	0.30	69%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OF CALEDON**	**FILE NUMBER**	**W23093**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**March 5, 2024**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up- stream	Down- stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	19	MH19	MH20	0.50	8.51	9.01			0.50		0.00	0.00	0.38	0.00	0.75	0.38	8.63	16.1	16.9		84.8	**2.035**	95.60	1350	0.30	**2.922**	2.04	0.78	70%
	20	MH20	MH21	0.41	9.01	9.42			0.41		0.00	0.00	0.31	0.00	0.75	0.31	8.94	16.9	17.6		82.2	**2.042**	96.30	1350	0.30	**2.922**	2.04	0.79	70%
	21	MH22	MH23	0.55	0.00	0.55		0.55			0.00	0.28	0.00	0.00	0.50	0.28	0.28	10.0	11.2		112.7	**0.086**	71.10	450	0.30	**0.156**	0.98	1.21	55%
	22	MH23	MH245	0.70	0.55	1.25		0.35	0.35		0.00	0.18	0.26	0.00	0.63	0.44	0.71	11.2	12.6		103.7	**0.205**	101.70	600	0.30	**0.336**	1.19	1.42	61%
	23	MH24	MH25	0.13	1.25	1.38				0.13	0.00	0.00	0.00	0.12	0.90	0.12	0.83	12.6	13.7		98.2	**0.226**	72.90	600	0.30	**0.336**	1.19	1.02	67%
	24	MH26	MH27	0.57	0.00	0.57		0.57			0.00	0.29	0.00	0.00	0.50	0.29	0.29	10.0	11.4		111.2	**0.088**	83.70	450	0.30	**0.156**	0.98	1.42	56%
	25	MH27	MH25	0.65	0.57	1.22		0.65			0.00	0.33	0.00	0.00	0.50	0.33	0.83	11.4	13.0		101.8	**0.235**	110.00	600	0.30	**0.336**	1.19	1.54	70%
	26	MH25	MH28	0.42	2.60	3.02		0.20	0.22		0.00	0.10	0.17	0.00	0.63	0.27	1.92	13.7	14.5		94.4	**0.505**	75.10	900	0.30	**0.991**	1.56	0.80	51%
	27	MH29	MH30	0.62	0.00	0.62		0.62			0.00	0.31	0.00	0.00	0.50	0.31	0.31	10.0	11.5		110.9	**0.096**	86.00	450	0.30	**0.156**	0.98	1.46	61%
	28	MH30	MH28	0.67	0.62	1.29		0.27	0.40		0.00	0.14	0.30	0.00	0.65	0.44	0.75	11.5	12.9		102.3	**0.212**	100.80	600	0.30	**0.336**	1.19	1.41	63%
	29	MH28	MH21	0.35	0.00	0.35		0.35			0.00	0.18	0.00	0.00	0.50	0.18	2.84	10.0	10.6		116.9	**0.924**	70.70	1200	0.30	**2.134**	1.89	0.62	43%
	30	MH21	MH30	0.42	9.77	10.19		0.42			0.00	0.21	0.00	0.00	0.50	0.21	11.99	17.6	18.3		80.1	**2.669**	82.90	1350	0.30	**2.922**	2.04	0.68	91%
	31	MH31	MH30	3.27	0.00	3.27			3.27		0.00	0.00	2.45	0.00	0.75	2.45	2.45	10.0	10.8		115.9	**0.790**	70.90	900	0.30	**0.991**	1.56	0.76	80%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: **Mayfield West**
File No.: **REGION:21T-XX / CITY:CXX**
Consultant: **Candevcon Limited**
Drainage Area Plan: **STM 1-3**

CITY OF CALEDON
STORM DRAINAGE

FILE NUMBER **W23093**
DATE **March 5, 2024**
PREPARED BY **SDL**

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	32	MH30	MH32	0.44	13.46	13.90			0.44		0.00	0.00	0.33	0.00	0.75	0.33	14.78	18.3	18.9		78.5	**3.223**	75.60	1650	0.30	**4.990**	2.33	0.54	65%
	33	MH25	MH26	0.26	0.00	0.26		0.26			0.00	0.13	0.00	0.00	0.50	0.13	0.13	10.0	10.9		115.2	**0.042**	44.50	375	0.30	**0.096**	0.87	0.85	43%
	34	MH26	MH27	0.27	0.26	0.53		0.27			0.00	0.14	0.00	0.00	0.50	0.14	0.27	10.9	11.7		109.4	**0.081**	49.40	450	0.30	**0.156**	0.98	0.84	52%
	35	MH27	MH28	0.31	0.53	0.84		0.31			0.00	0.16	0.00	0.00	0.50	0.16	0.42	11.7	13.0		101.8	**0.119**	74.60	450	0.30	**0.156**	0.98	1.27	76%
	36	MH28	MH29	0.59	0.84	1.43		0.59			0.00	0.30	0.00	0.00	0.50	0.30	0.72	13.0	14.0		96.3	**0.191**	76.90	600	0.30	**0.336**	1.19	1.08	57%
	37	MH29	MH32	0.12	1.43	1.55		0.12			0.00	0.06	0.00	0.00	0.50	0.06	0.78	14.0	15.1		91.5	**0.197**	76.50	600	0.30	**0.336**	1.19	1.07	59%
	38	MH32	MH33	0.28	15.45	15.73		0.28			0.00	0.14	0.00	0.00	0.50	0.14	15.69	18.9	19.2		77.4	**3.377**	51.30	1650	0.30	**4.990**	2.33	0.37	68%
	39	MH33	MH34	0.40	15.73	16.13		0.40			0.00	0.20	0.00	0.00	0.50	0.20	15.89	19.2	19.7		76.2	**3.366**	62.70	1650	0.30	**4.990**	2.33	0.45	67%
	40	MH34	MH35	0.27	16.13	16.40			0.27		0.00	0.00	0.20	0.00	0.75	0.20	16.09	19.7	20.2		74.8	**3.345**	75.30	1650	0.30	**4.990**	2.33	0.54	67%
	41	MH27	MH36	0.29	0.00	0.29			0.29		0.00	0.00	0.22	0.00	0.75	0.22	0.22	10.0	10.0		121.9	**0.074**	82.10	450	0.30	**0.156**	0.98	1.39	47%
	42	MH36	MH37	0.59	0.29	0.88		0.59			0.00	0.30	0.00	0.00	0.50	0.30	0.51	10.0	11.4		111.3	**0.159**	100.00	600	0.30	**0.336**	1.19	1.40	47%
	43	MH37	MH38	0.50	0.88	1.38		0.50			0.00	0.25	0.00	0.00	0.50	0.25	0.76	11.4	12.7		103.5	**0.219**	89.70	600	0.30	**0.336**	1.19	1.26	65%
	44	MH38	MH39	0.50	1.38	1.88		0.50			0.00	0.25	0.00	0.00	0.50	0.25	1.01	12.7	13.6		98.5	**0.277**	78.30	750	0.30	**0.610**	1.38	0.95	45%
	45	MH39	MH35	0.22	1.88	2.10		0.22			0.00	0.11	0.00	0.00	0.50	0.11	1.12	13.6	14.5		94.1	**0.294**	75.90	750	0.30	**0.610**	1.38	0.92	48%
	46	MH35	MH44	0.35	18.50	18.85		0.35			0.00	0.18	0.00	0.00	0.50	0.18	17.39	34.7	35.6		50.5	**2.440**	112.60	1500	0.30	**3.870**	2.19	0.86	63%
	47	MH44	MH45	0.34	18.85	19.19			0.34		0.00	0.00	0.26	0.00	0.75	0.26	17.65	35.6	36.1		50.0	**2.451**	68.10	1500	0.30	**3.870**	2.19	0.52	63%
	48	MH45	MH46	0.07	19.19	19.26		0.07			0.00	0.04	0.00	0.00	0.50	0.04	17.68	36.1	36.2		49.9	**2.451**	12.60	1500	0.30	**3.870**	2.19	0.10	63%
	49	MH46	MH47	0.42	19.26	19.68		0.42			0.00	0.21	0.00	0.00	0.50	0.21	17.89	36.2	36.7		49.4	**2.457**	64.90	1500	0.30	**3.870**	2.19	0.49	63%
	50	MH47	MH48	0.37	19.68	20.05		0.37			0.00	0.19	0.00	0.00	0.50	0.19	18.08	36.7	37.2		49.0	**2.460**	62.60	1500	0.30	**3.870**	2.19	0.48	64%
	51	MH48	MH49	0.16	20.05	20.21		0.16			0.00	0.08	0.00	0.00	0.50	0.08	18.16	37.2	37.3		48.8	**2.465**	18.00	1500	0.30	**3.870**	2.19	0.14	64%
	52	MH49	MH52	0.09	20.21	20.30		0.09			0.00	0.05	0.00	0.00	0.50	0.05	18.20	37.3	37.4		48.7	**2.465**	17.10	1500	0.30	**3.870**	2.19	0.13	64%
	53	MH39	MH23	0.70	0.00	0.70		0.35	0.35		0.00	0.18	0.26	0.00	0.63	0.44	0.44	10.0	11.7		109.4	**0.133**	110.40	525	0.30	**0.235**	1.09	1.69	57%
	54	MH44	MH23	0.23	0.70	0.93		0.23			0.00	0.12	0.00	0.00	0.50	0.12	0.55	11.7	12.9		102.1	**0.157**	79.20	525	0.30	**0.235**	1.09	1.21	67%
	55	MH23	MH41	0.20	0.93	1.13		0.20			0.00	0.10	0.00	0.00	0.50	0.10	0.65	12.9	14.1		96.1	**0.174**	76.70	525	0.30	**0.235**	1.09	1.17	74%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: Mayfield West
File No.: REGION:21T-XX / CITY:CXX
Consultant: Candevcon Limited
Drainage Area Plan: STM 1-3

CITY OF CALEDON
STORM DRAINAGE

FILE NUMBER W23093
DATE March 5, 2024
PREPARED BY SDL

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	**FLOW** Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			**Q_{design}**	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	56	MH38	MH40	0.21	0.00	0.21			0.21		0.00	0.00	0.16	0.00	0.75	0.16	0.16	10.0	10.8		115.3	**0.050**	49.40	450	0.30	**0.156**	0.98	0.84	32%
	57	MH40	MH41	0.23	0.21	0.44			0.23		0.00	0.00	0.17	0.00	0.75	0.17	0.33	10.8	11.9		108.0	**0.099**	62.70	450	0.30	**0.156**	0.98	1.06	63%
	58	MH41	MH42	0.15	1.57	1.72		0.15			0.00	0.08	0.00	0.00	0.50	0.08	1.06	14.1	14.6		93.6	**0.275**	43.40	675	0.30	**0.460**	1.29	0.56	60%
POND 5																													
	1	MH1	MH2	0.05	0.00	0.05				0.05	0.00	0.00	0.00	0.05	0.90	0.05	0.05	10.0	10.6		116.9	**0.015**	28.40	300	0.30	**0.053**	0.75	0.63	28%
	2	MH2	MH3	0.14	0.05	0.19			0.14		0.00	0.00	0.11	0.00	0.75	0.11	0.15	10.6	11.4		111.4	**0.046**	39.10	375	0.30	**0.096**	0.87	0.75	48%
	3	MH3	MH4	0.50	0.19	0.69		0.20	0.30		0.00	0.10	0.23	0.00	0.65	0.33	0.48	11.4	12.4		105.1	**0.139**	64.90	525	0.30	**0.235**	1.09	0.99	59%
	4	MH4	MH5	0.58	0.69	1.27			0.58		0.00	0.00	0.44	0.00	0.75	0.44	0.91	12.4	13.8		97.5	**0.247**	101.20	600	0.30	**0.336**	1.19	1.42	73%
	5	MH6	MH5	0.33	0.00	0.33		0.33			0.00	0.17	0.00	0.00	0.50	0.17	0.17	10.0	10.8		115.7	**0.053**	40.90	375	0.30	**0.096**	0.87	0.78	55%
	6	MH5	MH7	0.34	1.60	1.51		0.34			0.00	0.17	0.00	0.00	0.50	0.17	1.25	13.8	14.7		93.3	**0.323**	74.60	750	0.30	**0.610**	1.38	0.90	53%
	7	MH2	MH8	0.44	0.00	0.44			0.44		0.00	0.00	0.33	0.00	0.75	0.33	0.33	10.0	11.3		111.7	**0.103**	78.80	450	0.30	**0.156**	0.98	1.34	66%
	8	MH8	MH9	0.47	0.44	0.91		0.47			0.00	0.24	0.00	0.00	0.50	0.24	0.57	11.3	12.9		102.3	**0.161**	100.00	525	0.30	**0.235**	1.09	1.53	68%
	9	MH9	MH7	0.60	0.91	1.51		0.20	0.4		0.00	0.10	0.30	0.00	0.67	0.40	0.97	12.9	14.3		95.3	**0.256**	99.50	600	0.30	**0.336**	1.19	1.39	76%
	10	MH7	MH10	0.50	3.02	3.52		0.20	0.3		0.00	0.10	0.23	0.00	0.65	0.33	2.54	14.7	15.5		89.8	**0.633**	73.80	825	0.30	**0.786**	1.47	0.84	81%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OF CALEDON**	**FILE NUMBER**	**W23093**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**March 5, 2024**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	**FLOW** Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			**Q_{design}**	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	11	MH8	MH11	0.44	0.00	0.44			0.44		0.00	0.00	0.33	0.00	0.75	0.33	0.33	10.0	11.3		112.1	**0.103**	75.80	450	0.30	**0.156**	0.98	1.29	66%
	12	MH11	MH12	0.51	0.44	0.95		0.51			0.00	0.26	0.00	0.00	0.50	0.26	0.59	11.3	12.9		102.0	**0.166**	106.80	525	0.30	**0.235**	1.09	1.64	70%
	13	MH12	MH10	0.52	0.95	1.47		0.52			0.00	0.26	0.00	0.00	0.50	0.26	0.85	12.9	14.2		95.8	**0.225**	87.70	600	0.30	**0.336**	1.19	1.23	67%
	14	MH10	MH13	0.45	4.99	5.44			0.45		0.00	0.00	0.34	0.00	0.75	0.34	3.72	15.5	16.3		86.8	**0.897**	76.60	975	0.30	**1.227**	1.64	0.78	73%
	15	MH14	MH15	0.50	0.00	0.50			0.5		0.00	0.00	0.38	0.00	0.75	0.38	0.38	10.0	11.5		110.5	**0.115**	90.00	450	0.30	**0.156**	0.98	1.53	74%
	16	MH15	MH16	0.44	0.50	0.94		0.44			0.00	0.22	0.00	0.00	0.50	0.22	0.60	11.5	13.0		101.6	**0.168**	96.15	525	0.30	**0.235**	1.09	1.47	71%
	17	MH16	MH13	0.30	0.94	1.24		0.30			0.00	0.15	0.00	0.00	0.50	0.15	0.75	13.0	14.5		94.2	**0.195**	97.60	525	0.30	**0.235**	1.09	1.49	83%
	18	MH17	MH18	0.50	0.00	0.50		0.20	0.3		0.00	0.10	0.23	0.00	0.65	0.33	0.33	10.0	11.8		108.8	**0.098**	104.90	450	0.30	**0.156**	0.98	1.78	63%
	19	MH11	MH21	0.89	0.00	0.89		0.89			0.00	0.45	0.00	0.00	0.50	0.45	0.45	10.0	12.0		107.5	**0.133**	129.40	525	0.30	**0.235**	1.09	1.98	56%
	20	MH21	MH22	0.33	0.89	1.22		0.33			0.00	0.17	0.00	0.00	0.50	0.17	0.61	12.0	13.0		101.7	**0.172**	65.30	525	0.30	**0.235**	1.09	1.00	73%
	40	MH23	MH24	0.18	0.00	0.18		0.18			0.00	0.09	0.00	0.00	0.50	0.09	0.09	10.0	10.9		115.1	**0.029**	44.80	375	0.30	**0.096**	0.87	0.86	30%
	42	MH25	MH24	0.30	0.00	0.30		0.30			0.00	0.15	0.00	0.00	0.50	0.15	0.15	10.0	10.7		116.4	**0.049**	36.30	375	0.30	**0.096**	0.87	0.70	51%
	41	MH24	MH22	0.56	0.30	0.86		0.56			0.00	0.28	0.00	0.00	0.50	0.28	0.43	10.7	11.8		108.6	**0.130**	73.00	525	0.30	**0.235**	1.09	1.12	55%
	21	MH22	MH20	0.32	1.52	1.84		0.32			0.00	0.16	0.00	0.00	0.50	0.16	1.20	13.0	14.0		96.6	**0.322**	76.70	675	0.30	**0.460**	1.29	0.99	70%
	22	MH17	MH19	0.27	0.00	0.27		0.27			0.00	0.14	0.00	0.00	0.50	0.14	0.14	10.0	10.8		115.3	**0.043**	43.70	375	0.30	**0.096**	0.87	0.84	45%
	23	MH19	MH20	0.13	0.27	0.40		0.13			0.00	0.07	0.00	0.00	0.50	0.07	0.20	10.8	11.5		110.8	**0.062**	33.50	375	0.30	**0.096**	0.87	0.64	64%
	25	MH20	MH26	0.49	2.24	2.73		0.49			0.00	0.25	0.00	0.00	0.50	0.25	1.65	14.0	15.0		92.0	**0.421**	85.50	750	0.30	**0.610**	1.38	1.03	69%
	26	MH27	MH26	0.54	0.00	0.54			0.54		0.00	0.00	0.41	0.00	0.75	0.41	0.41	10.0	10.7		116.2	**0.131**	47.00	525	0.30	**0.235**	1.09	0.72	56%
	27	MH26	MH18	0.25	0.54	0.79		0.25			0.00	0.13	0.00	0.00	0.50	0.13	0.53	10.7	11.9		108.0	**0.159**	77.40	525	0.30	**0.235**	1.09	1.19	68%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: **Mayfield West** **CITY OF CALEDON** **FILE NUMBER** **W23093**
File No.: **REGION:21T-XX / CITY:CXX** **STORM DRAINAGE** **DATE** **March 5, 2024**
Consultant: **Candevcon Limited** **PREPARED BY** **SDL**
Drainage Area Plan: **STM 1-3**

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	28	MH18	MH10	0.24	1.29	1.53		0.24			0.00	0.12	0.00	0.00	0.50	0.12	0.98	11.9	12.9		102.4	**0.278**	73.60	675	0.30	**0.460**	1.29	0.95	60%
	29	MH13	MH29	0.37	6.68	7.05		0.37			0.00	0.19	0.00	0.00	0.50	0.19	4.65	16.3	17.3		83.3	**1.076**	102.60	1050	0.30	**1.495**	1.73	0.99	72%
	30	MH26	MH28	0.45	0.00	0.45			0.45		0.00	0.00	0.34	0.00	0.75	0.34	0.34	10.0	11.3		112.0	**0.105**	76.80	450	0.30	**0.156**	0.98	1.30	67%
	31	MH28	MH29	0.06	0.45	0.51				0.06	0.00	0.00	0.00	0.05	0.90	0.05	0.39	11.3	12.2		106.4	**0.116**	50.60	450	0.30	**0.156**	0.98	0.86	74%
	32	MH29	MH31	0.40	7.56	7.96		0.40			0.00	0.20	0.00	0.00	0.50	0.20	5.24	17.3	18.0		80.9	**1.178**	77.60	1050	0.30	**1.495**	1.73	0.75	79%
	33	MH31	MH37	0.50	7.96	8.46		0.50			0.00	0.25	0.00	0.00	0.50	0.25	5.49	18.0	18.8		78.6	**1.199**	80.00	1050	0.30	**1.495**	1.73	0.77	80%
	34	MH28	MH33	0.48	0.00	0.48			0.48		0.00	0.00	0.36	0.00	0.75	0.36	0.36	10.0	11.3		112.1	**0.112**	75.90	450	0.30	**0.156**	0.98	1.29	72%
	35	MH33	MH34	0.10	0.48	0.58				0.1	0.00	0.00	0.00	0.09	0.90	0.09	0.45	11.3	12.3		105.4	**0.132**	68.00	525	0.30	**0.235**	1.09	1.04	56%
	37	MH34	MH35	0.18	0.58	0.76			0.18		0.00	0.00	0.14	0.00	0.75	0.14	0.59	12.3	13.4		99.6	**0.162**	68.00	525	0.30	**0.235**	1.09	1.04	69%
	36	MH31	MH35	0.50	8.46	8.96				0.5	0.00	0.00	0.00	0.45	0.90	0.45	0.45	10.0	11.3		111.8	**0.140**	86.7	525	0.30	**0.235**	1.09	1.33	59%
POND 8																													
	1	23A	MH1	0.99	0.00	0.99		0.99			0.00	0.50	0.00	0.00	0.50	0.50	0.50	10.0	10.2		120.1	**0.165**	14.5	525	0.30	**0.235**	1.09	0.22	70%
	2A	MH18	MH1	0.22	0.00	0.22		0.22			0.00	0.11	0.00	0.00	0.50	0.11	0.61	10.0	10.5		117.5	**0.198**	35.4	525	0.30	**0.235**	1.09	0.54	84%
	2	MH1	MH2	0.22	1.21	1.43		0.22			0.00	0.11	0.00	0.00	0.50	0.11	1.21	10.5	11.5		110.9	**0.373**	75.8	750	0.30	**0.610**	1.38	0.92	61%
	3	MH3	MH4	0.66	0.00	0.66		0.66			0.00	0.33	0.00	0.00	0.50	0.33	0.33	10.0	11.9		108.0	**0.099**	112.2	450	0.30	**0.156**	0.98	1.90	63%
	4	MH5	MH6	0.38	0.22	0.60		0.38			0.00	0.19	0.00	0.00	0.50	0.19	0.19	10.0	10.7		116.4	**0.061**	36.4	375	0.30	**0.096**	0.87	0.70	64%
	5	MH6	MH7	0.38	0.60	0.98		0.38			0.00	0.19	0.00	0.00	0.50	0.19	0.38	10.7	12.0		107.5	**0.114**	76	450	0.30	**0.156**	0.98	1.29	73%
	6	,H7	MH4	0.44	0.98	1.42		0.44			0.00	0.22	0.00	0.00	0.50	0.22	0.60	12.0	13.2		100.8	**0.168**	76.1	525	0.30	**0.235**	1.09	1.17	71%
	7	MH4	MH2	0.44	2.08	2.52		0.44			0.00	0.22	0.00	0.00	0.50	0.22	1.15	13.2	14.1		95.9	**0.307**	75.3	675	0.30	**0.460**	1.29	0.98	67%
	8	MH2	MH8	0.71	3.95	4.66		0.71			0.00	0.36	0.00	0.00	0.50	0.36	1.51	14.1	15.5		90.1	**0.377**	109.9	750	0.30	**0.610**	1.38	1.33	62%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: **Mayfield West** **CITY OF CALEDON** **FILE NUMBER** **W23093**
File No.: **REGION:21T-XX / CITY:CXX** **STORM DRAINAGE** **DATE** **March 5, 2024**
Consultant: **Candevcon Limited** **PREPARED BY** **SDL**
Drainage Area Plan: **STM 1-3**

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	**FLOW** Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	9	MH8A	MH8	0.17	0.00	0.17		0.17			0.00	0.09	0.00	0.00	0.50	0.09	0.09	10.0	10.9		115.1	**0.027**	39	300	0.30	**0.053**	0.75	0.87	51%
	10	MH8	MH9	0.28	4.83	5.11		0.28			0.00	0.14	0.00	0.00	0.50	0.14	1.73	15.5	16.3		87.0	**0.418**	66	750	0.30	**0.610**	1.38	0.80	69%
	11	MH9	MH10	0.08	5.11	5.19		0.08			0.00	0.04	0.00	0.00	0.50	0.04	1.77	16.3	16.4		86.4	**0.425**	14	750	0.30	**0.610**	1.38	0.17	70%
	12	MH7	MH11	0.29	0.00	0.29		0.29			0.00	0.15	0.00	0.00	0.50	0.15	0.15	10.0	11.2		113.0	**0.046**	60.5	375	0.30	**0.096**	0.87	1.16	47%
	13	MH11	MH12	0.25	0.29	0.54		0.25			0.00	0.13	0.00	0.00	0.50	0.13	0.27	11.2	11.7		109.1	**0.082**	48	750	0.30	**0.610**	1.38	0.58	13%
	14	MH3	MH12	0.12	0.00	0.12		0.12			0.00	0.06	0.00	0.00	0.50	0.06	0.06	10.0	10.7		116.6	**0.019**	29.6	300	0.30	**0.053**	0.75	0.66	37%
	15	MH12	MH13	0.58	5.19	5.77		0.58			0.00	0.29	0.00	0.00	0.50	0.29	0.62	11.7	12.9		101.9	**0.176**	78.6	525	0.30	**0.235**	1.09	1.20	75%
	16	MH13	MH14	0.20	5.77	5.97		0.2			0.00	0.10	0.00	0.00	0.50	0.10	0.72	12.9	13.3		100.0	**0.200**	25.7	600	0.30	**0.336**	1.19	0.36	60%
	17	MH4	MH14	0.64	0.00	0.64		0.64			0.00	0.32	0.00	0.00	0.50	0.32	0.32	10.0	36.5		49.5	**0.044**	1385.2	375	0.30	**0.096**	0.87	26.55	46%
	18	MH14	MH15	0.23	6.61	6.84		0.23			0.00	0.12	0.00	0.00	0.50	0.12	1.16	36.5	37.6		48.6	**0.156**	66.7	525	0.30	**0.235**	1.09	1.02	66%
	19	MH15	MH16	0.03	5.77	5.80		0.03			0.00	0.02	0.00	0.00	0.50	0.02	1.17	37.6	37.8		48.4	**0.157**	13	525	0.30	**0.235**	1.09	0.20	67%
	20	MH16	MH17	0.32	5.97	6.29		0.32			0.00	0.16	0.00	0.00	0.50	0.16	1.33	37.8	38.5		47.7	**0.177**	50.7	525	0.30	**0.235**	1.09	0.78	75%
	21	MH2	MH17	0.24	0.64	0.88		0.24			0.00	0.12	0.00	0.00	0.50	0.12	0.12	10.0	11.5		110.8	**0.037**	76.8	375	0.30	**0.096**	0.87	1.47	39%
	22	MH17	MH10	0.43	7.17	7.60		0.43			0.00	0.22	0.00	0.00	0.50	0.22	1.67	38.5	40.0		46.5	**0.215**	103.2	600	0.30	**0.336**	1.19	1.45	64%
POND 6	1	MH1	MH2	0.21	0.00	0.21		0.21			0.00	0.11	0.00	0.00	0.50	0.11	0.11	10.0	10.5		117.8	**0.034**	23.1	300	0.30	**0.053**	0.75	0.51	65%
	2	MH2	MH3	0.21	0.21	0.42		0.21			0.00	0.11	0.00	0.00	0.50	0.11	0.21	10.5	11.3		112.2	**0.065**	39.6	375	0.30	**0.096**	0.87	0.76	68%
	3	MH3	MH4	0.28	0.42	0.70		0.28			0.00	0.14	0.00	0.00	0.50	0.14	0.35	11.3	12.2		106.5	**0.104**	52.1	450	0.30	**0.156**	0.98	0.88	66%
	4	MH5	MH6	0.44	0.00	0.44		0.44			0.00	0.22	0.00	0.00	0.50	0.22	0.22	10.0	11.9		107.9	**0.066**	100.3	375	0.30	**0.096**	0.87	1.92	69%
	5	MH6	MH4	0.58	0.44	1.02			0.58		0.00	0.00	0.44	0.00	0.75	0.44	0.66	11.9	13.4		99.5	**0.181**	96.4	525	0.30	**0.235**	1.09	1.48	77%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OF CALEDON**	**FILE NUMBER**	**W23093**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**March 5, 2024**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

EAST SIDE

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	**FLOW** Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	6	MH7	MH8	0.12	0.00	0.12				0.12	0.00	0.00	0.00	0.11	0.90	0.11	0.11	10.0	10.9		114.7	**0.034**	47.7	375	0.30	**0.096**	0.87	0.91	36%
	7	MH6	MH8	3.66	0.00	3.66				3.66	0.00	0.00	0.00	3.29	0.90	3.29	3.29	10.0	10.8		115.6	**1.059**	82.4	1050	0.30	**1.495**	1.73	0.80	71%
	8	MH8	MH9	0.73	3.78	4.51		0.35	0.38		0.00	0.18	0.29	0.00	0.63	0.46	3.86	10.9	11.8		108.4	**1.164**	96.2	1050	0.30	**1.495**	1.73	0.93	78%
	9	MH9	MH10	0.16	4.51	4.67		0.16			0.00	0.08	0.00	0.00	0.50	0.08	3.94	11.8	11.9		107.8	**1.182**	9.7	1050	0.30	**1.495**	1.73	0.09	79%
	10	MH10	MH11	0.26	4.67	4.93		0.26			0.00	0.13	0.00	0.00	0.50	0.13	4.07	11.9	12.4		105.0	**1.189**	47.7	1050	0.30	**1.495**	1.73	0.46	80%
	11	MH11	MH4	0.12	4.93	5.05		0.12			0.00	0.06	0.00	0.00	0.50	0.06	4.13	12.4	12.6		103.6	**1.190**	25.4	1050	0.30	**1.495**	1.73	0.25	80%

Printed 26 September 2017

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OFCe aledon**	**FILE NUMBER**	**W19174**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**November 21, 2023**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

WEST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
POND 1																													
	1	MH1	MH2	0.68	0	0.68		0.68			0.00	0.34	0.00	0.00	0.50	0.34	0.34	10.0	10.9		114.7	**0.108**	60.00	525	0.30	**0.235**	1.09	0.92	46%
	2	MH2	MH3	0.48	0.68	1.16		0.48			0.00	0.24	0.00	0.00	0.50	0.24	0.58	10.9	12.0		107.5	**0.173**	70.00	525	0.30	**0.235**	1.09	1.07	74%
	3	MH3	MH5	0.45	1.16	1.61		0.45			0.00	0.23	0.00	0.00	0.50	0.23	0.81	12.0	12.8		102.4	**0.229**	61.10	600	0.30	**0.336**	1.19	0.86	68%
POND 2																													
	1	MH6	MH7	0.56	0.00	0.56			0.56		0.00	0.00	0.42	0.00	0.75	0.42	0.42	10.0	11.5		110.9	**0.130**	95.10	525	0.30	**0.235**	1.09	1.46	55%
	2	MH7	MH8	0.07	0.56	0.63			0.07		0.00	0.00	0.05	0.00	0.75	0.05	0.47	11.5	12.1		106.9	**0.140**	40.60	525	0.30	**0.235**	1.09	0.62	60%
	3	MH9	MH10	0.08	0.00	0.08			0.08		0.00	0.00	0.06	0.00	0.75	0.06	0.06	10.0	10.3		119.4	**0.020**	13.90	300	0.30	**0.053**	0.75	0.31	38%
	4	MH10	MH11	0.45	0.08	0.53			0.45		0.00	0.00	0.34	0.00	0.75	0.34	0.40	10.3	11.4		111.4	**0.123**	64.00	450	0.30	**0.156**	0.98	1.09	79%
	5	MH11	MH12	0.34	0.53	0.87			0.34		0.00	0.00	0.26	0.00	0.75	0.26	0.65	11.4	12.4		105.2	**0.191**	69.80	600	0.30	**0.336**	1.19	0.98	57%
	6	MH9	MH13	0.57	0.00	0.57			0.57		0.00	0.00	0.43	0.00	0.75	0.43	0.43	10.0	12.6		103.9	**0.123**	153.00	450	0.30	**0.156**	0.98	2.60	79%
	7	MH13	MH14	0.19	0.57	0.76		0.19			0.00	0.10	0.00	0.00	0.50	0.10	0.52	12.6	13.2		100.7	**0.146**	37.10	525	0.30	**0.235**	1.09	0.57	62%
	8	MH14	MH15	0.22	0.76	0.98		0.22			0.00	0.11	0.00	0.00	0.50	0.11	0.63	13.2	13.7		98.0	**0.172**	34.00	525	0.30	**0.235**	1.09	0.52	73%
	9	MH11	MH16	0.36	0.00	0.36		0.18	0.18		0.00	0.09	0.14	0.00	0.63	0.23	0.23	10.0	10.0		121.9	**0.076**	77.40	375	0.30	**0.096**	0.87	1.48	79%
	10	MH16	MH15	0.50	0.36	0.86		0.25	0.25		0.00	0.13	0.19	0.00	0.63	0.31	0.54	13.7	15.1		91.6	**0.137**	91.80	525	0.30	**0.235**	1.09	1.41	58%
	11	MH15	MH17	0.11	1.84	1.95		0.11			0.00	0.06	0.00	0.00	0.50	0.06	1.23	13.7	14.0		96.3	**0.328**	27.40	675	0.30	**0.460**	1.29	0.35	71%
	12	MH17	MH18	0.22	1.95	2.17		0.22			0.00	0.11	0.00	0.00	0.50	0.11	1.34	14.0	14.5		94.0	**0.349**	41.40	750	0.30	**0.610**	1.38	0.50	57%
	13	MH18	MH19	0.13	2.17	2.30		0.13			0.00	0.07	0.00	0.00	0.50	0.07	1.40	14.5	14.7		93.4	**0.364**	11.10	750	0.30	**0.610**	1.38	0.13	60%
	14	MH19	MH20	0.78	2.30	3.08		0.78			0.00	0.39	0.00	0.00	0.50	0.39	1.79	14.7	15.9		88.3	**0.439**	102.10	750	0.30	**0.610**	1.38	1.23	72%
	15	MH20	MH12	0.16	3.08	3.24		0.16			0.00	0.08	0.00	0.00	0.50	0.08	1.87	15.9	16.3		86.8	**0.451**	33.40	750	0.30	**0.610**	1.38	0.40	74%
	16	MH12	MH21	0.22	4.11	4.33		0.22			0.00	0.11	0.00	0.00	0.50	0.11	2.63	16.3	16.7		85.3	**0.624**	37.00	825	0.30	**0.786**	1.47	0.42	79%
	17	MH21	MH8	0.23	4.33	4.56		0.23			0.00	0.12	0.00	0.00	0.50	0.12	2.75	16.7	17.1		83.9	**0.641**	37.70	900	0.30	**0.991**	1.56	0.40	65%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OFCe aledon**	**FILE NUMBER**	**W19174**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**November 21, 2023**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

WEST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	18	MH8	MH22	0.08	5.19	5.27				0.08	0.00	0.00	0.00	0.07	0.90	0.07	3.29	17.1	17.6		82.5	**0.755**	39.20	900	0.30	**0.991**	1.56	0.42	76%
	19	MH22	MH23	0.05	5.27	5.32				0.05	0.00	0.00	0.00	0.05	0.90	0.05	3.34	17.6	17.8		81.6	**0.757**	25.80	900	0.30	**0.991**	1.56	0.28	76%
	20	MH23	MH24	0.04	5.32	5.36				0.04	0.00	0.00	0.00	0.04	0.90	0.04	3.37	17.8	18.0		81.2	**0.761**	11.60	900	0.30	**0.991**	1.56	0.12	77%
	21	MH24	MH25	0.22	5.36	5.58		0.22			0.00	0.11	0.00	0.00	0.50	0.11	3.48	18.0	18.4		79.7	**0.772**	44.50	900	0.30	**0.991**	1.56	0.48	78%
	22	MH25	MH26	0.18	5.58	5.76		0.18			0.00	0.09	0.00	0.00	0.50	0.09	3.57	18.4	18.9		78.4	**0.778**	43.60	900	0.30	**0.991**	1.56	0.47	79%
	23	MH26	MH27	0.09	5.76	5.85		0.09			0.00	0.05	0.00	0.00	0.50	0.05	3.62	18.9	19.1		77.9	**0.783**	16.20	900	0.30	**0.991**	1.56	0.17	79%
	24	MH27	MH28	0.26	5.85	6.11			0.26		0.00	0.00	0.20	0.00	0.75	0.20	3.81	19.1	19.8		76.0	**0.805**	67.60	975	0.30	**1.227**	1.64	0.69	66%
	25	MH28	MH29	0.03	6.11	6.14				0.03	0.00	0.00	0.00	0.03	0.90	0.03	3.84	19.8	19.9		75.6	**0.807**	13.90	975	0.30	**1.227**	1.64	0.14	66%
	26	MH29	MH30	0.32	6.14	6.46		0.32			0.00	0.16	0.00	0.00	0.50	0.16	4.00	19.9	20.9		73.1	**0.813**	95.71	975	0.30	**1.227**	1.64	0.97	66%
	27	MH27	MH31	0.73	0.00	0.73		0.73			0.00	0.37	0.00	0.00	0.50	0.37	0.37	10.0	12.0		107.3	**0.109**	118.70	450	0.30	**0.156**	0.98	2.01	70%
	28	MH31	MH30	0.13	0.73	0.86				0.13	0.00	0.00	0.00	0.12	0.90	0.12	0.48	12.0	13.5		99.1	**0.133**	95.70	525	0.30	**0.235**	1.09	1.47	56%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OFCe aledon**	**FILE NUMBER**	**W19174**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**November 21, 2023**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

WEST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
FUTURE POND																													
	F1	MH210	MH32	0.42	0.00	0.42		0.42			0.00	0.21	0.00	0.00	0.50	0.21	0.21	10.0	11.5		110.9	**0.065**	76.00	375	0.30	**0.096**	0.87	1.46	67%
	F2	MH32	MH32A	0.16	1.15	1.31		0.16			0.00	0.08	0.00	0.00	0.50	0.08	0.29	12.0	12.7		103.3	**0.083**	39.80	450	0.30	**0.156**	0.98	0.68	53%
	F3	MH32A	MH32B	0.21	0.00	0.21		0.21			0.00	0.11	0.00	0.00	0.50	0.11	0.40	13.5	14.3		94.9	**0.104**	51.20	450	0.30	**0.156**	0.98	0.87	67%
	F4	MH32B	MH33	0.41	0.00	0.41		0.41			0.00	0.21	0.00	0.00	0.50	0.21	0.60	14.3	15.8		88.8	**0.148**	93.40	525	0.30	**0.235**	1.09	1.43	63%
	F5	MH33	MH34	0.49	0.41	0.90		0.49			0.00	0.25	0.00	0.00	0.50	0.25	0.85	15.8	17.3		83.3	**0.196**	109.60	600	0.30	**0.336**	1.19	1.54	58%
	F6	MH34	MH35	0.20	0.90	1.10		0.20			0.00	0.10	0.00	0.00	0.50	0.10	0.95	17.3	18.0		81.0	**0.213**	49.30	600	0.30	**0.336**	1.19	0.69	63%
	F7	MH35	MH36	0.33	0.00	0.33		0.33			0.00	0.17	0.00	0.00	0.50	0.17	1.11	18.0	19.1		77.7	**0.240**	79.30	600	0.30	**0.336**	1.19	1.11	71%
	F8	MH36	MH37	0.06	0.00	0.06				0.06	0.00	0.00	0.00	0.05	0.90	0.05	1.16	19.1	19.6		76.5	**0.247**	32.60	600	0.30	**0.336**	1.19	0.46	74%
	F9	MH38	MH38-1	0.08	0.00	0.08		0.08			0.00	0.04	0.00	0.00	0.50	0.04	0.04	10.0	10.3		119.3	**0.013**	14.50	300	0.30	**0.053**	0.75	0.32	25%
	F10	MH38-1	MH38-1	0.41	0.08	0.49		0.41			0.00	0.21	0.00	0.00	0.50	0.21	0.25	10.3	11.7		109.2	**0.074**	72.80	375	0.30	**0.096**	0.87	1.40	77%
	F11	MH38	MH39	0.32	0.49	0.81		0.32			0.00	0.16	0.00	0.00	0.50	0.16	0.41	11.7	12.2		106.1	**0.119**	29.30	450	0.30	**0.156**	0.98	0.50	77%
	F12	MH39	MH40	0.21	0.00	0.21		0.21			0.00	0.11	0.00	0.00	0.50	0.11	0.51	12.2	12.7		103.4	**0.147**	29.80	525	0.30	**0.235**	1.09	0.46	62%
	F13	MH40	MH41	0.46	0.00	0.46		0.46			0.00	0.23	0.00	0.00	0.50	0.23	0.74	12.7	13.7		97.9	**0.201**	74.80	600	0.30	**0.336**	1.19	1.05	60%
	F14	MH33	MH41	0.11	0.46	0.57				0.11	0.00	0.00	0.00	0.10	0.90	0.10	0.84	13.7	14.8		93.0	**0.217**	75.00	600	0.30	**0.336**	1.19	1.05	65%
	F15	MH41	MH43	0.56	0.57	1.13		0.56			0.00	0.28	0.00	0.00	0.50	0.28	1.86	14.8	15.9		88.4	**0.457**	93.10	750	0.30	**0.610**	1.38	1.12	75%
	F16	MH43	MH44	0.31	0.00	0.31		0.31			0.00	0.16	0.00	0.00	0.50	0.16	2.01	15.9	16.4		86.5	**0.484**	41.40	750	0.30	**0.610**	1.38	0.50	79%
	F17	MH44	MH45	0.18	0.31	0.49		0.18			0.00	0.09	0.00	0.00	0.50	0.09	2.10	16.4	16.9		84.7	**0.495**	43.80	825	0.30	**0.786**	1.47	0.50	63%
	F18	MH38	MH47	0.29	0.49	0.78		0.29			0.00	0.15	0.00	0.00	0.50	0.15	0.15	10.0	11.4		111.6	**0.045**	70.90	375	0.30	**0.096**	0.87	1.36	47%
	F19	MH47	MH48	0.17	0.78	0.95		0.17			0.00	0.09	0.00	0.00	0.50	0.09	0.23	11.4	12.4		104.9	**0.067**	55.20	375	0.30	**0.096**	0.87	1.06	70%
	F20	MH48	MH49	0.19	0.95	1.14		0.19			0.00	0.10	0.00	0.00	0.50	0.10	0.51	12.4	13.0		101.8	**0.143**	35.40	525	0.30	**0.235**	1.09	0.54	61%
	F21	MH49	MH50	0.29	1.14	1.43		0.29			0.00	0.15	0.00	0.00	0.50	0.15	0.65	13.0	13.7		97.8	**0.177**	50.80	525	0.30	**0.235**	1.09	0.78	75%
	F22	MH42	MH50	0.44	1.02	1.46			0.44		0.00	0.00	0.33	0.00	0.75	0.33	0.33	10.0	11.3		112.0	**0.103**	77.00	450	0.30	**0.156**	0.98	1.31	66%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision: **Mayfield West** **CITY OFCe aledon** **FILE NUMBER** **W19174**
File No.: **REGION:21T-XX / CITY:CXX** **STORM DRAINAGE** **DATE** **November 21, 2023**
Consultant: **Candevcon Limited** **PREPARED BY** **SDL**
Drainage Area Plan: **STM 1-3**

WEST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up- stream	Down- stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	Capacity (m^3/sec)	Velocity (m/s)	Time (min)	% Full
	F23	MH50	MH51	0.27	1.46	1.73		0.27			0.00	0.14	0.00	0.00	0.50	0.14	1.12	13.7	14.3		94.9	**0.294**	46.50	675	0.30	**0.460**	1.29	0.60	64%

CANDEVCON GROUP INC.
CONSULTING ENGINEERS & PLANNERS

Subdivision:	**Mayfield West**	**CITY OFCe aledon**	**FILE NUMBER**	**W19174**
File No.:	**REGION:21T-XX / CITY:CXX**	**STORM DRAINAGE**	**DATE**	**November 21, 2023**
Consultant:	**Candevcon Limited**		**PREPARED BY**	**SDL**
Drainage Area Plan:	**STM 1-3**			

WEST SIDE

Park	0.25
Single/semi	0.50
Multiple/inst	0.75
Industrial	0.90
Roads	0.90

For 2-yr storm I_2 = 22.1* T ^ (-.714)
For 10-yr storm I_{10} = 35.1* T ^ (-.695)
For 100-yr storm I_{100} = 51.3* T ^ (-.686)

Core System	Area No.	Up-stream	Down-stream	Contributing Area (ha)			Breakdown of Areas				Area x Storm Co-eff				C	Total	Cummulative	Time (min)		I_2	I_{10}	FLOW Q= 2.78AC I/1000	PIPE						
		Node	Node	In Area	Control	Total	0.25	0.50	0.75	0.90	0.25	0.50	0.75	0.90		A x C	AxC	In Area	Total			Q_{design}	Length (m)	Size (mm)	Grade (%)	**Capacity (m^3/sec)**	Velocity (m/s)	Time (min)	% Full
	F24	MH51	MH52	0.31	1.73	2.04		0.31			0.00	0.16	0.00	0.00	0.50	0.16	1.27	14.3	14.9		92.6	**0.327**	40.60	675	0.30	**0.460**	1.29	0.53	71%
	F25	MH52	MH54					0.10			0.00	0.05	0.00	0.00	0.50	0.05	1.32	14.9	15.4		90.4	**0.332**	40.60	675	0.30	**0.460**	1.29	0.53	72%
	F26	MH45-2	MH45-1	0.31	0	0.31		0.31			0.00	0.16	0.00	0.00	0.50	0.16	0.16	10.0	11.3		112.3	**0.048**	65.40	375	0.30	**0.096**	0.87	1.25	50%
	F27	MH45-1	MH45	0.58	0.31	0.89		0.58			0.00	0.29	0.00	0.00	0.50	0.29	0.45	11.3	12.6		103.8	**0.128**	88.40	525	0.30	**0.235**	1.09	1.35	55%
	F28	MH45	MH57	0.17	0.89	1.06		0.17			0.00	0.09	0.00	0.00	0.50	0.09	2.63	12.6	13.0		101.7	**0.745**	34.40	900	0.30	**0.991**	1.56	0.37	75%
	F29	MH56	MH55	0.65	1.06	1.71		0.65			0.00	0.33	0.00	0.00	0.50	0.33	0.33	13.0	14.3		95.3	**0.086**	76.10	450	0.30	**0.156**	0.98	1.29	55%
	F30	MH55	MH54	0.40	3.75	4.15		0.40			0.00	0.20	0.00	0.00	0.50	0.20	0.53	14.3	14.9		92.3	**0.135**	37.90	525	0.30	**0.235**	1.09	0.58	57%
	F31	MH54	MH48	0.36	4.15	4.51		0.36			0.00	0.18	0.00	0.00	0.50	0.18	0.71	14.9	15.4		90.3	**0.177**	37.90	600	0.30	**0.336**	1.19	0.53	53%

APPENDIX C

GEOTECHNICAL REPORT

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
100 NUGGET AVENUE, TORONTO, ONTARIO M1S 3A7 • TEL: (416) 754-8515 • FAX: (416) 754-8516

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (416) 754-8516	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

A REPORT TO
BROOKVALLEY DEVELOPMENTS INC.

A SOIL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

PART OF LOT 21, CONCESSION 1 WHS
OLD SCHOOL ROAD AND HURONTARIO STREET

TOWN OF CALEDON

Reference No. 1408-S018

NOVEMBER 2014

DISTRIBUTION

3 Copies - Brookvalley Developments Inc.
1 Copy - Soil Engineers Ltd. (Mississauga)
1 Copy - Soil Engineers Ltd. (Toronto)

TABLE OF CONTENTS

TABLES

DIAGRAM

ENCLOSURES

1.0 INTRODUCTION

In accordance with written authorization dated August 8, 2014, from Mr. Paul Mondell of Brookvalley Developments Inc., a soil investigation was carried out at a parcel of land at Old School Road and Hurontario Street, in the Town of Caledon, for a proposed Residential Development.

The purpose of the investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the design and construction of the proposed project.

The geotechnical findings and resulting recommendations are presented in this Report.

2.0 **SITE AND PROJECT DESCRIPTION**

The site is situated on Halton-Peel till plain where the drift dominates the soil stratigraphy. In places, the till has been reworked by the water action of Peel Ponding (glacial lake) and the depositing lacustrine sand, silt, clay and reworked till.

The investigated site, irregular in shape, is located at Old School Road and Hurontario Street in the Town of Caledon. The investigated site is a farm field and the area is generally grass-covered with trees. The ground surface is relatively level with some undulations.

It is understood that the proposed project will consist of the construction of a new residential development with municipal services and roadways meeting the municipal standards.

3.0 **FIELD WORK**

The field work, consisting of 12 boreholes to depths of 6.3 m and 6.6 m, was performed on August 25, 26 and 27, 2014, at the locations shown on the Borehole Location Plan and Subsurface Profile, Drawing No. 1.

The holes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed “List of Abbreviations and Terms”, were performed at the sampling depths. The test results are recorded as the Standard Penetration Resistance (or ‘N’ values) of the subsoil. The relative density of the granular strata and the consistency of the cohesive strata are inferred from the ‘N’ values. Split-spoon samples were recovered for soil classification and laboratory testing.

The field work was supervised and the findings recorded by a Geotechnical Technician.

The geodetic elevation at each of the borehole locations was obtained by Soil Engineers Ltd. using the Global Navigation Satellite System (GNSS).

4.0 **SUBSURFACE CONDITIONS**

Detailed descriptions of the encountered subsurface conditions are presented on the Borehole Logs, comprising Figures 1 to 12, inclusive. The revealed stratigraphy is plotted on the subsurface profile on Drawing No. 1, and the engineering properties of the disclosed soils are discussed herein.

The investigation has disclosed that beneath a veneer of topsoil, the site is underlain by strata of silty clay, silty clay till, silt, sandy silt, silty sand till and silty fine sand at various depths and locations.

4.1 **Topsoil** (All Boreholes)

The revealed topsoil ranges from 15 to 36 cm thick. It is dark brown in colour, indicating that it contains appreciable amounts of roots and humus. These materials are unstable and compressible under loads; therefore, the topsoil is considered to be void of engineering value. Due to its humus content, it may produce volatile gases and generate an offensive odour under anaerobic conditions. Therefore, the topsoil must not be buried below any structures or deeper than 1.2 m below the finished grade, so that it will not have an adverse impact on the environmental well-being of the developed areas.

Since the topsoil is considered void of engineering value, it can only be used for general landscaping and landscape contouring purposes. A fertility analysis can determine the suitability of the topsoil as a planting material.

4.2 **Silty Clay** (All Boreholes, except Boreholes 2, 4 and 9)

The silty clay was encountered at various depths and extends to the maximum investigated depth at Borehole 11. The clay is laminated with sand and silt seams and layers, showing that it is a glaciolacustrine deposit. The clay deposit is weathered to depths of 0.7 m and 1.4 m below the prevailing ground surface.

The obtained ‘N’ values range from 7 to 23, with a median of 14 blows per 30 cm of penetration, indicating that the consistency of the clay is firm to very stiff, being generally stiff. The firm clay is restricted to the weathered zone of the clay stratum.

The Atterberg Limits of 2 representative samples and the water content values of the samples were determined. The results are plotted on the Borehole Logs and summarized below:

Liquid Limit	50% and 53%
Plastic Limit	25% and 26%
Natural Water Content	12% to 34% (median 21%)

The above results show that the clay is a cohesive material with medium plasticity. The natural water content values generally ranges from below its plastic limits to between its plastic and liquid limits, confirming the generally stiff consistency of the clay as determined from the ‘N’ values.

Grain size analyses were performed on 2 representative samples of the silty clay; the results are plotted on Figure 13.

Based on the above findings, the following engineering properties are deduced:

- High frost susceptibility and high soil-adfreezing potential.
- Low water erodibility.
- Low permeability, with an estimated coefficient of permeability of 10^{-7} to 10^{-8} cm/sec, an estimated percolation rate of 80 to 100+ min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- A cohesive-frictional soil, its shear strength is derived from consistency and augmented by the internal friction of the silt. Its shear strength is moisture dependent.
- In excavation, the clay will be prone to sloughing if it is exposed for prolonged periods in steep cuts. This would generally be initiated by infiltrating precipitation or groundwater seeping out from the silt and fine sand layers.
- A very poor pavement-supportive material, with an estimated California Bearing Ratio (CBR) value of 3% or less.
- Moderately high corrosivity to buried metal, with an estimated electrical resistivity of 3500 ohm·cm.

4.3 **Silty Clay Till** (All Boreholes, except Borehole 6)

The silty clay till was encountered at various depths and extends to the maximum investigated depth at Boreholes 3, 5, 7 and 9. It consists of a random mixture of soils; the particle sizes range from clay to gravel, with the clay fraction exerting the dominant influence on its soil properties. Occasional sand and silt seams and layers were also detected in the clay till mantle. The till is heterogeneous in structure, indicating that it is a glacial deposit. The clay till layer is weathered to a depth of 0.7 m in Borehole 4.

The obtained ‘N’ values range from 7 blows per 30 cm to 50 blows per 8 cm, with a median of 30 blows per 30 cm, indicating that the consistency of the clay till is firm to hard, being generally very stiff. The firm clay till occurred in the weathered zone of the till stratum.

Hard resistance was encountered during augering, showing that the till is embedded with cobbles and boulders.

The Atterberg Limits of 4 representative samples and the natural water content values of the samples were determined; the results are plotted on the Borehole Logs and summarized below:

Liquid Limit	23%, 24% and 27%
Plastic Limit	14%, 15% and 16%
Natural Water Content	8% to 27% (median 13%)

The results show that the clay till is a cohesive material with low plasticity. The natural water content values generally range from below its plastic limits to close to its liquid limits, confirming the generally very stiff consistency of the till as determined by the ‘N’ values. The low ‘N’ values and high moisture content occurred in the weathered zone of the till stratum.

Grain size analyses were performed 4 representative samples of the silty clay till. The results are plotted on Figure 14.

Based on the findings, the engineering properties related to the project are as follows:

- High frost susceptibility, with low water erodibility.
- Low permeability, with an estimated coefficient of permeability of 10^{-7} cm/sec, an estimated percolation rate of 80+ min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- A cohesive soil, its shear strength is primarily derived from consistency which is inversely related to its moisture content. It contains sand; therefore, its shear strength is augmented by internal friction.
- It will generally be stable in a relatively steep cut; however, prolonged exposure will allow the fissures in the weathered zone and the wet sand and silt seams and layers to become saturated, which may lead to localized sloughing.
- A very poor pavement-supportive material, with an estimated CBR value of 3% or less.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4000 ohm·cm.

4.4 **Silt** (Boreholes 1, 2, 6, 8, 9, 10 and 12)

The silt deposit was encountered at various depths and extends to the maximum investigated depth at Boreholes 2, 6, 8, 10 and 12. The silt is embedded with seams and layers of silty clay and fine sand, and it contains a variable amount of clay. The laminated structure shows that the silt is a glaciolacustrine deposit. The silt layer in Borehole 2 is weathered to a depth of 1.4 m.

The natural water content values of the silt samples range from 12% to 23%, with a median of 18%, indicating it is in a damp to wet, generally wet condition. The wet samples are water bearing and became highly dilatant under tactile examinations, showing the shear strength of the silt will be subject to dynamic disturbance.

The obtained ‘N’ values range from 13 blows per 30 cm to 50 blows per 10 cm, with a median of 39 blows per 30 cm, indicating that the relative density of the silt is compact to very dense, being generally dense.

Grain size analyses were performed on 2 representative samples and the results are plotted on Figure 15.

Based on the above findings, the engineering properties relating to the project are given below:

- Highly frost susceptible, with high soil-adfreezing potential.
- Highly water erodible; it is susceptible to migration through small openings under seepage pressure.
- Relatively pervious to impervious, with an estimated coefficient of permeability of 10^{-4} to 10^{-5} cm/sec, depending on the clay content, an estimated percolation rate of 40 to 60 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.07 to 0.11
2% - 6%	0.12 to 0.16
6% +	0.18 to 0.23

- The soil has a high capillarity and water retention capacity.
- A frictional soil, its shear strength is density dependent. Due to the dilatancy, the strength of the wet silt is susceptible to impact disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In excavation, the moist silt will be stable in relatively steep cuts, while the wet silt will slough and run slowly with seepage bleeding from the cut face, and the bottom will boil under a piezometric head of 0.3 m.
- A poor pavement-supportive material, with an estimated CBR value of 6%.
- Moderate corrosivity to buried metal, with an estimated electrical resistivity of 4500 ohm·cm.

4.5 **Sandy Silt** (Boreholes 7 and 9)

The sandy silt layer was encountered below a layer of silty clay till in Borehole 7 and beneath a topsoil layer in Borehole 9. Occasional silty fine sand and silt seams and layers were found laminated in the sandy silt. The laminated structure shows that the sandy silt is a lacustrine deposit. The sandy silt layer in Borehole 9 has been weathered.

The obtained ‘N’ values are 12 and 32 blows per 30 cm, showing the relative density of the sandy silt is compact to dense.

The natural water content of the samples was determined, and the results are plotted on the Borehole Logs. The values are 12% and 25%, showing the sandy silt deposit is in a wet condition. The wet sandy silt is water bearing.

A grain size analysis was performed on one of the samples and the result is plotted on Figure 16.

Accordingly, the following engineering properties are deduced:

- Highly frost susceptible with high soil-adfreezing potential.
- Highly water erodible.
- A soil of high capillarity and water retention capability.
- Relatively impervious, with an estimated coefficient of permeability of 10^{-4} to 10^{-5} cm/sec, an estimated percolation rate of 20 to 35 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.07 to 0.11
2% - 6%	0.12 to 0.16
6% +	0.18 to 0.23

- A frictional soil, its shear strength is derived from internal friction and is density dependent. Due to its dilatancy, the shear strength of the wet sandy silt is susceptible to impact disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction of shear strength.
- In relatively steep cuts, the sandy silt will be stable in a damp to moist condition, but will slough if it is wet, run with water seepage and boil with a piezometric head of 0.3 m.
- A fair pavement-supportive material, with an estimated CBR value of 10%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.6 **Silty Sand Till** (Boreholes 1 and 4)

The silty sand till was encountered at the lower stratigraphy and extends to the maximum investigated depth at both boreholes. The till consists of a random mixture of soil particle sizes ranging from clay to gravel, with the sand being the dominant fraction. It is heterogeneous in structure, showing that it is a glacial deposit.

Frequent hard resistance to augering was encountered, showing that appreciable amounts of cobbles and boulders are embedded in the sand till. It should be noted that the size of the boulders in the till may be large.

The natural water content values of the samples were determined, and the results are plotted on the Borehole Logs; the values range from 8% to 15%, with a median of 10%, showing the sand till is in a moist to wet, generally wet condition.

The obtained ‘N’ values range from 39 blows per 30 cm to 50 blows per 10 cm, with a median of 49 blows per 30 cm, showing that its relative density is dense to very dense, being generally dense.

Grain size analyses were performed on 2 representative samples and the results are plotted on Figure 17.

The deduced engineering properties pertaining to the project are given below:

- High frost susceptibility and moderately high water erodibility.
- Moderately pervious to impervious, depending on the clay content, with an estimated coefficient of permeability of 10^{-4} to 10^{-5} cm/sec, an estimated percolation rate of about 25 to 45 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.07 to 0.11
2% - 6%	0.12 to 0.16
6% +	0.18 to 0.23

- A frictional soil, its shear strength is primarily derived from internal friction and is augmented by cementation. Therefore, its strength is density dependent.
- It will be stable in steep cuts; however, under prolonged exposure, immediate sloughing and sheet collapse will likely occur, particularly where seepage occurs.
- A fair pavement-supportive material, with an estimated CBR value of 8%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.7 **Silty Fine Sand** (Borehole 2)

The sand deposit was encountered beneath a topsoil layer and sample examination shows that it is non-cohesive. The laminated structure shows the deposit was derived from a lacustrine environment. The sand layer is weathered.

The obtained ‘N’ value is 8 blows per 30 cm; therefore, the relative density of the sand is loose.

The natural water content was determined and the result is plotted on the Borehole Log. The value is 10%, showing that the sand deposit is in a damp condition.

Accordingly, the following engineering properties are deduced:

- Highly frost susceptible with high soil-adfreezing potential.
- Highly water erodible.
- Relatively pervious, with an estimated coefficient of permeability of 10^{-4} cm/sec, an estimated percolation rate of 20 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.07
2% - 6%	0.12
6% +	0.18

- A frictional soil, its shear strength is derived from internal friction and is density dependent. Due to its dilatancy, the shear strength of the wet sand is susceptible to impact disturbance; i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction of shear strength.
- In relatively steep cuts, the sand will be stable in a damp to moist condition, but will slough if it is wet and run with water seepage. The bottom will boil under a piezometric head of 0.3 m.
- A fair material to support pavement, with an estimated CBR value of at least 8%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.8 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction of the on-site material is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied.

As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Silty Clay	12 to 34 (median 21)	25	21 to 30
Silty Clay Till	8 to 27 (median 13)	16	12 to 21
Silt	12 to 23 (median 18)	13	8 to 17
Sandy Silt	12 and 25	12	8 to 16
Silty Sand Till	8 to 15 (median 10)	10	6 to 15
Silty Fine Sand	10	11	6 to 16

Based on the above findings, the silty sand till and silty fine sand, the majority of the silty clay and silty clay till, and a portion of the sandy silt are generally suitable for a 95% or + Standard Proctor compaction. However, some of the clays, most of the silt and a portion of the sandy silt are too wet; these soils will require aeration or mixing with drier soils prior to structural compaction. Aeration of the wet soils can be effectively carried out by spreading them thinly on the ground in the dry, warm weather. In addition, portions of the clay and clay till are too dry and will require wetting or mixing with wetter soils.

The silty clay and tills should be compacted using a heavy-weight, kneading-type roller. The silts and sand can be compacted by a smooth roller with or without vibration, depending on the water content of the soil being compacted. The lifts for compaction should be limited to 20 cm, or to a suitable thickness as assessed by test strips performed by the equipment which will be used at the time of construction.

When compacting the very dense and hard tills on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soils and be transmitted laterally in the soil mantle. Therefore, the lifts of these soils must be limited to 20 cm or less (before compaction). It is difficult to monitor the lifts of backfill placed in deep trenches; therefore, it is preferable that the compaction of backfill at depths over 1.0 m below the pavement subgrade be carried out on the wet side of the optimum. This would allow a wider latitude of lift thickness.

One should be aware that, with considerable effort, a 90%± Standard Proctor compaction of the wet silts is achievable. Further densification is prevented by the pore pressure induced by the compactive effort; however, large random voids will have been expelled and, with time, the pore pressure will dissipate and the percentage of compaction will increase. There are many cases on record where, after a few months of rest, the density of the compacted mantle has increased to over 95% of its maximum Standard Proctor dry density.

If the compaction of the soils is carried out with the water content within the range for 95% Standard Proctor dry density but on the wet side of the optimum, the surface of the compacted soil mantle will roll under the dynamic compactive load. This is unsuitable for pavement construction since each component of the pavement structure is to be placed under dynamic conditions which will induce the rolling action of the subgrade surface and cause structural failure of the new pavement. The foundation or bedding of the sewer and slab-on-grade will be placed on a subgrade which will not be subjected to impact loads. Therefore, the structurally compacted soil mantle with the water content on the wet side or dry side of the optimum will provide an adequate subgrade for the construction.

The presence of boulders in the tills will prevent transmission of the compactive energy into the underlying material to be compacted. If an appreciable amount of boulders over 15 cm in size is mixed with the material, it must either be sorted or must not be used for structural backfill and/or in the construction of engineered fill.

5.0 GROUNDWATER CONDITIONS

Groundwater seepage encountered during augering was recorded on the field logs. The level of groundwater and the occurrence of cave-in were measured upon completion of the boreholes; the data are plotted on the Borehole Logs and listed in Table 2.

Table 2 - Groundwater Levels

	Borehole	Soil Colour Changes Brown to Grey	Seepage Encountered During Augering		Measured Groundwater/ Cave-In* Level On Completion	
BH No.	**Depth (m)**	**Depth (m)**	**Depth (m)**	**Amount**	**Depth (m)**	**El (m)**
1	6.6	3.0	2.2	Some	3.4/2.4*	260.0/261.0*
2	6.6	4.0	0.4	Some	4.9/5.5*	257.7/257.1*
3	6.3	2.3	-	-	5.8	256.2
4	6.6	3.2	-	-	Dry	-
5	6.6	4.0	-	-	Dry	-
6	6.6	3.3	0.8	Slight	2.7/3.0*	257.0/256.7*
7	6.6	3.0	-	-	5.2/5.5*	254.1/253.8*
8	6.6	3.0	-	-	Dry	-
9	6.6	3.0	2.2	Some	3.4/3.0*	258.1/258.5*
10	6.6	3.0	1.0	Slight	5.8/5.5*	254.0/254.3*
11	6.6	4.0	1.0	Slight	Dry	-
12	6.6	4.0	0.4	Slight	Dry	-

* Cave-in level (In the wet sand and silt layers, the level generally represents the groundwater regime at the borehole location.)

Groundwater was measured and/or cave-in occurred at depths ranging from 2.4 to 5.8 m below the prevailing ground surface in the majority of the boreholes. The detected groundwater generally represents the groundwater regime of the site at the time of the investigation and will be subject to seasonal fluctuation.

The groundwater yield from the silty clay and tills, due to their low to relatively low permeability, will be small and limited. The yield of groundwater from the silts and sand, if encountered, will be moderate to appreciable and persistent.

6.0 DISCUSSION AND RECOMMENDATIONS

The findings from the boreholes have revealed that beneath a veneer of topsoil, the site is underlain by strata of firm to very stiff, generally stiff silty clay, firm to hard, generally very stiff silty clay till, compact to very dense, generally dense silt, compact to dense sandy silt, dense to very dense, generally dense silty sand till and loose silty fine sand at various depths and locations. The surficial soil layers are generally weathered to depths of 0.7 m or 1.4 m below the prevailing ground surface, and the weathered soils are generally loose or firm.

Groundwater was measured and/or cave-in occurred at depths ranging from 2.4 to 5.8 m below the prevailing ground surface in the majority of the boreholes. The detected groundwater generally represents the groundwater regime of the site at the time of the investigation and will fluctuate with the seasons.

The groundwater yield from the silty clay and tills, due to their low to relatively low permeability, will be small and limited. The yield of groundwater from the silts and sand, if encountered, will be moderate to appreciable and persistent.

The geotechnical findings which warrant special consideration are presented below:

1. The topsoil must be stripped for the project construction. This material will generate volatile gases under anaerobic conditions and is unsuitable for engineering applications. Therefore, this material should be placed in the landscaped areas only and should not be buried within the building envelope, or deeper than 1.2 m below the exterior finished grade of the project. A fertility test must be carried out to assess its suitability as landscaping material.
2. The sound natural soils below the topsoil and weathered soils are suitable for normal spread and strip footing construction. Due to the presence of topsoil

and weathered soils, the footing subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, or a building inspector who has geotechnical experience, to ensure that its condition is compatible with the design of the foundation.

3. For basement construction, perimeter subdrains and dampproofing of the foundation walls will be required. Where groundwater seepage occurs at a shallow depth, floor subdrains should also be installed. All the subdrains must be encased in a fabric filter to protect them against blockage by silting and must be connected to a positive outlet. This can be assessed at the time of construction.
4. Due to the occurrence of shallow groundwater in some areas, it is recommended that the basement level, if there is one, should remain at least 0.5 m above the detected groundwater level. To provide a dry floor, subdrains consisting of filter-wrapped weepers must be installed beneath the floor slabs and connected to a positive outlet. A vapour barrier must be placed in the granular base of the floor above the crown of the subdrain.
5. For slab-on-grade construction, the slab should be placed on relatively sound soils or properly compacted earth fill. Prior to the slab construction, the subgrade must be proof-rolled and inspected. Any weathered or soft soils detected must be subexcavated and replaced with inorganic material compacted to 98% or + Standard Proctor dry density.
6. A Class ‘B bedding, consisting of compacted 20-mm Crusher-Run Limestone, is recommended for the construction of the underground services. Where water-bearing silts occur, the sewer joints should be leak-proof, or wrapped with an appropriate waterproof membrane, to prevent subgrade migration. If subgrade stabilization is required, the stone immersion technique may be applied. In areas where more extensive dewatering is required for sewer construction, a Class ‘A’ bedding should be considered.

7. Some of the soils are highly frost susceptible, with high soil-adfreezing potential. Where these soils are used to backfill against foundation walls, special measures must be incorporated into the building construction to prevent serious damage due to soil adfreezing.
8. The tills contain occasional boulders and cobbles. Boulders over 15 cm in size must not be used for structural backfill. Excavation into the till containing boulders will require extra effort and the use of a heavy-duty backhoe.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 **Foundations**

Based on the borehole findings, it is recommended that the normal spread and strip footings for the proposed project must be placed below the topsoil and weathered soils onto the sound natural native soils; a Maximum Allowable Soil Pressure (SLS) of 150 kPa and a Factored Ultimate Soil Bearing Pressure (ULS) of 250 kPa can be used for the design of the normal spread and strip and foundations at a founding depth of 1.0± m below the prevailing ground surface.

The recommended soil pressures (SLS) for normal foundations incorporate a safety factor of 3. The total and differential settlements of the foundations are estimated to be 25 mm and 15 mm, respectively.

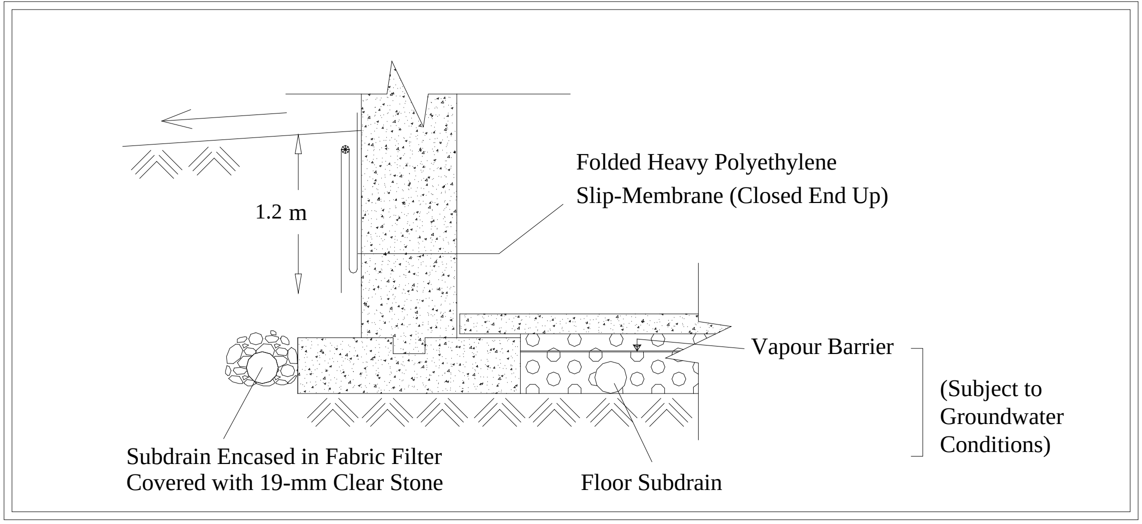
The foundations exposed to weathering and in unheated areas should have at least 1.2 m of earth cover for protection against frost action, or must be properly insulated.

To ensure that the condition of the subgrade is compatible with the foundation design requirements, the footing subgrade of the normal foundations must be inspected by a geotechnical engineer, or a technician under the supervision of a geotechnical engineer, or a building inspector who has geotechnical experience.

Due to the occurrence of groundwater at shallow depths at some areas, it is recommended that the basement level should remain at least 0.5 m above the detected groundwater level. In areas where groundwater seepage occurs at a shallow depth, or in the areas affected by artesian water, floor subdrains consisting of filter-wrapped weepers must be installed beneath the floor slabs and connected to a positive outlet. A vapour barrier must be placed in the granular base of the floor above the crown of the subdrain. Should the basement level be placed below the groundwater regime, waterproofing will be required and the basement must be designed to resist hydrostatic pressure and uplift, which will be costly and difficult to construct. Otherwise, the groundwater is to be properly controlled to ensure that it will be below the basement level at all times.

Some of the occurring soils are high in frost heave and soil-adfreezing potential. If these soils are to be used for the foundation backfill, the foundation walls should be shielded by a polyethylene slip-membrane for protection against soil adfreezing. The membrane will allow vertical movement of the heaving soil (due to frost) without imposing structural distress on the foundations. The recommended measures are schematically illustrated in Diagram 1.

Diagram 1 - Frost Protection Measures (Foundations)



The necessity to implement the above recommendations should be further assessed by a geotechnical engineer at the time of construction.

The foundations must meet the requirements specified by the latest Ontario Building Code, and the buildings must be designed to resist a minimum earthquake force using Site Classification ‘D’ (stiff soil).

6.2 **Engineered Fill**

Where earth fill is required to raise the site or where extended footings are necessary for foundation construction, the engineering requirements for a certifiable fill for road construction, municipal services, slab-on-grade, and footings designed with a Maximum Allowable Soil Pressure (SLS) of 150 kPa and a Factored Ultimate Soil Bearing Pressure (ULS) of 250 kPa for normal footings are presented below:

1. The topsoil must be removed.
2. The weathered and loose or firm soils must be subexcavated, and the subgrade must be inspected and proof-rolled prior to any fill placement.
3. Inorganic soils must be used for filling. The fill should be free of topsoil inclusions or other deleterious materials. It must be uniformly compacted in lifts 20 cm thick to 98% or + of their maximum Standard Proctor dry density up to the proposed finished grade. The soil moisture must be properly controlled on the wet side of the optimum.
4. If imported fill is to be used, the hauler is responsible for its environmental quality and must provide a document to certify that the material is free of hazardous contaminants.
5. If the house foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% of the maximum Standard Proctor compaction.
6. If the engineered fill is to be left over the winter months, adequate earth cover or equivalent must be provided for protection against frost action.
7. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors. Foundations partially on engineered fill must be reinforced by two 15-mm steel reinforcing bars in the footings and upper section of the foundation walls, or be designed by a structural engineer, to properly distribute the stress induced by the abrupt differential settlement (about 15 mm) between the natural soil and engineered fill.
8. The engineered fill must not be placed during the period from late November to early April when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.

9. Where the fill is to be placed on a bank steeper than 1 vertical:3 horizontal, the face of the bank must be flattened to 3 + so that it is suitable for safe operation of the compactor and the required compaction can be obtained.
10. Where the ground is wet due to subsurface water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement, particularly if it is to be carried out on sloping ground.
11. The fill operation must be inspected on a full-time basis by a technician under the direction of a geotechnical engineer.
12. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that supervised the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
13. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.
14. Despite stringent control in the placement of the engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the strip footings and the upper section of the foundation walls constructed on the engineered fill may require continuous reinforcement with steel bars, depending on the uniformity of the soils in the engineered fill and the thickness of the engineered fill underlying the foundations. Should the footings and/or walls require reinforcement, the required number and size of reinforcing bars must be assessed by considering the uniformity as well as the thickness of the engineered fill beneath the foundations. In sewer

construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.3 Slab-On-Grade

For slab-on-grade construction, the subgrade must consist of sound natural soils, or properly compacted inorganic soils, to at least 98% of its maximum Standard Proctor dry density. The slab should be constructed on a granular base, 20 cm thick, consisting of 20-mm Crusher-Run Limestone, or equivalent, compacted to its maximum Standard Proctor dry density.

The sound natural soils are suitable for slab-on-grade construction. The weathered soils should be aerated and surface compacted for slab-on-grade construction.

A Modulus of Subgrade Reaction of 25 MPa/m is recommended for the design of the floor slab.

The ground around the building must be graded to direct water away from the structure to minimize the frost heave phenomenon generally associated with the disclosed soils.

6.4 Garages, Driveways, Sidewalks and Interlocking Stone Pavement

The driveways at the entrances to the garages should be backfilled with non-frost-susceptible granular material, with a frost taper at a slope of 1 vertical:1 horizontal.

Interlocking stone pavement in areas which are sensitive to frost-induced ground movement, such as entrances, must be constructed on a free-draining, non-frost-susceptible granular material such as Granular ‘B’. The material must extend to

1.2 m below the slab or pavement surface and be provided with positive drainage such as weeper subdrains connected to manholes or catch basins. Alternatively, the sidewalks and the interlocking stone pavement should be properly insulated with 50-mm Styrofoam, or equivalent, as approved by a geotechnical engineer.

The grading around the structures must be sloped such that surface runoff is directed away from the structures.

6.5 **Underground Services**

The subgrade for the underground services should consist of natural soils or compacted organic-free earth fill. Where topsoil, loose/firm and badly weathered soils are encountered, these materials must be subexcavated and replaced with properly compacted bedding material.

A Class ‘B bedding, consisting of compacted 20-mm Crusher-Run Limestone, is recommended for the construction of the underground services. Where the services are constructed in water-bearing silts, the pipe joints should be leak-proof or wrapped with an appropriate waterproof membrane to prevent subgrade migration. If subgrade stabilization is required, the stone immersion technique may be applied. In areas where more extensive dewatering is required for sewer construction, a Class ‘A’ bedding should be considered.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover with a thickness equal to the diameter of the pipe should be in place at all times after completion of the pipe installation.

Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

Since the silty clay has moderately high corrosivity to buried metal, the water main should be protected against corrosion. In determining the mode of protection, an electrical resistivity of 3500 ohm·cm should be used. This, however, should be confirmed by testing the soil along the water main alignment at the time of sewer construction.

6.6 **Trench Backfilling**

The on-site inorganic soils are suitable for trench backfill. In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% of its maximum Standard Proctor dry density with the moisture content 2% to 3% drier than the optimum. In the lower zone, a 95% or + Standard Proctor compaction is considered to be adequate; however, the material must be compacted on the wet side of the optimum.

In normal underground services construction practice, the problem areas of road settlement largely occur adjacent to manholes, catch basins, services crossings, foundation walls and columns, and it is recommended that a sand backfill be used.

The narrow trenches should be cut at 1 vertical:2 or + horizontal so that the backfill can be effectively compacted. Otherwise, soil arching will prevent the achievement of proper compaction. The lift of each backfill layer should either be limited to a thickness of 20 cm, or the thickness should be determined by test strips.

One must be aware of the possible consequences during trench backfilling and exercise caution as described below:

- When construction is carried out in freezing winter weather, allowance should be made for the following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in situ soils have a water content on the dry side of the optimum, it would be impossible to wet the soils due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as in a narrow vertical trench section, or when the trench box is removed. The above will invariably cause backfill settlement that may become evident within 1 to several years, depending on the depth of the trench which has been backfilled.

- In areas where the underground services construction is carried out during winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement and the slab-on-grade construction.
- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1 vertical: 1.5 + horizontal, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% of the maximum Standard Proctor dry density, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand. In a trench stabilized by a trench box, the void left after the removal of the box will be filled by the backfill. It is necessary to backfill this sector with sand, and the compacted backfill must be flooded for 1 day, prior to the placement of the backfill above this sector,

i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section. In areas where groundwater movement is expected in the sand fill mantle, seepage collars should be provided.

6.7 Pavement Design

Based on the borehole findings, the recommended pavement design for local roads is presented in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL-3
Asphalt Binder	65	HL-8
Granular Base	150	20-mm Crusher-Run Limestone or equivalent
Granular Sub-base		50-mm Crusher-Run Limestone or equivalent
Local	300	
Minor Collector	400	

In preparation of the subgrade, the final graded subgrade surface should be proof-rolled; any soft spots, topsoil and deleterious materials within 1.0 m below the underside of the granular sub-base should be subexcavated and replaced by properly compacted organic-free earth fill. It is necessary to provide a subgrade consisting of uniform material to minimize any differential heaving during the freezing and thawing seasons.

All the granular bases should be compacted to their maximum Standard Proctor dry density.

In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% of its maximum Standard Proctor dry density, with the water content 2% to 3% drier than the optimum. In the lower zone, a 95% or + Standard Proctor compaction is considered adequate.

The road subgrade will suffer a strength regression if water is allowed to infiltrate prior to paving. The following measures should therefore be incorporated into the construction procedures and road design:

- If the road construction does not immediately follow the trench backfilling, the subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.
- Lot areas adjacent to the roads should be properly graded to prevent the ponding of large amounts of water during the interim construction period.
- Curb subdrains will be required. The subdrains should consist of filter-sleeved weepers to prevent blockage by silting.
- If the roads are to be constructed during the wet seasons and extensively soft subgrade occurs, the granular sub-base may require thickening. This can be assessed during construction.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor			
	Unit Weight (kN/m^3)	**Estimated Bulk Factor**	
	Bulk	**Loose**	**Compacted**
Weathered Soils	21.0	1.20	1.00
Silty Clay and sound Tills	22.0	1.33	1.05
Silts and Sand	22.0	1.30	1.02
Lateral Earth Pressure Coefficients			
	Active K_a	**At Rest K_o**	**Passive K_p**
Weathered Soils	0.45	0.55	2.22
Silty Clay and sound Tills	0.40	0.50	2.50
Silts and Sand	0.35	0.45	2.86

6.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91.

Excavations in excess of 1.2 m should be sloped at 1 vertical:1 horizontal for stability.

Excavation into the tills containing boulders will require extra effort and the use of a heavy-duty, properly equipped backhoe.

For excavation purposes, the types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Sound Tills	2
Silty Clay, weathered Soils, Silts and Sand above groundwater	3
Silts and Sand below groundwater	4

The groundwater yield from the silty clay and tills, due to their low to relatively low permeability, will be small, if any, and can be controlled by pumping from sumps. However, the yield from the silts and sand will likely be moderate to appreciable and persistent; it should be controlled by vigorous pumping from closely spaced sumps or, if necessary, the use of a well-point dewatering system should be considered.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to at least 1.0 m below the intended bottom of excavation. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

It should be noted that Phase One Environmental Site Assessment has been carried out, and the results and assessment were presented under separate cover, Reference No. 1408-S018E, dated September 24, 2014. Therefore, this report deals only with a study of the geotechnical aspects of the proposed project.

This report was prepared by Soil Engineers Ltd. for the account of Brookvalley Developments Inc., and for review by its designated consultants and government agencies. The material in it reflects the judgement of Frank Lee, P.Eng., and Daniel Man, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

Frank Lee, P.Eng.

F. K. LEE
26094506

Daniel Man
Daniel Man, P.Eng.
FL/DM:dd

D.S.C. MAN
28853117
NOV 12/2014

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—●—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test
□	Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres

1lb = 0.454 kg

1 inch = 25.4 mm

1ksf = 47.88 kPa

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 1

FIGURE NO: 1

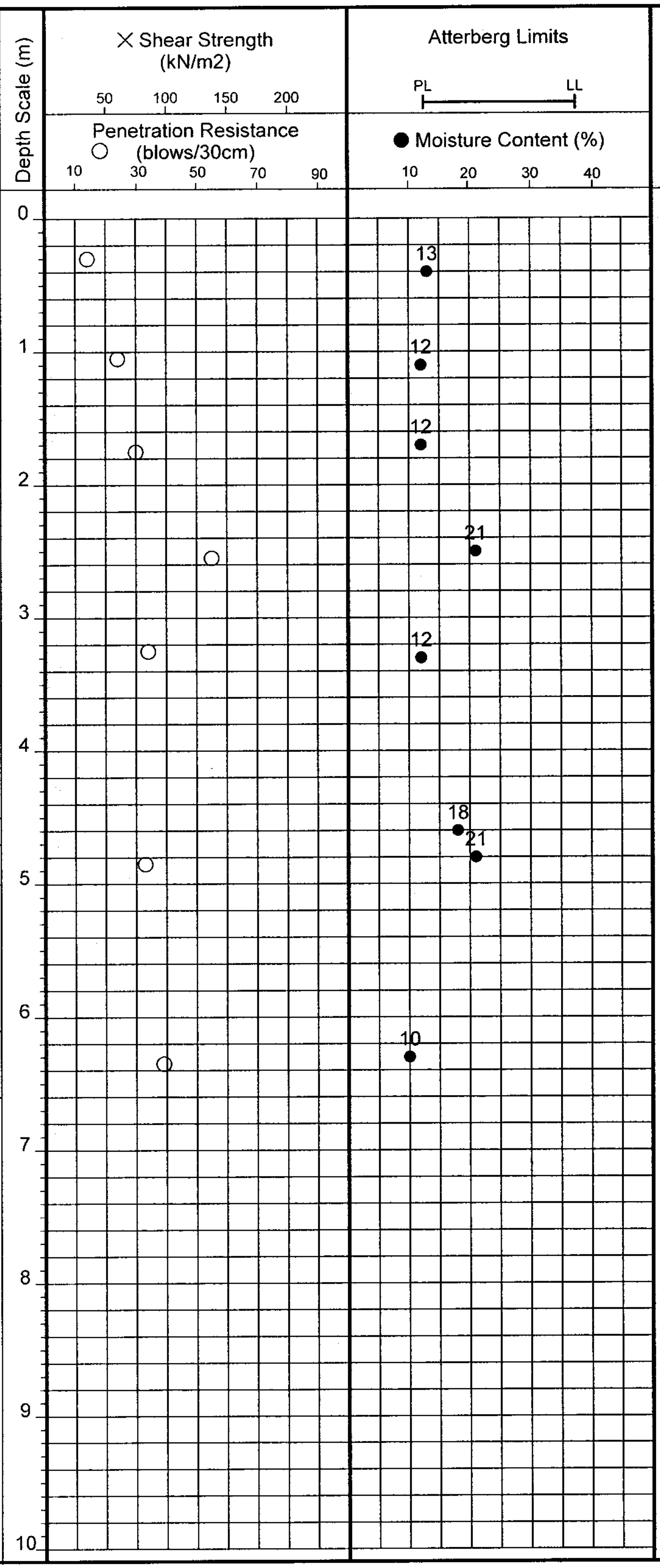
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 25, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
263.4	**18 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	14
0.7 262.7	Brown, very stiff **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2 3	DO DO	24 30
2.1 261.3	Dense to very dense **SILT** brown grey	4 5 6A 6B	DO DO DO DO	55 34 - 33
5.2 258.2	Grey, dense **SILTY SAND, Till** occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	39
6.6 256.8	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 260.0 m on completion
Cave-in @ El. 261.0 m on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 2

FIGURE NO: 2

JOB DESCRIPTION: Proposed Residential Development

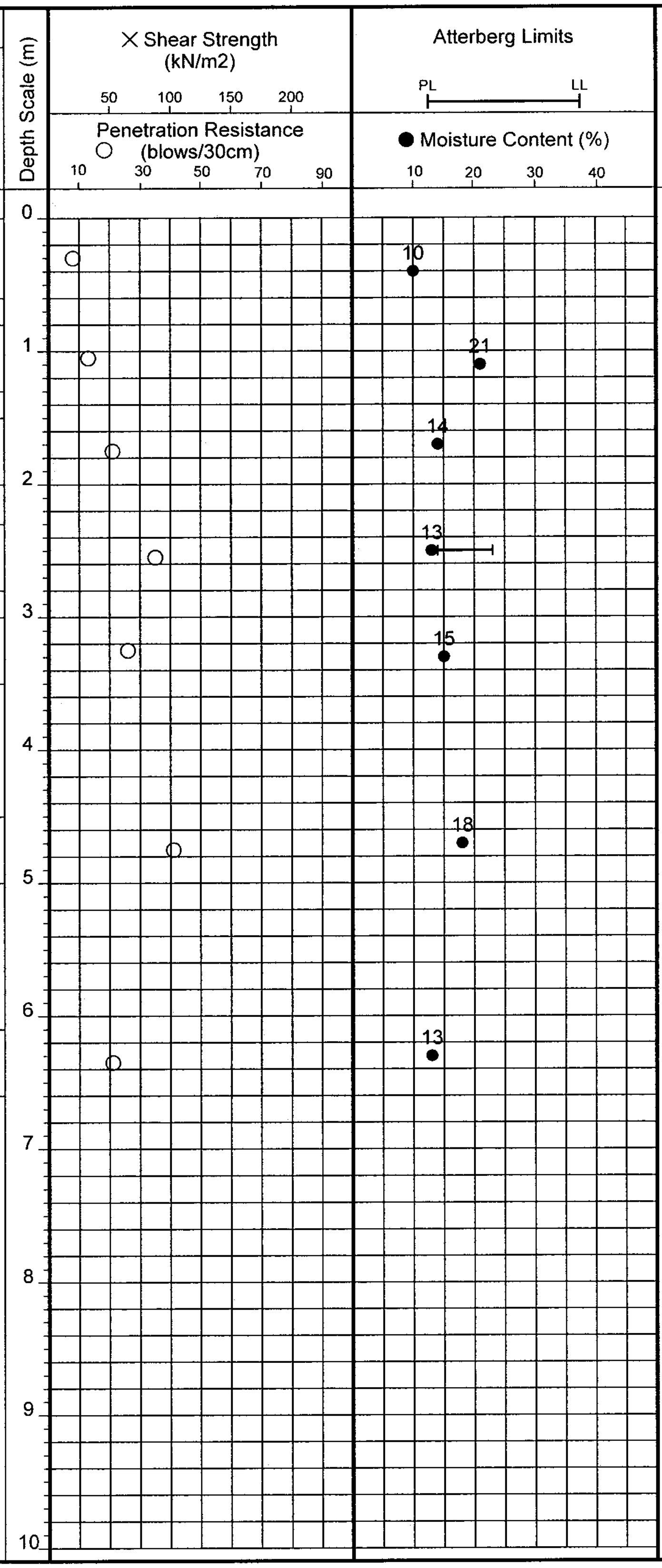
JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 25, 2014

Depth Elev. (m)	SOIL DESCRIPTION
0.0	Ground Surface
262.6	**23 cm TOPSOIL** Brown, loose, weathered **SILTY FINE SAND** occ. sandy silt and silt seams and layers
0.7 261.9	Brown, compact, weathered **SILT**
1.4 261.2	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders
4.0 258.6	Grey, compact to dense **SILT**
6.6 256.0	**END OF BOREHOLE**

SAMPLES Number	Type	N-Value
1	DO	8
2	DO	13
3	DO	21
4	DO	35
5	DO	26
6	DO	41
7	DO	21



WATER LEVEL

W.L. @ El. 257.7 m on completion
Cave-in @ El. 257.1 m on completion

∇

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 3

FIGURE NO: 3

JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

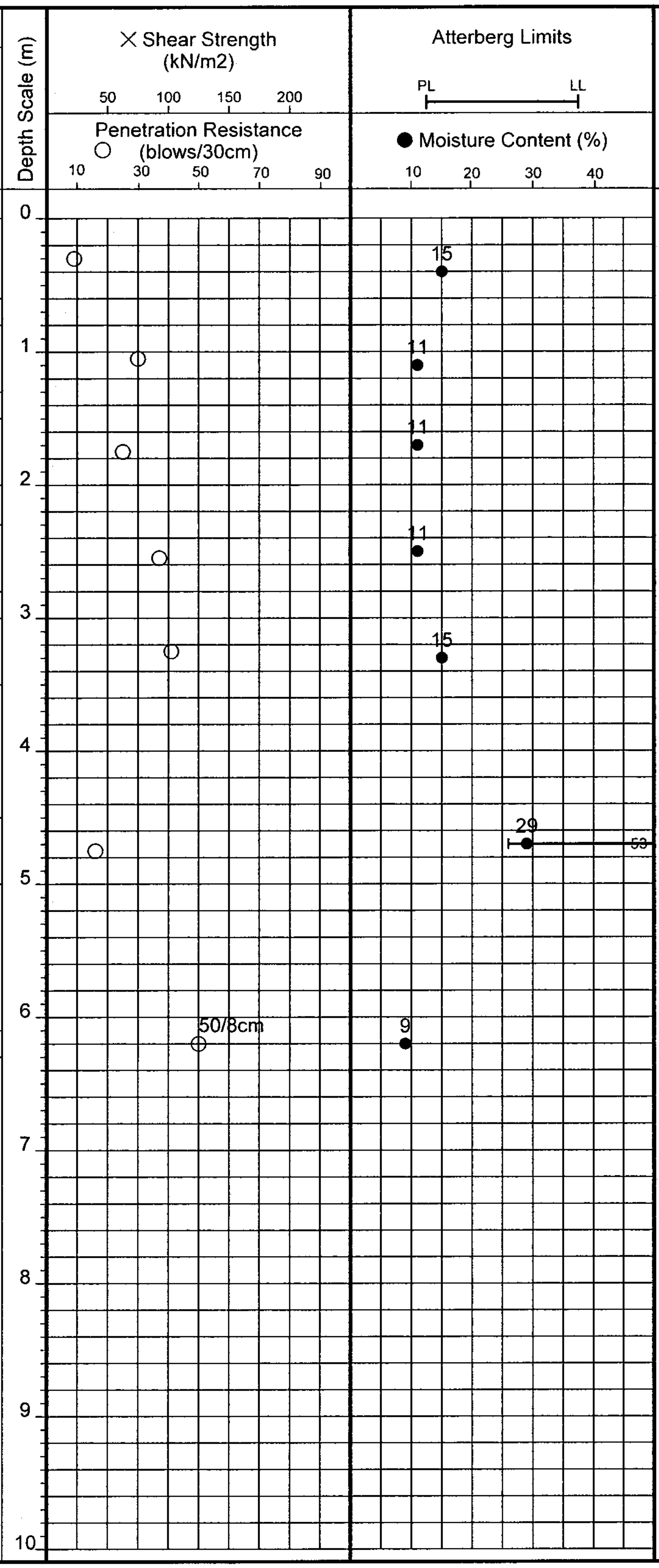
METHOD OF BORING: Flight-Auger

DATE: August 27, 2014

Depth Elev. (m)	SOIL DESCRIPTION
0.0	Ground Surface
262.0	**36 cm TOPSOIL**
	Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers
0.7 261.3	Very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders brown grey
4.0 258.0	Grey, stiff **SILTY CLAY** occ. wet sand and silt seams and layers
5.8 256.2	Grey, hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders
6.3 255.7	**END OF BOREHOLE**

SAMPLES

Number	Type	N-Value
1	DO	9
2	DO	30
3	DO	25
4	DO	37
5	DO	41
6	DO	16
7	DO	50/8



WATER LEVEL

W.L. @ El. 256.2 m on completion ∇

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 4

FIGURE NO: 4

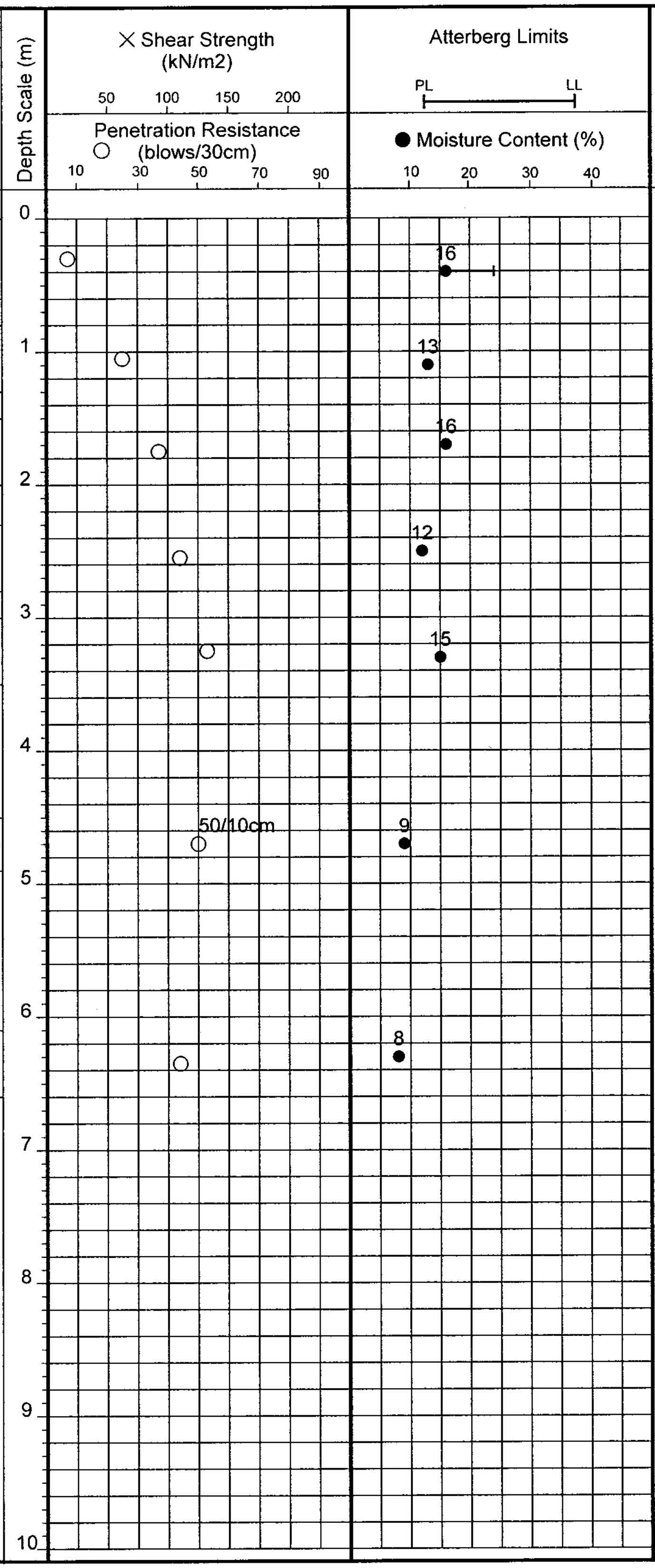
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 25, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
0.0	Ground Surface			
261.6	**25 cm TOPSOIL**			
	Brown, firm to hard	1	DO	7
	weathered			
		2	DO	25
	SILTY CLAY, Till			
	occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	37
		4	DO	44
3.2	silty fine sand			
258.4	Grey, dense to very dense	5	DO	53
	SILTY SAND, Till			
	occ. wet sand and silt seams and layers, cobbles and boulders	6	DO	50/10
		7	DO	44
6.6 255.0	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 5

FIGURE NO: 5

JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

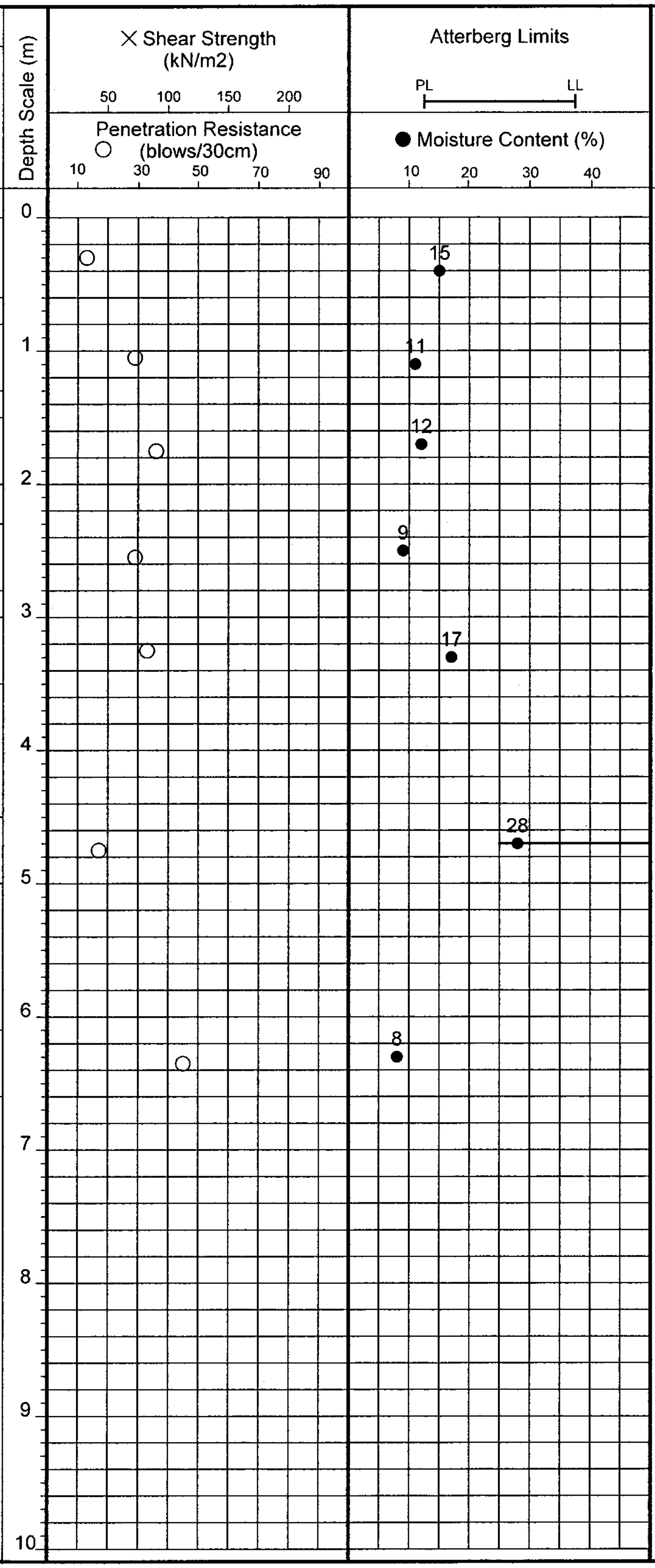
METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION
0.0	Ground Surface
259.5	**15 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers
0.7 258.8	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders
4.0 255.5	Grey, very stiff **SILTY CLAY** occ. wet sand and silt seams and layers
5.8 253.7	Grey, hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders
6.6 252.9	**END OF BOREHOLE**

SAMPLES

Number	Type	N-Value
1	DO	13
2	DO	29
3	DO	36
4	DO	29
5	DO	33
6	DO	17
7	DO	45



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 6

FIGURE NO: 6

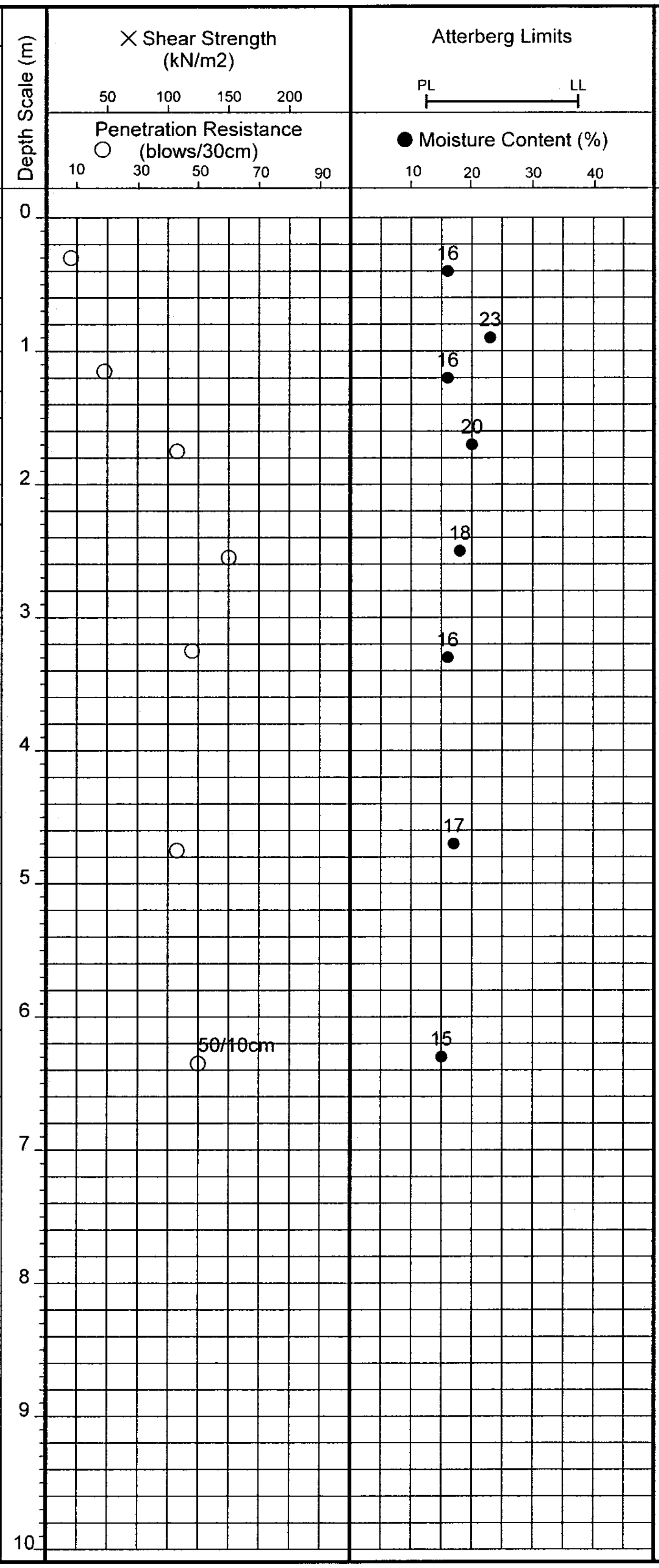
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
259.7	**20 cm TOPSOIL**			
	Brown, firm, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	8
0.7 259.0	Compact to very dense	2A	DO	-
		2B	DO	19
		3	DO	43
		4	DO	60
	SILT			
	brown grey	5	DO	48
		6	DO	43
		7	DO	50/10
6.6 253.1	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 257.0 m on completion
Cave-in @ El. 256.7 m on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 7

FIGURE NO: 7

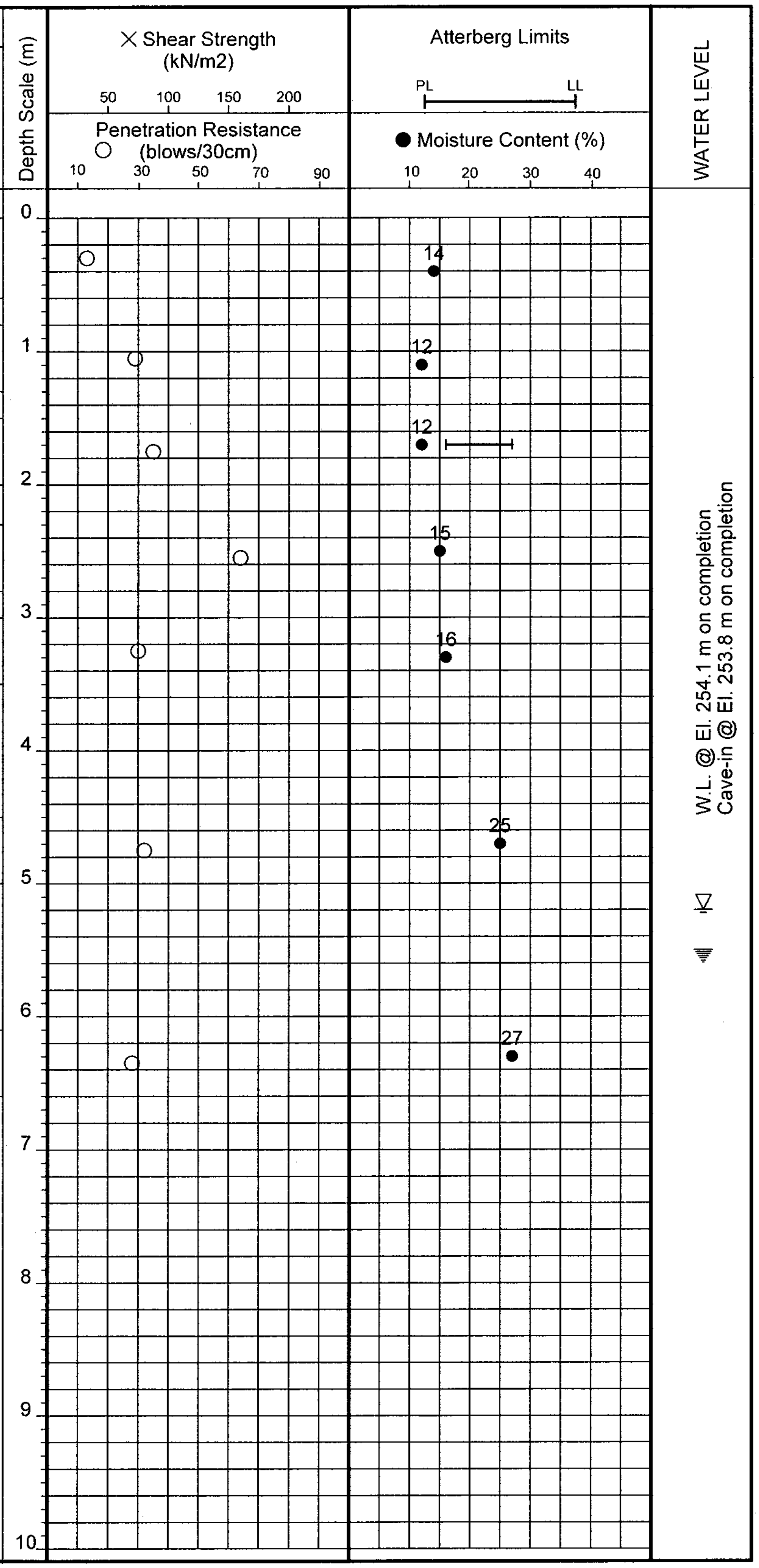
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0 259.3	Ground Surface			
	23 cm TOPSOIL			
	Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	13
0.7 258.6	Very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	29
		3	DO	35
		4	DO	64
	brown grey	5	DO	30
4.0 255.3	Grey, dense **SANDY SILT**	6	DO	32
5.8 253.5	Grey, very stiff **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	28
6.6 252.7	**END OF BOREHOLE**			



W.L. @ El. 254.1 m on completion
Cave-in @ El. 253.8 m on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 8

FIGURE NO: 8

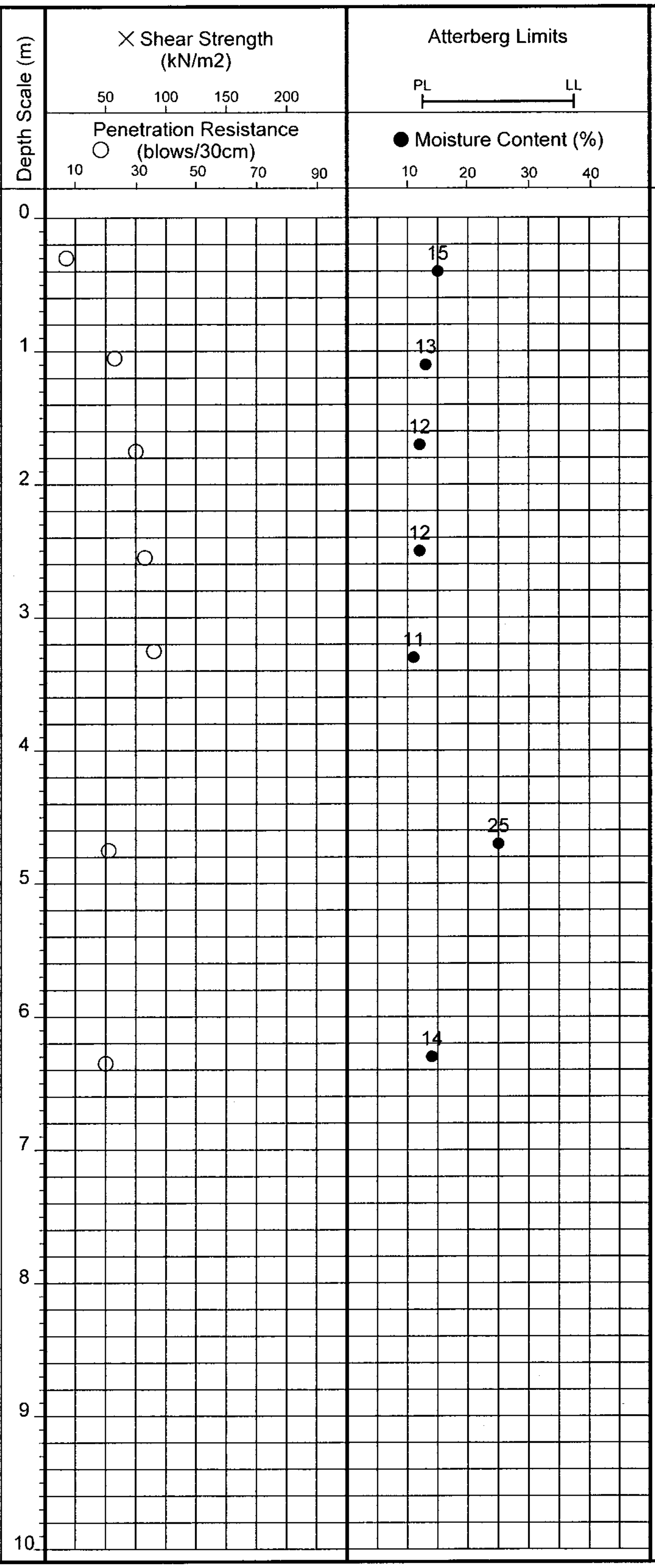
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 25, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
259.6	**15 cm TOPSOIL** Brown, firm, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	7
0.7 258.9	Very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	23
		3	DO	30
		4	DO	33
	brown grey	5	DO	36
4.0 255.6	Grey, very stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	21
5.8 253.8	Grey, compact **SILT**	7	DO	20
6.6 253.0	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 9

FIGURE NO: 9

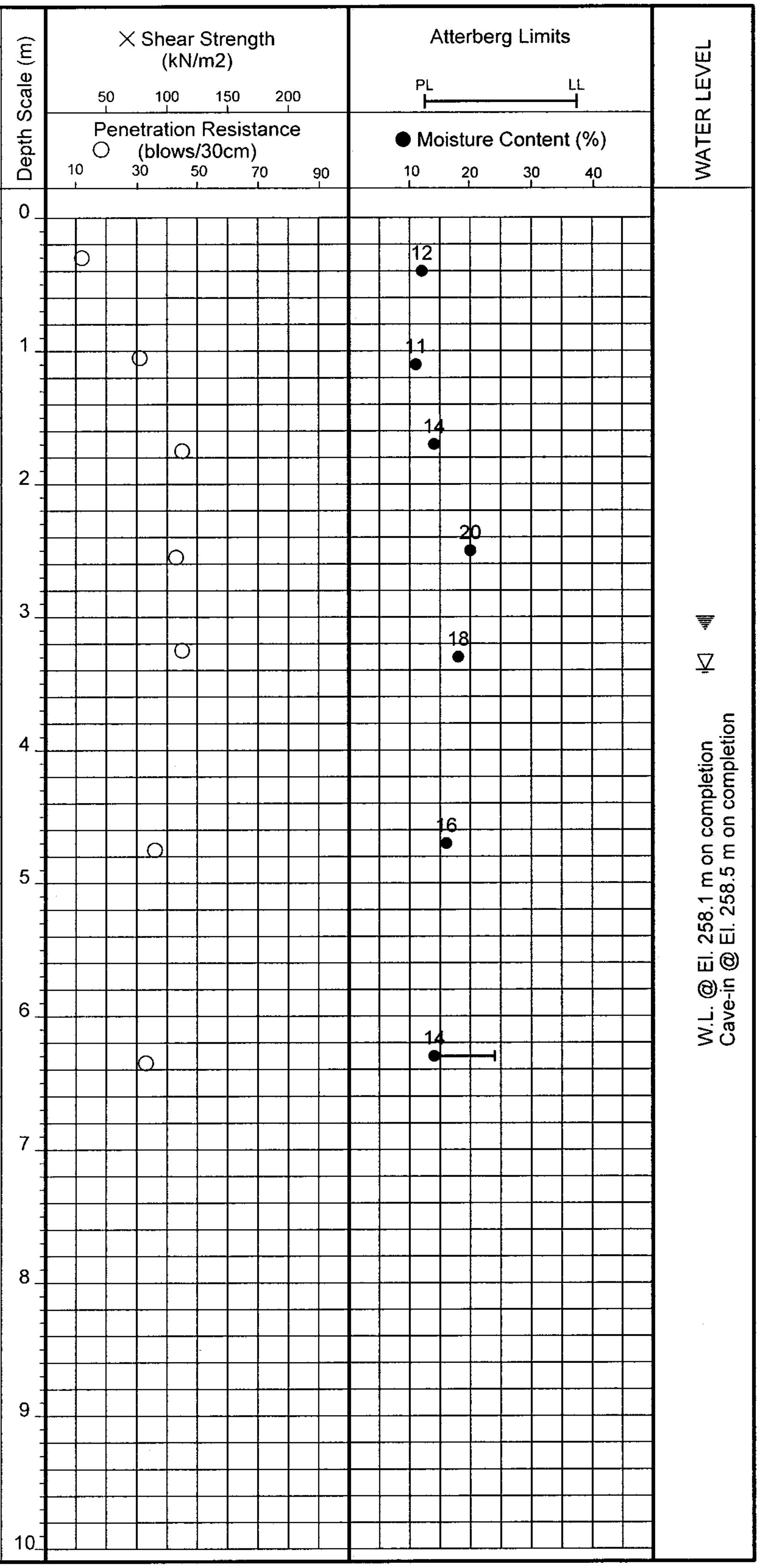
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 25, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
261.5	**15 cm TOPSOIL** Brown, compact, weathered **SANDY SILT**	1	DO	12
0.7 260.8	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	31
		3	DO	45
2.1 259.4	Dense **SILT**	4	DO	43
	brown grey	5	DO	45
		6	DO	36
5.8 255.7	Grey, hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	33
6.6 254.9	**END OF BOREHOLE**			



W.L. @ El. 258.1 m on completion
Cave-in @ El. 258.5 m on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 10

FIGURE NO: 10

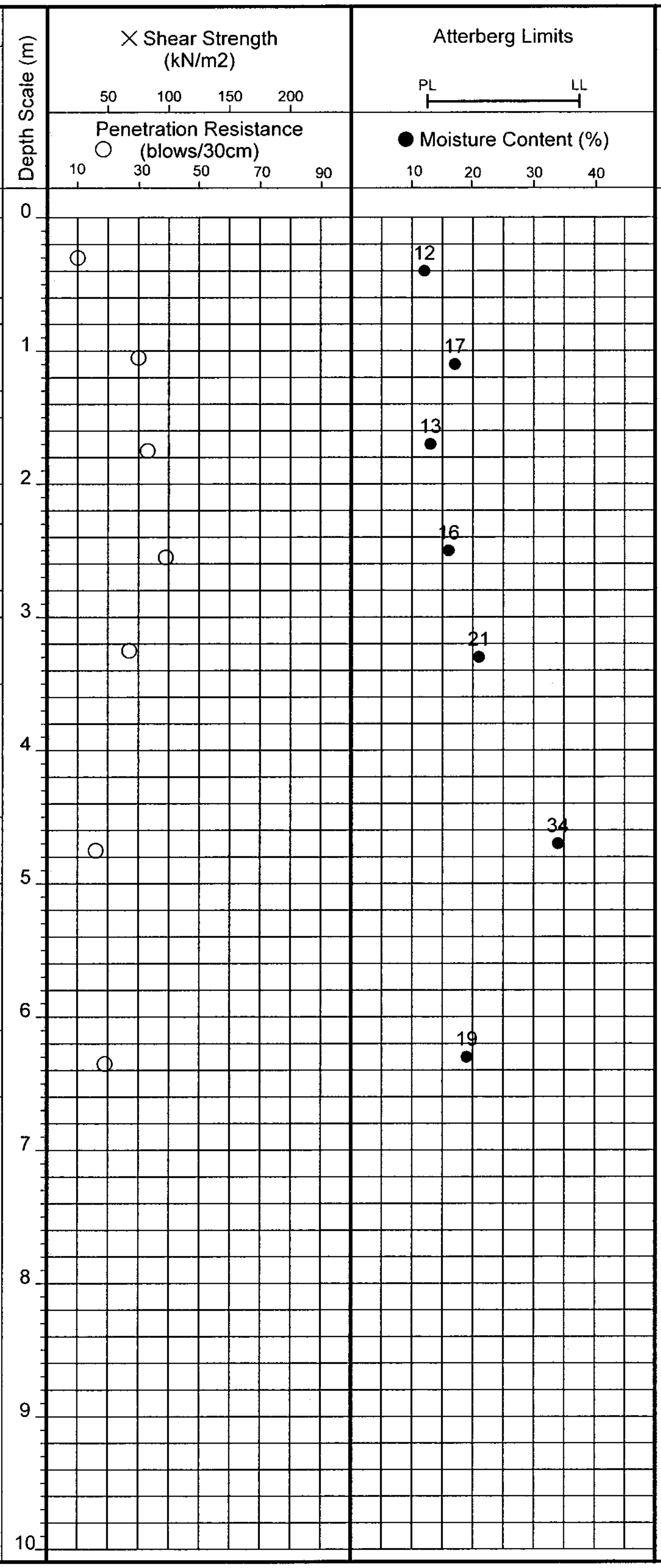
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
0.0	Ground Surface			
259.8	**23 cm TOPSOIL**			
	Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	10
0.7 259.1	Very stiff to hard	2	DO	30
	SILTY CLAY, Till	3	DO	33
	occ. wet sand and silt seams and layers, cobbles and boulders	4	DO	39
	brown grey	5	DO	27
4.0 255.8	Grey, stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	16
5.8 254.0	Grey, compact **SILT**	7	DO	19
6.6 253.2	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 254.0 m on completion
Cave-in @ El. 254.3 m on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 11

FIGURE NO: 11

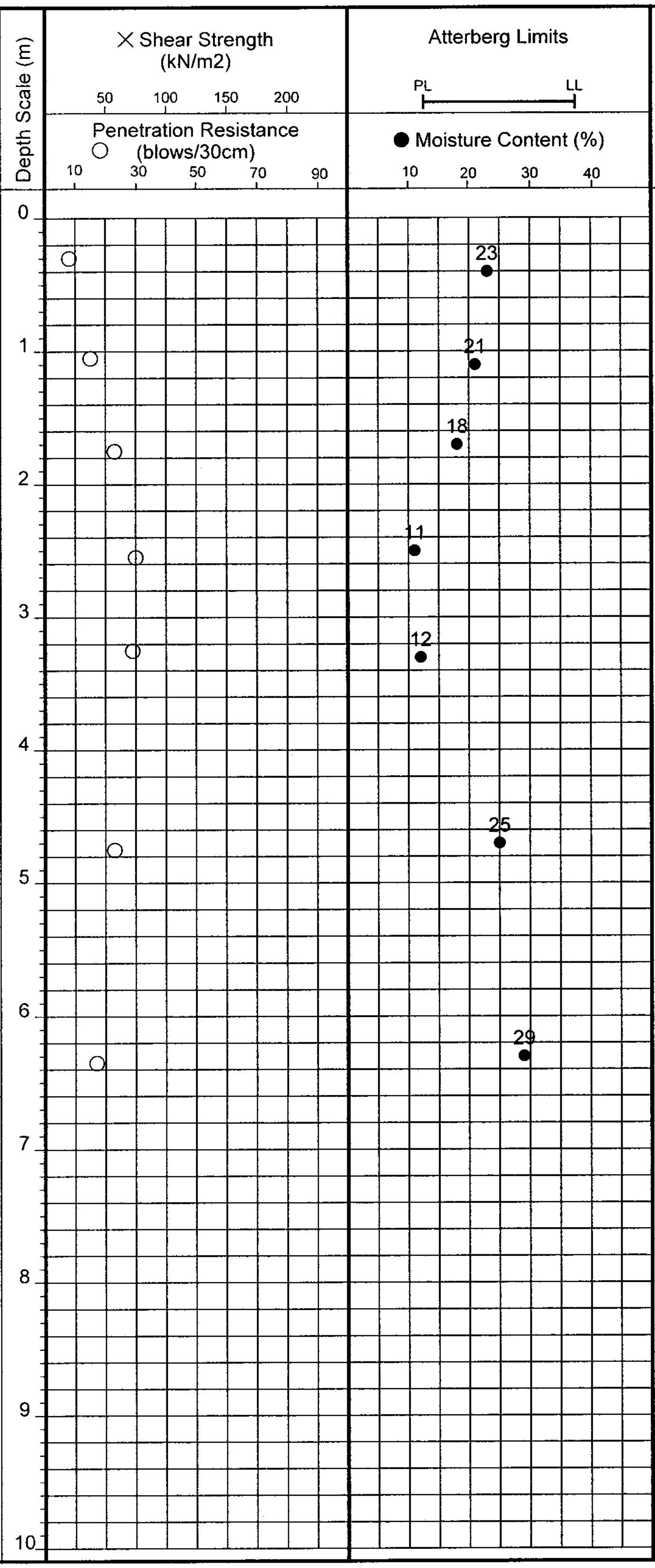
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
260.0	**23 cm TOPSOIL**			
	Brown, firm to stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	8
		2	DO	15
1.4 258.6	Brown, very stiff **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	3	DO	23
		4	DO	30
		5	DO	29
4.0 256.0	Grey, very stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	23
		7	DO	17
6.6 253.4	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 12

FIGURE NO: 12

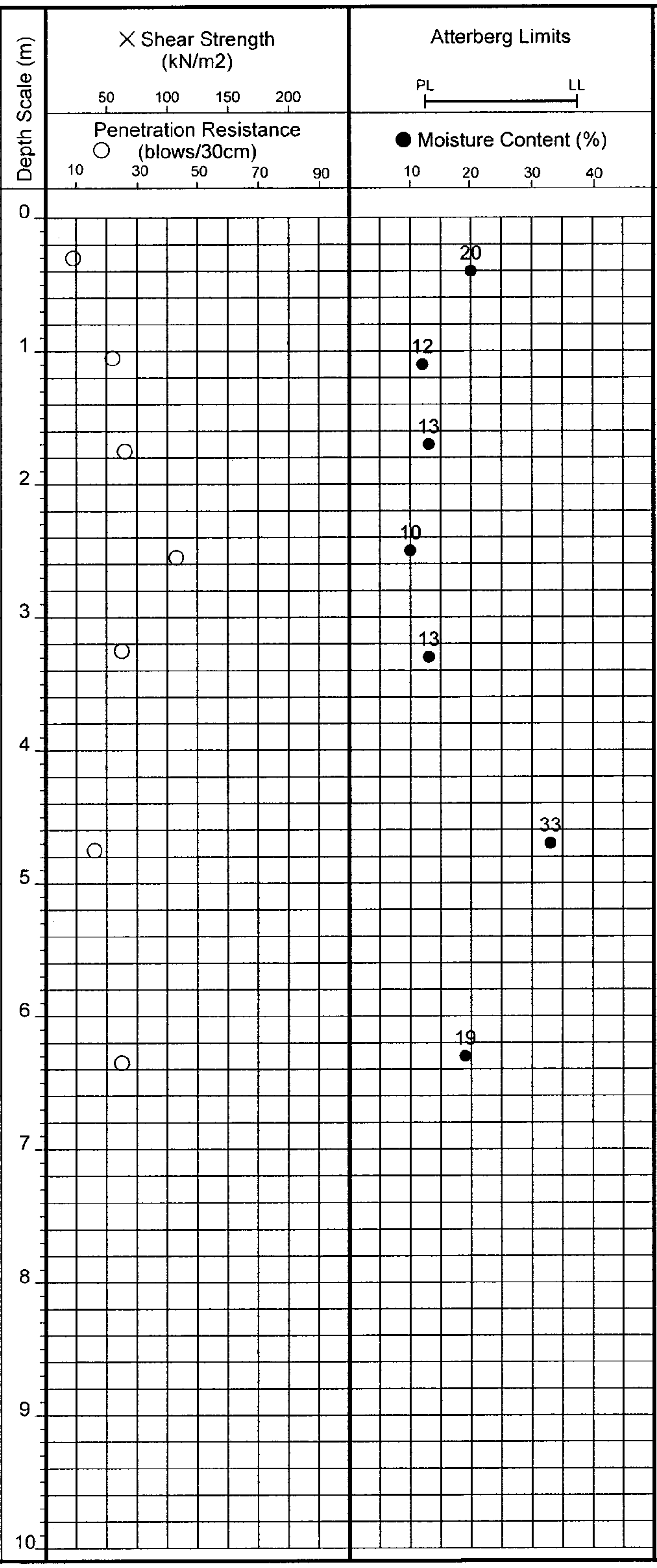
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
257.7	**15 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	9
0.7 257.0	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	22
		3	DO	26
		4	DO	43
		5	DO	25
4.0 253.7	Grey, stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	16
5.8 251.9	Grey, compact **SILT**	7	DO	25
6.6 251.1	**END OF BOREHOLE**			



WATER LEVEL

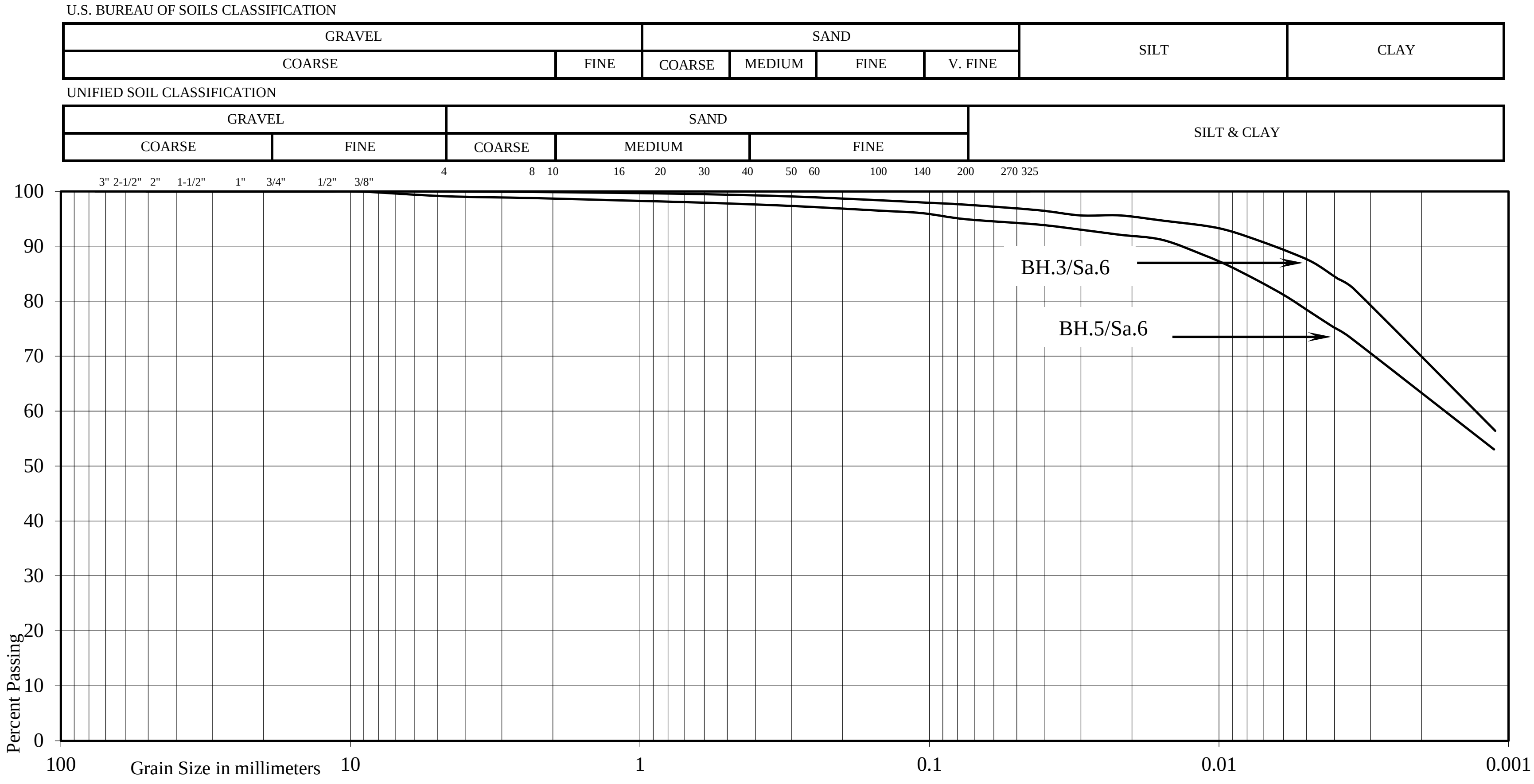
Dry on completion

Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1408-S018



Project: Proposed Residential Development

Location: Old School Road and Hurontario Street

Town of Caledon

Borehole No: 3 5

Sample No: 6 6

Depth (m): 4.7 4.7

Elevation (m): 257.3 254.8

BH./Sa.	3/6	5/6
Liquid Limit (%) =	53	50
Plastic Limit (%) =	26	25
Plasticity Index (%) =	27	25
Moisture Content (%) =	29	28
Estimated Permeability (cm./sec.) =	10^{-8}	10^{-8}

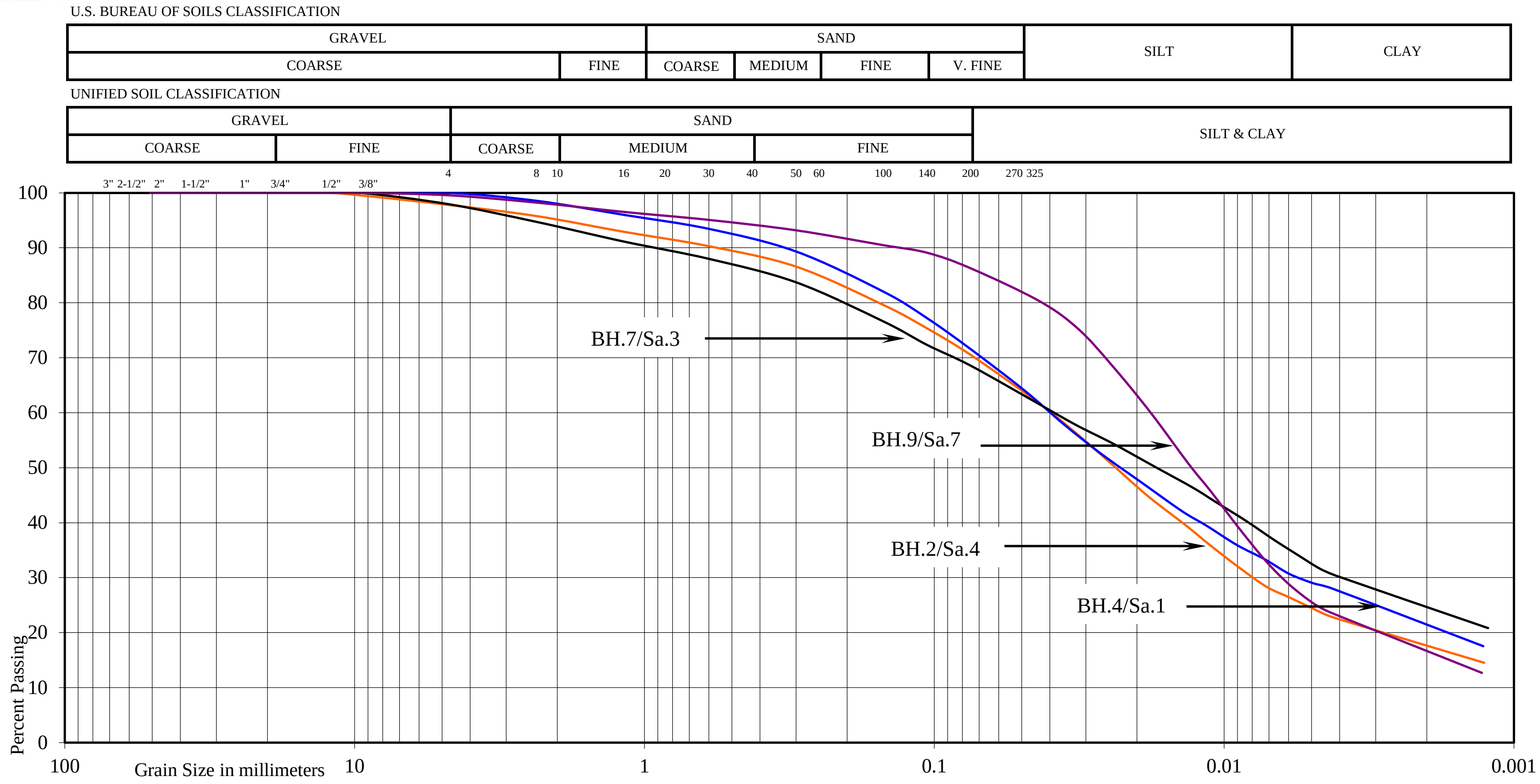
Classification of Sample [& Group Symbol]: SILTY CLAY

Figure: 13

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1408-S018



Project: Proposed Residential Development

Location: Old School Road and Hurontario Street

Town of Caledon

Borehole No:	2	4	7	9
Sample No:	4	1	3	7
Depth (m):	2.5	0.4	1.7	6.3
Elevation (m):	260.1	261.2	257.6	255.2

BH./Sa.	2/4	4/1	7/3	9/7
Liquid Limit (%) =	23	24	27	24
Plastic Limit (%) =	14	15	16	15
Plasticity Index (%) =	9	9	11	9
Moisture Content (%) =	13	16	12	14
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}	10^{-7}	10^{-7}

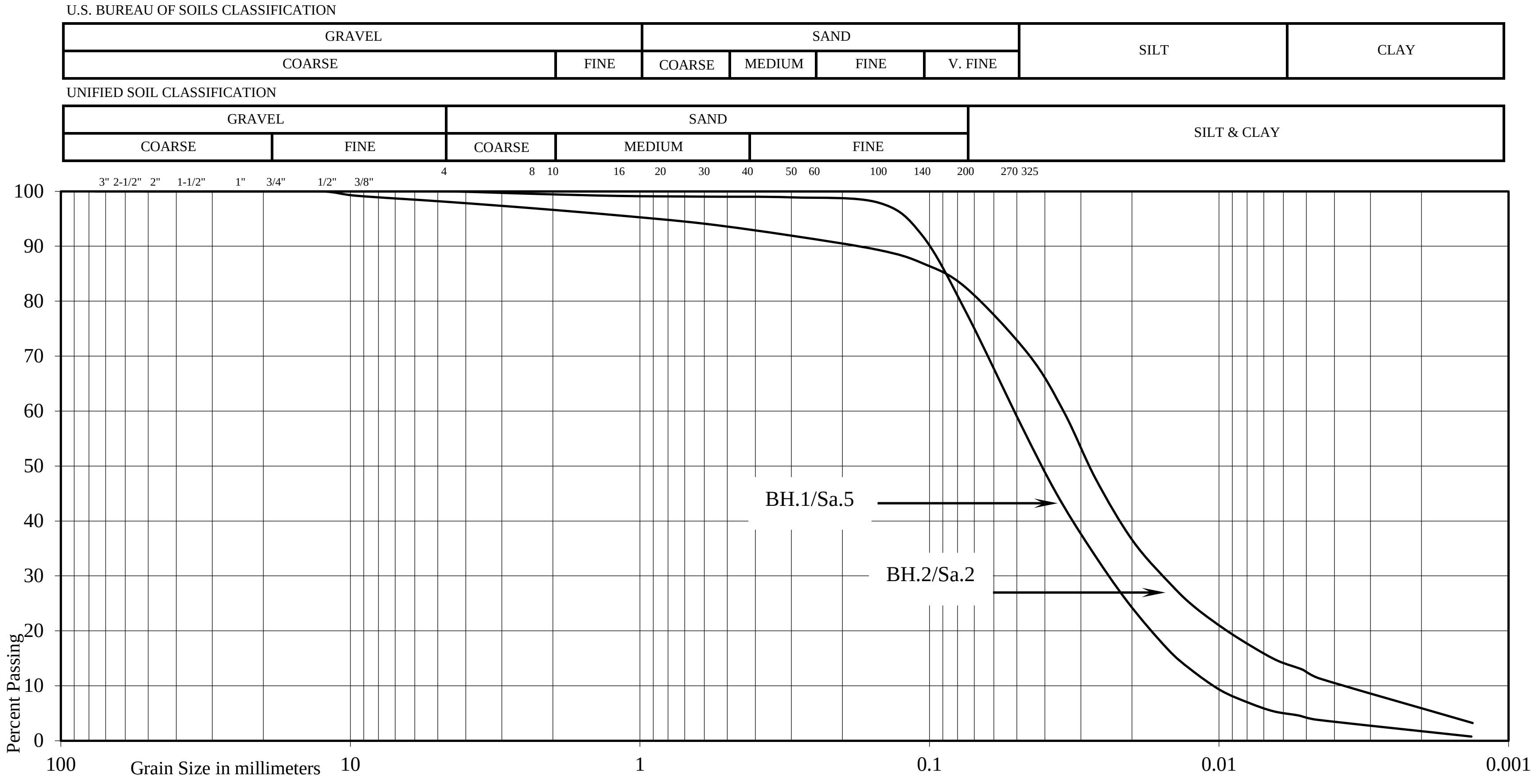
Classification of Sample [& Group Symbol]: SILTY CLAY, Till

Figure: 14

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1408-S018



Project: Proposed Residential Development

Location: Old School Road and Hurontario Street
Town of Caledon

Borehole No:	1	2
Sample No:	5	2
Depth (m):	3.3	1.1
Elevation (m):	260.1	261.5

BH./Sa.	1/5	2/2
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	12	21
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}

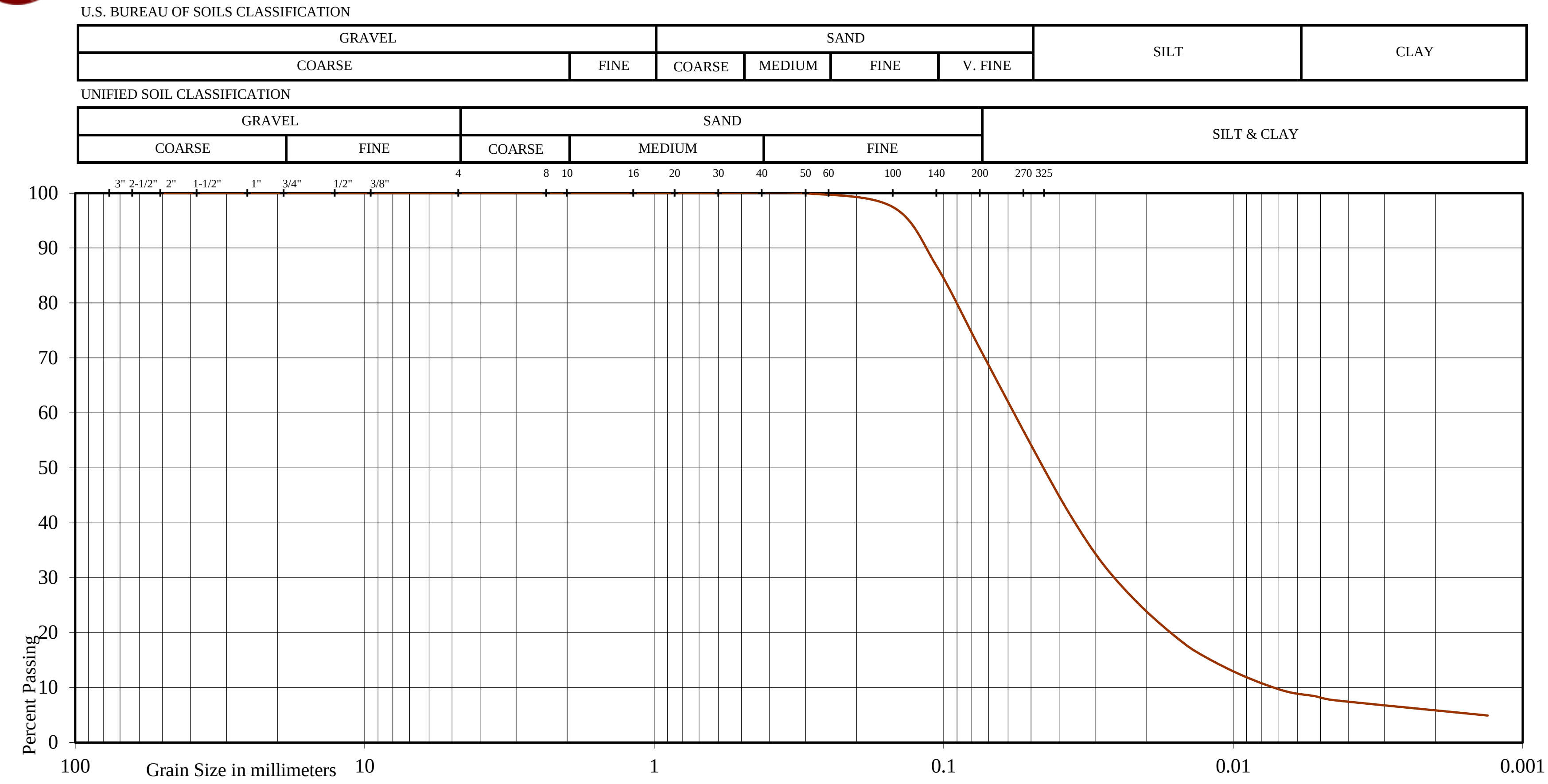
Classification of Sample [& Group Symbol]: SILT

Figure: 15

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1408-S018



Project:	Proposed Residential Development		
Location:	Old School Road and Hurontario Street	Liquid Limit (%) =	-
	Town of Caledon	Plastic Limit (%) =	-
Borehole No:	7	Plasticity Index (%) =	-
Sample No:	6	Moisture Content (%) =	25
Depth (m):	4.7	Estimated Permeability	
Elevation (m):	254.6	(cm./sec.) =	10^{-5}

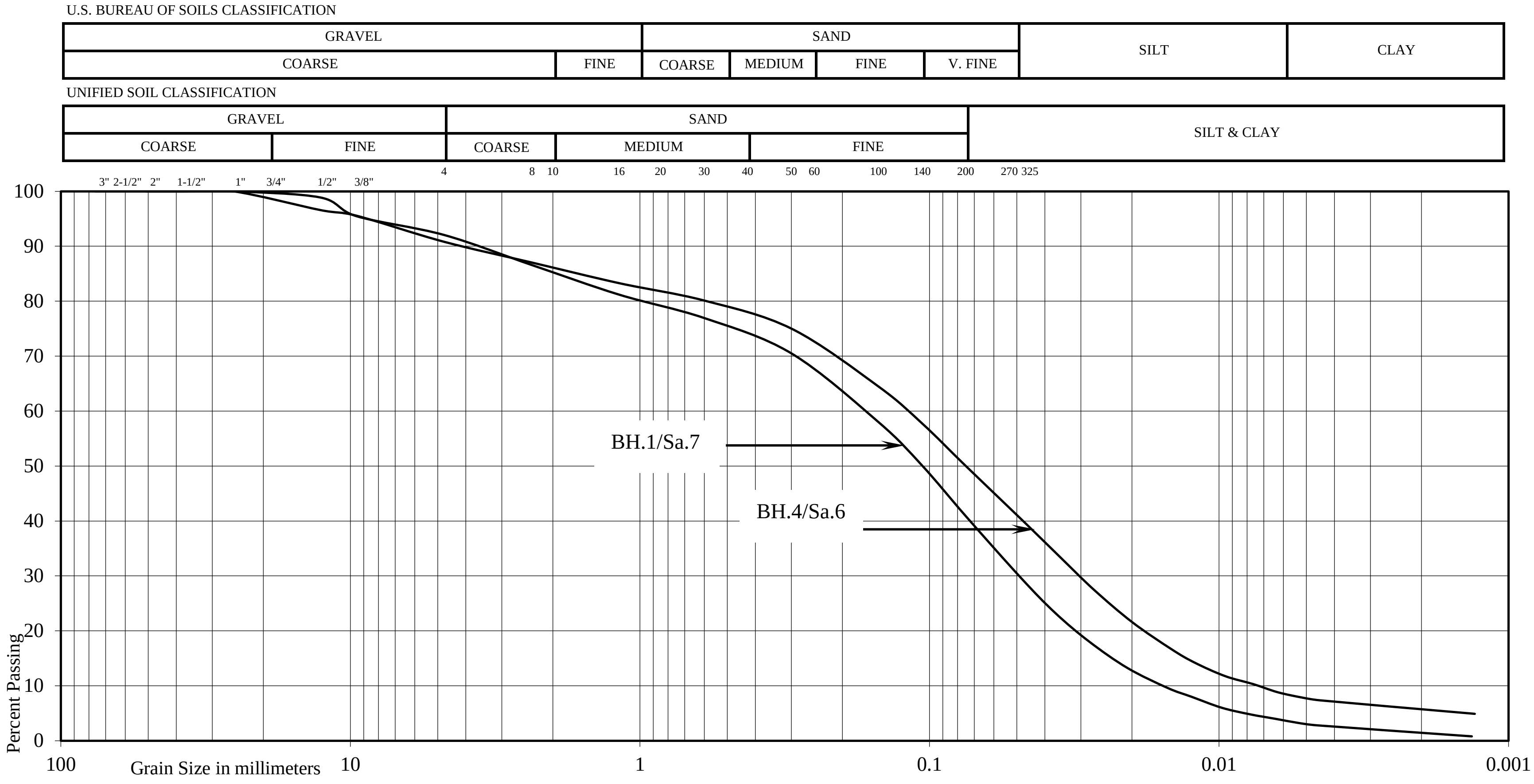
Classification of Sample [& Group Symbol]: SANDY SILT

Figure: 16

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1408-S018



Project: Proposed Residential Development

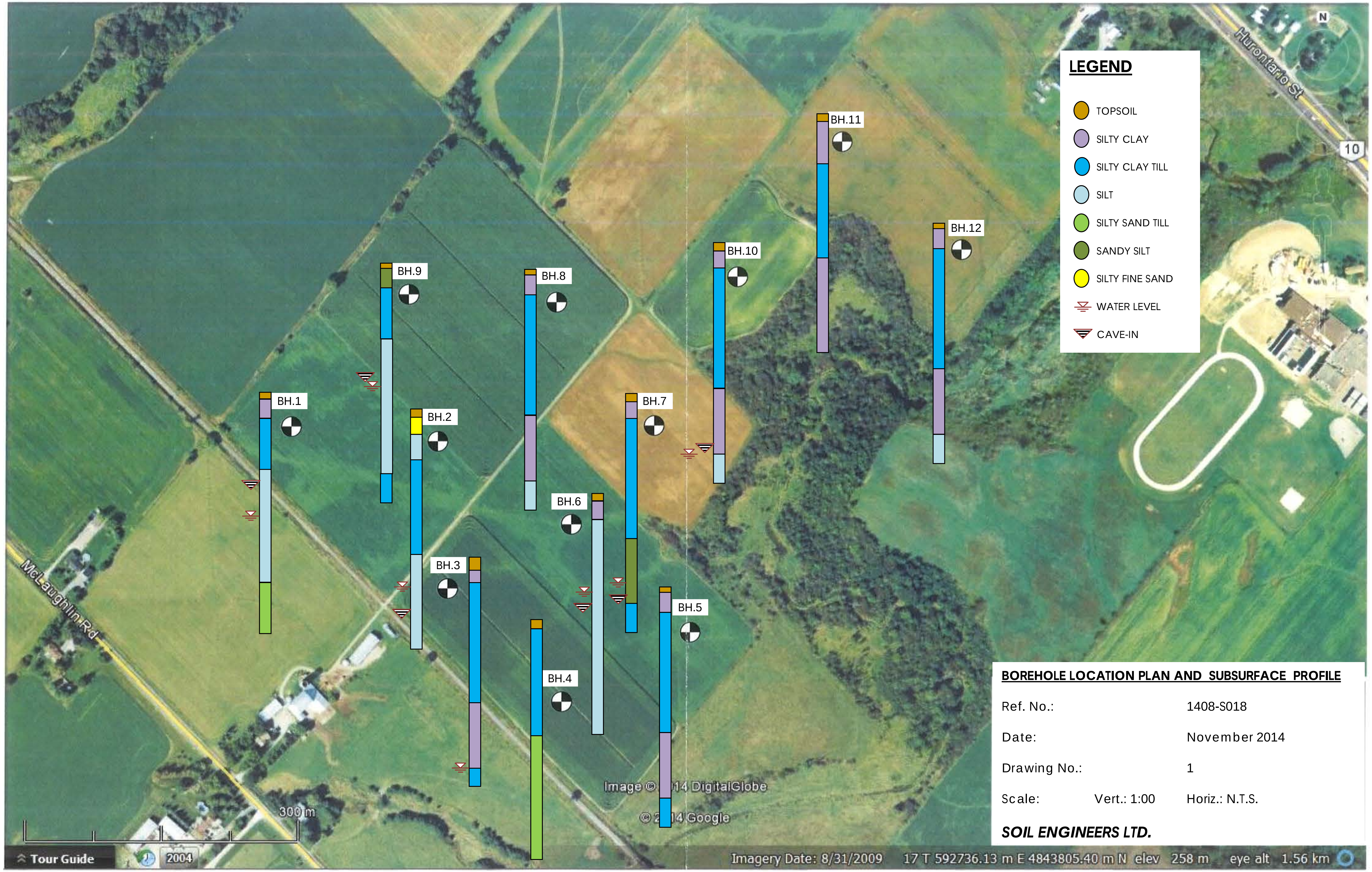
Location: Old School Road and Hurontario Street
Town of Caledon

Borehole No:	1	4
Sample No:	7	6
Depth (m):	6.3	4.7
Elevation (m):	257.1	256.9

BH./Sa.	1/7	4/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	10	9
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}

Classification of Sample [& Group Symbol]: SILTY SAND, Till

Figure: 17



LEGEND

- ● TOPSOIL
- ● SILTY CLAY
- ● SILTY CLAY TILL
- ● SILT
- ● SILTY SAND TILL
- ● SANDY SILT
- ● SILTY FINE SAND
- ▽ WATER LEVEL
- ▽ CAVE-IN

BOREHOLE LOCATION PLAN AND SUBSURFACE PROFILE

Ref. No.:		1408-S018
Date:		November 2014
Drawing No.:		1
Scale:	Vert.: 1:00	Horiz.: N.T.S.

SOIL ENGINEERS LTD.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

A REPORT TO
SCHOOL VALLEY SOUTH LTD.

A SUPPLEMENTARY GEOTECHNICAL INVESTIGATION FOR

PROPOSED PUMPING STATION AND STORMWATER MANAGEMENT FACILITIES

SOUTHEAST OF OLD SCHOOL ROAD
AND MCLAUGHLIN ROAD

TOWN OF CALEDON

REFERENCE NO. 2310-S040

JANUARY 2024

DISTRIBUTION

Digital Copy - School Valley South Ltd.

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the email authorization received October 2, 2023, from Mr. Frank Filippo of School Valley South Ltd., a supplementary geotechnical investigation was carried out at the property located southeast of Old School Road and McLaughlin Road in the Town of Caledon.

In 2014, two geotechnical investigations were completed for the captioned property to support the design and construction of a residential subdivision. The findings and recommendations were presented under separate covers, Reference Nos. 1408-S018 and 1408-S019, dated November 2014.

The purpose of the supplementary investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of a pumping station and 3 stormwater management (SWM) ponds within the subdivision. The geotechnical findings and resulting recommendations are presented in this Report.

2.0 SITE DESCRIPTION

The subject site is located approximately 600 m south of Old School Road, between McLaughlin Road and Hurontario Street, in the southern region of Town of Caledon. It is located within a physiographic region known as the South Slope, situated in between the Oak Ridges Moraine and the Peel Plain. The soil stratigraphy in the area is characterized by sand and silt deposits layered in between an upper Halton Till unit and a lower Newmarket Till formation. The sand and silt deposits were identified as an Oak Ridges Moraine (ORM) or equivalent unit in the Hydrogeological Assessment for Mayfield West, Phase 2 Stage 3 Lands, prepared by Palmer Environmental Consulting Group Inc. (PECG) in 2018.

The investigation was carried out in either open grass field or cultivated farm fields. Based on the conceptual site plan, the pumping station will potentially be located close to the McLaughlin Road frontage, and the SWM ponds (SWM 7, 8 and 9) will be constructed at various locations adjacent to the existing natural systems across the southern limit of the property. At the time of report preparation, details of the pumping station and SWM ponds are not available for review.

3.0 FIELD WORK

The field work, consisting of 4 boreholes extending to depths of 6.6 m and 15.3 m, was performed on October 16 to 19, 2023, at the locations shown on the Borehole Location Plan

(Drawing No. 1). The boreholes are labelled in the 100-series in order to differentiate them from the previous borehole investigations carried out for the subdivision.

The boreholes were advanced at intervals to the sampling depths by a track-mounted machine equipped with solid- and hollow-stem augers and split spoon sampler for soil sampling. Split-spoon samples were recovered for soil classification and laboratory testing. Standard Penetration Tests using the procedures described on the enclosed "List of Abbreviations and Terms" were performed at the sampling depths. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the 'N' values. The field work was supervised and the findings were recorded by a geotechnical technician.

To facilitate the hydrogeological study by PECG, 50-mm diameter monitoring wells were installed at the borehole locations. The depths and details of the monitoring wells are shown on the corresponding borehole logs.

The ground elevation at each borehole location was determined using a handheld equipment of the Global Navigation Satellite System.

4.0 **SUBSURFACE CONDITIONS**

The investigation has revealed that beneath the surficial topsoil layer, the investigated areas are underlain by silty clay and silty clay till overlying silty fine sand/sandy silt/silt deposits, which in turn bed onto a sandy silt till deposit in places. Clay-shale reversion and weathered shale bedrock was encountered at the bottom of Borehole 101, at depths below El. 248.0 m.

The tills consist of a random mixture of particle sizes ranging from clay to gravel, with silt and clay being the dominant fractions. The fine-grained silty fine sand, sandy silt and silt samples contain a trace of clay, and are often found to be wet or water-bearing. Sample examination revealed that the soils within the surficial zone, extending to a depth of 1.0± m below grade, is generally weathered. Intermittent hard resistance to augering was encountered in places, indicating the presence of cobbles and boulders in the till mantles.

Detailed descriptions of the encountered subsurface conditions are presented on the borehole logs, comprising of Figures 1 to 4, inclusive. The stratigraphy is illustrated on the Subsurface Profile, Drawing No. 2. Relevant borehole data from previous investigations for each of the SWM ponds is also included in this report, and the associated borehole logs are enclosed in the Appendix for reference. A prefix of 18- and 19- is used to distinguish between the respective 1408-S018 and 1408-S019 investigations.

Grain size analyses were performed on representative samples of the silty clay till, sandy silt till, sandy silt and silty clay; the results are plotted on Figures 5 to 8. In addition, Atterberg limits tests were performed on 3 samples of the clay till and clay and the results are plotted on the respective sample depths on the Borehole Logs. The results show that the clay till is low in plasticity and the clay is medium in plasticity.

The subsurface condition is summarized based on each infrastructure feature in the following sections.

4.1 **Pumping Station**

The pumping station is proposed on the east side of McLaughlin Road, approximately 1 km south of Old School Road. Borehole 101 was completed within the proposed pumping station, which revealed that beneath a 30-cm thick topsoil layer, the native soil makeup consists of silty clay till and sandy silt till, interstratified with sandy silt and silty clay deposits. Clay-shale reversion was encountered at an approximate depth of 13.7 m or El. 247.9 m and the borehole was terminated in the grey weathered shale bedrock at El. 246.3 m.

The encountered sandy silt deposit is approximately 3 m in thickness at this location. Sample examination revealed that the silt samples are moist to wet, generally becoming wet at depths below 4.5 m. The remaining soils are generally moist.

The obtained 'N' values measured in number of blows per 30 cm of penetration, the resulting relative density/consistency of the soils and water content values are summarized in the table below:

Soil Type	**'N' Values**	**Relative Density/ Consistency**	**Water Content Values (%)**
Silty Clay Till	7 to 78 (median 35)	Firm to hard, generally hard	11 to 18 (median 16)
Silty Clay	20 and over 100 (shale reversion)	Very stiff; reverted clay is hard	15 and 22
Sandy Silt	25	Compact	19 and 20
Shale Bedrock	Over 100	-	14

4.2 SWM 7

SWM 7 is proposed on the opposite side of a natural corridor from the pumping station, adjacent to and west of the Orangeville Brampton railway trail.

Two boreholes, Boreholes 102 and 19-6, were completed within SWM 7. Beneath a topsoil layer measuring 23 and 36 cm thick, the area is generally underlain by silty clay till and silty clay, a silty fine sand/sandy silt deposit at approximate depths of 4.0 to 5.6 m (between El. 256.6 to 255.0 m), which in turn beds onto silty clay or sandy silt till. In Borehole 19-6, a layer of weathered sandy silt is found beneath the topsoil, extending to a depth of 0.7 m below grade. Sample examination revealed that the subsoils are generally moist while the silty fine sand/sandy silt deposit is very moist to wet.

The obtained 'N' values measured in number of blows per 30 cm of penetration, the resulting relative density/consistency of the soils and water content values are summarized in the table below:

Soil Type	'N' Values	Relative Density/ Consistency	Water Content Values (%)
Silty Clay Till	7 to 26 (median 24)	Firm to very stiff, generally very stiff	11 and 13
Silty Clay	22, 35 and 41	Very stiff to hard	16, 18 and 19
Silty Fine Sand/ Sandy Silt	12 and 30	Compact	14, 16 and 20
Sandy Silt Till	20	Compact	12

4.3 SWM 8

SWM 8 is proposed adjacent to and on the west side of the Etobicoke Creek natural valley system located in the southeast corner of the site.

Two boreholes, Boreholes 103 and 18-5, were completed within SWM 8, which revealed that beneath a 15 and 20 cm thick topsoil layer, the area is generally underlain by silty clay till and silty clay deposits. A wet sandy silt deposit was also encountered below a depth of 4.0 m from grade, or below El. 255.0 m, in Borehole 103; this borehole was terminated in the sandy silt deposit.

The obtained ‘N’ values measured in number of blows per 30 cm of penetration, the resulting relative density/consistency of the soils and water content values are summarized in the table below:

Soil Type	‘N’ Values	Relative Density/ Consistency	Water Content Values (%)
Silty Clay Till	12 to 47 (median 31)	Stiff to hard, generally hard	8 to 17 (median 11)
Silty Clay	13, 17 and 20	Stiff to very stiff	15, 16 and 28
Sandy Silt	8 and 20	Loose to compact	17 and 20

4.4 <u>SWM 9</u>

SWM 9 is proposed in the southeast corner of the property, adjacent to and on the east side of the Etobicoke Creek natural valley system.

Two boreholes, Boreholes 104 and 18-12, were completed within SWM 9. Beneath the topsoil layer, 10 and 15 cm thick, the area is underlain by silty clay till and silty clay, overlying a silt deposit at approximate depths below 5.6 m, or below El. 252.4 m. Both boreholes were terminated in the silt deposit. Sample examination revealed that the till and clay are generally moist, and the silt is very moist.

The obtained ‘N’ values measured in number of blows per 30 cm of penetration, the resulting relative density/consistency of the soils and water content values are summarized in the table below:

Soil Type	‘N’ Values	Relative Density/ Consistency	Water Content Values (%)
Silty Clay Till	22 to 52 (median 25)	Compact to very dense, generally compact	10 to 13 (median 12)
Silty Clay	9 to 46 (median 17)	Stiff to hard, generally very stiff	17 to 33 (median 20)
Silt	25 and 37	Compact to dense	18 and 19

5.0 GROUNDWATER CONDITION

Groundwater levels were recorded in Boreholes 101, 103 and 19-6 at depths ranging from 5.3 to 14.9 m, or from El. 246.7 to 253.7 m while other boreholes remained dry upon completion of drilling. Artesian uplift was not evident from the wet silt and sand units during drilling.

Groundwater readings recorded by PECG from the installed monitoring wells in December 2023 range from depths of 3.57 to 4.40 m, or from El. 258.03 to 254.60 m. The records on completion are plotted on the borehole logs and the December 2023 monitoring well measurements are summarized in Table 1.

Table 1 - Monitored Groundwater Level

Monitoring Well No.	Ground Elevation (m)	Well Depth (m)	Measured Groundwater Level			
			December 6, 2023		December 12-13, 2023	
			Depth (m)	El. (m)	Depth (m)	El. (m)
Pumping Station - 101	261.60	15.2	3.59	258.01	3.57	258.03
SWM 7 - 102	260.56	6.1	4.27	256.29	4.20	256.36
SWM 8 - 103	259.00	6.1	4.40	254.60	N/A	-
SWM 9 - 104	258.98	6.1	Dry	-	N/A	-

The groundwater records are generally consistent with or near the observed wet silty fine sand/silts at the boreholes, and suggest a drainage pattern towards the Etobicoke Creek. The groundwater regime is subject to seasonal fluctuations. Detailed groundwater profile and monitoring records can be referred to the hydrogeological study by PECG.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation has revealed that beneath the surficial topsoil veneer, the pumping station and SWM pond sites are predominantly underlain by an upper silty clay/silty clay till deposit, overlying a silty fine sand/sandy silt or silt unit and a lower sandy silt till deposit. Clay-shale reversion and weathered shale bedrock was encountered at the bottom of Borehole 101, at depths below El. 248.0 m. The thickness of the overburden above the more pervious sand/silt unit appears to increase towards the east, with Boreholes 103, 18-12 and 104 terminated within the silt deposit.

Sample examination revealed that the sand/silt unit is moist to wet; artesian uplift was not evident from this unit during drilling. Groundwater readings recorded by PECG from the installed monitoring wells (Boreholes 101 to 103) in December 2023 range from depths of 3.57 to 4.40 m below grade, or from El. 258.03 to 254.60 m. Borehole 104 was dry during the recording event.

At the time of investigation, detailed design of the proposed sanitary pumping station and SWM ponds are not available for review. It is understood that in lieu of a traditional pumping station with wet well, an inverted syphon system is also being explored. The geotechnical findings which warrant special consideration are presented below:

1. Open excavation must be carried out in accordance with Ontario Regulation 213/91. Where vertical cut is necessary, such as in the case of a wet well, the excavation must be properly shored. In addition, any excavation extending into the saturated sand/silt will require construction dewatering.
2. For any proposed structures, they can be supported using conventional spread and strip footings founded onto the native soils.
3. A Class ‘B’ bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL), is recommended for the construction of underground services. Where the pipes are founded within the water-bearing sand/silt unit, a Class ‘A’ (concrete) bedding should be used instead.

6.1 **Pumping Station**

Foundations

Where in-ground structures (such as wet well) or buildings are proposed in the construction of the pumping station, the proposed structures can be supported on conventional footings founded on sound native soils below the weathered soil. The recommended design bearing pressures are presented below:

- Soil Bearing Pressure at Serviceability Limit State (SLS): 150 kPa
- Factored Ultimate Soil Bearing Pressure at Ultimate Limit State (ULS): 250 kPa

Should the structures extend into the very dense sandy silt till below El. 254.0 m, the design bearing pressures at SLS and ULS can be increased to 500 kPa and 800 kPa, respectively.

The total and differential settlements of footings designed for the recommended bearing pressures at SLS are estimated at 25 mm and 20 mm, respectively.

Footings exposed to weathering, or in unheated areas, should have at least 1.2 m of earth cover for protection against frost action.

The foundation should meet the requirements specified by the latest Ontario Building Code, and the structures should be designed to resist a minimum earthquake force using Site Classification ‘C’ (very dense soil and soft rock).

The underground structures should be designed to sustain a lateral earth pressure calculated using the soil parameters presented in Table 3, with consideration of applicable surcharge loads, hydrostatic pressure and potential uplift forces. Where the in-ground structures are located within the zone of influence of nearby shallow building foundation, the design of the in-ground structures must also incorporate the added foundation loads.

Hydrostatic uplift pressure is not anticipated for foundations founded into the clay and sandy silt till beneath the wet sand/silt unit below El. 255.0 m. Should the foundation be constructed above El. 255.0 m, this should be further assessed once the detailed design and updated groundwater monitoring levels are available for review.

The foundation subgrade must be inspected by a geotechnical engineer, or a geotechnical technician under the supervision of a geotechnical engineer, to ensure that the subgrade conditions are compatible with the design of the foundations.

Where the footing excavation consists of wet sand/silt, or the footing subgrade is wet, a concrete mud-slab of lean mix concrete, 8 to 10 cm in thickness, should be poured immediately after subgrade preparation and inspection to protect the approved subgrade against disturbance by the construction traffic.

Slab-On-Grade Construction

For slab-on-grade construction, the subgrade must consist of sound native soils, or properly compacted inorganic soils. The subgrade should be inspected by a geotechnical technician and assessed by proof-rolling prior to placement of granular bedding. Badly weathered and any soft areas detected should be subexcavated and replaced with inorganic material compacted to at least 98% Standard Proctor Dry Density (SPDD).

The concrete slab should be constructed on a granular base, not less than 20 cm thick, consisting of 19-mm CRL, or equivalent, compacted to 100% SPDD. A Modulus of Subgrade Reaction of 25 MPa/m can be used for the design of slab-on-grade.

6.2 Pipe Bedding

The subgrade for underground services should consist of sound native soils, or properly compacted earth fill. Where soft or loose soil is encountered at the invert level, it should be subexcavated and replaced with bedding material, compacted to at least 98% SPDD.

A Class 'B' bedding is recommended for construction of the underground services across the subdivision as well as within the pump station and SWM pond blocks. The bedding material should consist of compacted 19-mm CRL, or equivalent. In water-bearing sand/silt deposits, a Class 'A' bedding should be used instead to prevent fines from migrating into a gravel bedding.

The pipe joints connected into manholes, catch basins and into the pumping station must be connected by leak-proof joints to prevent fines migration through the joints. Opening to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

In order to prevent pipe floatation when the service trench is deluged with water derived from precipitation, a soil cover, having a thickness at least equal to the diameter of the pipe, should be in place at all times after completion of the pipe installation.

6.3 Backfilling Trenches and Excavated Areas

The on-site inorganic soils are generally suitable for trench backfill. Any saturated soils should be properly stockpiled to drain the excess water or aerated prior to being used for structural backfill. Any boulder larger than 15 cm in size are not suitable for structural backfill.

The backfill should be compacted to 95% SPDD in lifts of not more than 20 cm thick. In the zone within 1.0 m below the slab-on-grade, the backfill should be compacted to at least 98% SPDD, with the moisture content at 2% to 3% drier than the optimum. This is to provide the required stiffness for floor construction.

In confined areas which are inaccessible to a heavy compactor, such as around manholes, catch basins and service crossings, sand backfill should be used and compacted using a smaller vibratory compactor. Otherwise in (lower) zones where proper compaction cannot be achieved, the backfill should consist of lean-mix concrete or unshrinkable fill.

One must be aware of the possible consequences during trench backfilling and exercise caution as described below:

- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1V:1.5+H, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand and the compaction must be carried out diligently, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to the final surfacing of the new pavement construction.
- When construction is carried out in the winter, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction.
- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.4 Stormwater Management Ponds

Three SWM ponds (SWM 7, 8 and 9) are proposed in the southern region of the subdivision, adjacent to natural corridors. Detailed designs of the ponds were not available for review at the time of report preparation.

Based on the borehole findings, the SWM areas are generally underlain by very stiff to hard silty clay till and silty clay, interstratified with or overlying a moist to wet, loose to very dense silty fine sand/sandy silt/silt deposit in the lower stratigraphy. Compact sandy silt till was also encountered at the bottom of Borehole 102 (SWM7) beneath the sandy silt.

A review of the subsoil profile and water level records suggests that the groundwater regime generally lies within the wet sand/silt units, at depths of 4.0+ m below grade. The water levels will fluctuate with seasons.

The need of a clay liner is not anticipated should the pond design remain within the silty clay till and silty clay deposits, with sufficient thickness of the low-permeable overburden above the underlying sand/silt units. However, should the ponds extend close to or into the sandy/silty deposits, an earthen clay liner (with an estimated permeability of 10^{-7} cm/sec or less) or a geosynthetic clay liner (GCL) with soil ballast will be required. The appropriate thickness of the clay liner or ballast to counteract hydrostatic uplift concerns, if any, and the extent of the liner can be established once the pond elevations are available for review.

The side slopes of the ponds should be graded at 1V:3H or flatter for stability above the wet perimeter, and 1V:4H or flatter below the wet perimeter. All exposed side slopes must be vegetated and/or sodded to prevent surface erosion.

Any proposed earth embankments should be constructed using selected on-site inorganic clay or clay till material, compacted to at least 98% SPDD in lifts of no more than 20 cm in thickness. The subgrade must be inspected and proof-rolled prior to any fill placement. The construction of the berms must be supervised and certified by the site geotechnical engineer. The pond side slopes should be surface compacted.

The following bearing pressures can be used for the design of control structures supported on conventional footings founded on sound native soils or on engineered fill:

- Soil Bearing Pressure at SLS: 150 kPa
- Factored Ultimate Soil Bearing Pressure at ULS: 250 kPa

The footings must be placed below the scouring depth and be provided with a minimum earth cover of 1.2 m to protect them from frost damage.

The foundation for the control structures should meet the requirements specified by the latest Ontario Building Code, and the structures should be designed to resist a minimum earthquake force using Site Classification ‘D’ (stiff soil).

One should be aware that minor maintenance may be required after rapid drawdown as the water recedes from a flood level to normal level. Routine visual inspection and maintenance will be required to rectify any observed deficiency.

6.5 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils are classified in Table 2.

Table 2 - Classification of Soils for Excavation

Material	Type
Sound Tills and Clay	2
Drained Silt	3
Saturated Soils	4

The yield of groundwater from the clay and tills will likely be limited in quantity and can be controllable by pumping from sumps. Continuous groundwater yield can be expected from the wet sand/silt deposit. Detailed groundwater profile and dewatering needs can be referred to the hydrogeological study by PECG.

In open excavation, the tills and clay will be stable in relatively steep excavation; however, prolonged exposure of the excavated face may lead to localized sloughing. The wet silty fine sand/sandy silt and silt, on the other hand, will slump readily, leading to sloughing and migrate/run with seepage and boil under an approximate piezometric head of 0.4 m.

Where safe sloped excavation is not feasible or where vertical cut is necessary, temporary shoring will be required. For excavation of deep in-ground structures at the pumping station, watertight shoring structures such as caisson wall or secant wall, or sheet piling can be used, extending into the lower till stratum. Where construction dewatering is carried out, a pile and lagging system can also be employed. The shoring structure must be properly designed by a structural engineer experienced in this type of construction or shoring specialist.

The overburden and the surcharge from any adjacent structures, if any, should be considered in the design of the shoring. In calculating the lateral earth pressure for the shoring structure, the soil parameters provided in Table 3.

The depth of pile support can be calculated from the following expressions:

In Cohesionless Soils: $R= 1.5\ D\ K_p\ L^2\ \gamma$

where R = Ultimate Load to be restrained (kN)
D = Diameter of concrete filled hole (m)
K_p = Passive resistance in subsoil for pile support
L = Embedment depth of the pile (m)
γ = Unit weight of subsoil below bottom of excavation (kN/m^3)

In Cohesive Soils: $R = 9\, c_u\, D\, (L - 1.5\, D)$

where R = Ultimate Load to be restrained (kN)
D = Diameter of concrete filled hole (m)
L = Embedment depth of the pile (m)
c_u = Undrained shear strength of subsoil for pile support = 150 kPa

The shoring system should be designed for a factor of safety of 2. Close monitoring of the vertical and lateral movement of the shoring system, by inclinometers or by survey on targets, should be carried out at the site. Extra bracing or support may be required if any movement is found excessive. The contractor should maintain the shoring to ensure any movement is within the design limit.

6.6 Soil Parameters

The recommended soil parameters for the project design are given in Table 3.

Table 3 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silty Clay Till	22.0	12.0	1.33	1.03
Sandy Silt Till	22.5	12.5	1.33	1.05
Silty Clay	20.5	10.5	1.30	1.00
Silty Fine Sand/Sandy Silt/Silt	20.5	10.5	1.20	1.00

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Silty Clay Till	0.33	0.50	3.00
Sandy Silt Till	0.32	0.48	3.12
Silty Clay	0.39	0.56	2.56
Silty Fine Sand/Sandy Silt/Silt	0.33	0.50	3.00

Table 3 - Soil Parameters (Cont'd)

Estimated Coefficient of Permeability (K) and Percolation Time (T)	**K (cm/sec)**	**T (min/cm)**
Silty Clay and Silty Clay till	10^{-7}	80+
Sandy Silt Till	10^{-6}	50
Silty Fine Sand/Sandy Silt/Silt	10^{-4}	12
Coefficients of Friction		
Between Concrete and Granular Base		0.50
Between Concrete and Native Soils or Compacted Earth Fill		0.35

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of School Valley South Ltd., and for review by its designated consultants, contractors and government agencies. Use of the report is subject to the conditions and limitations of the contractual agreement.

The material in the report reflects the judgement of Hui Wing Yang, P.Eng. and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

LICENSED PROFESSIONAL ENGINEER
Jan 8, 2024
H. W. YANG
100126690
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Jan 8, 2024
K. F. LI
100169280
PROVINCE OF ONTARIO

Hui Wing Yang, P.Eng.
HWY/KF

Kin Fung Li, P.Eng.

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—•—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
less than 12	less than 2	very soft
12 to 25	2 to 4	soft
25 to 50	4 to 8	firm
50 to 100	8 to 15	stiff
100 to 200	15 to 30	very stiff
over 200	over 30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0 Field vane test in borehole; the number denotes the sensitivity to remoulding

△ Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 2310-S040

LOG OF BOREHOLE: SVS-101

FIGURE NO.: 1

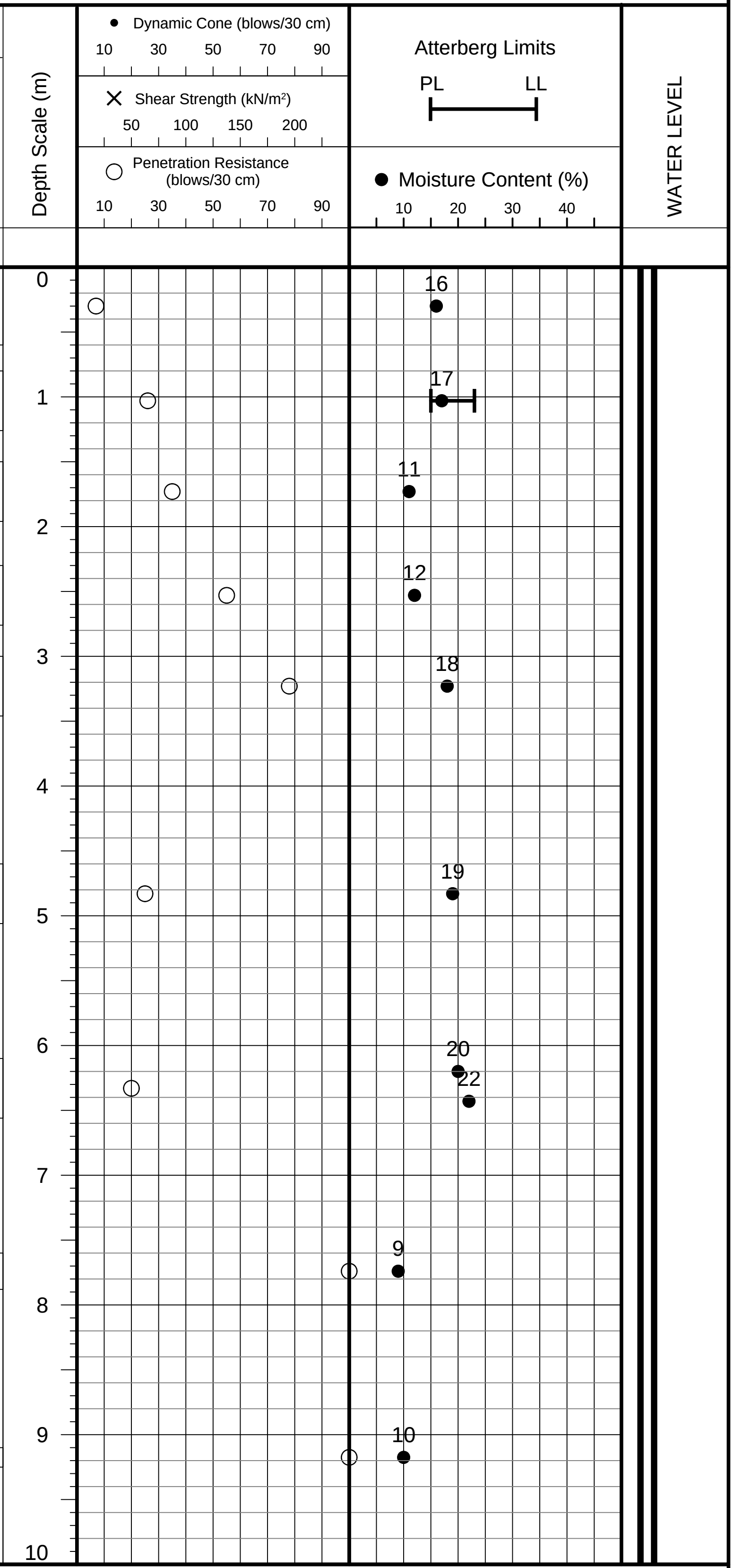
PROJECT DESCRIPTION: Proposed Pumping Station and Stormwater Management Facilities

METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

DRILLING DATE: October 18, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
261.6	Ground Surface			
0.0	**30 cm TOPSOIL**			
	Brown, firm to hard **SILTY CLAY TILL** weathered some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles and boulders	1	DO	7
		2	DO	26
		3	DO	35
		4	DO	55
		5	DO	78
258.3 3.3	Compact, moist to wet **SANDY SILT** moist brown grey a trace of clay occ. silt layers	6	DO	25
255.3 6.3	Grey, very stiff **SILTY CLAY** a trace of sand	7A 7B	DO	20
254.4 7.2	Reddish-brown, very dense **SANDY SILT TILL** some clay, a trace of gravel occ. sand and silt seams and layers, cobbles and boulders	8	DO	50/13
		9	DO	55/15
251.6				



Soil Engineers Ltd.

JOB NO.: 2310-S040

LOG OF BOREHOLE: SVS-101

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Pumping Station and Stormwater Management Facilities

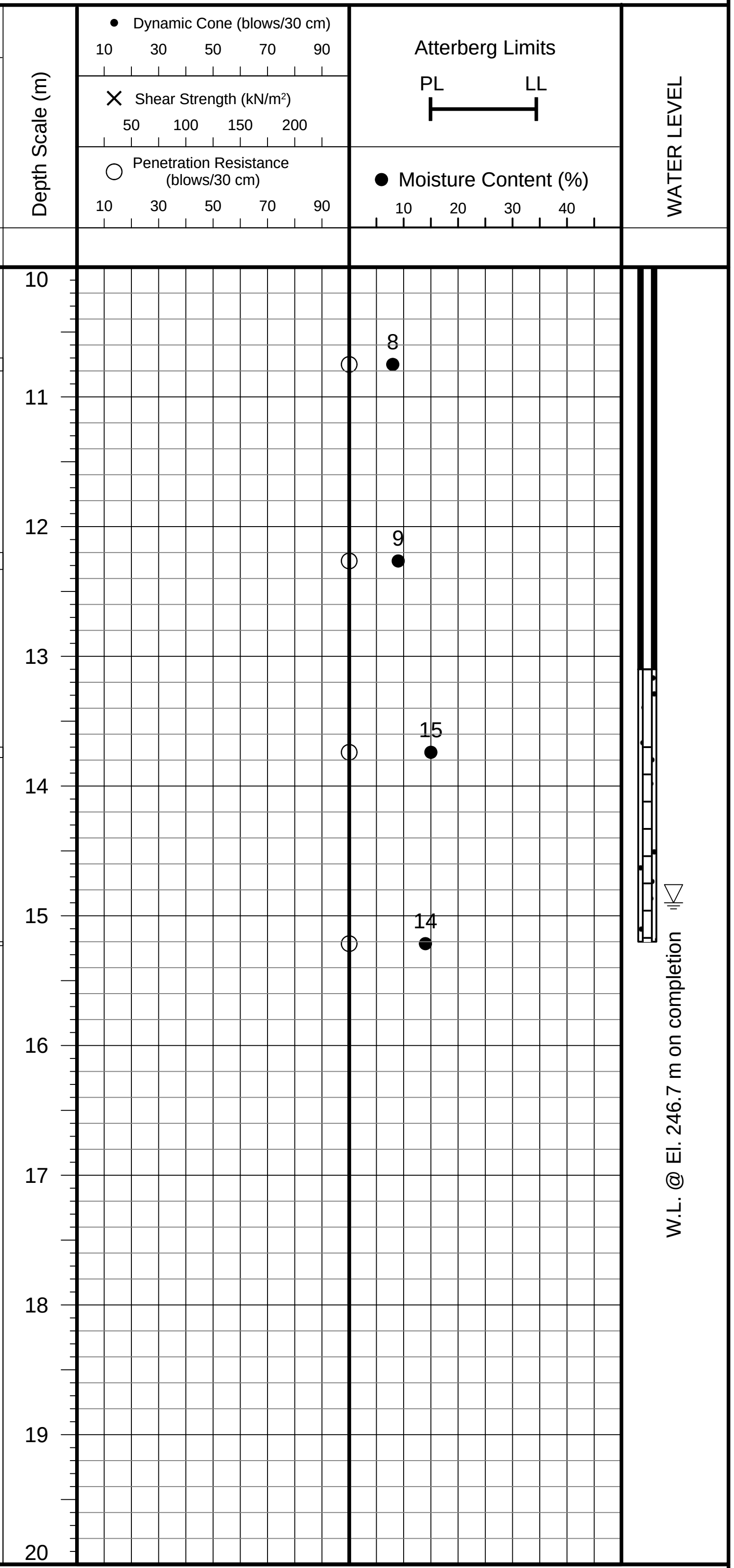
METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

DRILLING DATE: October 18, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Depth Scale (m)
10.0	Reddish-brown, very dense **SANDY SILT TILL** some clay, a trace of gravel occ. sand and silt seams and layers, cobbles and boulders	10	DO	50/10	10
		11	DO	50/13	12
247.9 13.7	Reddish-brown, hard, very moist **SILTY CLAY** clay shale reversion; with shale fragments	12	DO	50/8	13
247.0 14.6	Grey, weathered **SHALE BEDROCK** with reddish-brown clay	13	DO	50/3	15
246.3 15.3	**END OF BOREHOLE**				

Installed 50-mm Ø PVC monitoring well to
15.2 m, completed with 1.5 m screen
Sand backfill from 13.1 to 15.2 m
Bentonite seal from 0.0 to 13.1 m
Provided with a steel monument casing



JOB NO.: 2310-S040

LOG OF BOREHOLE: SVS-102

FIGURE NO.: 2

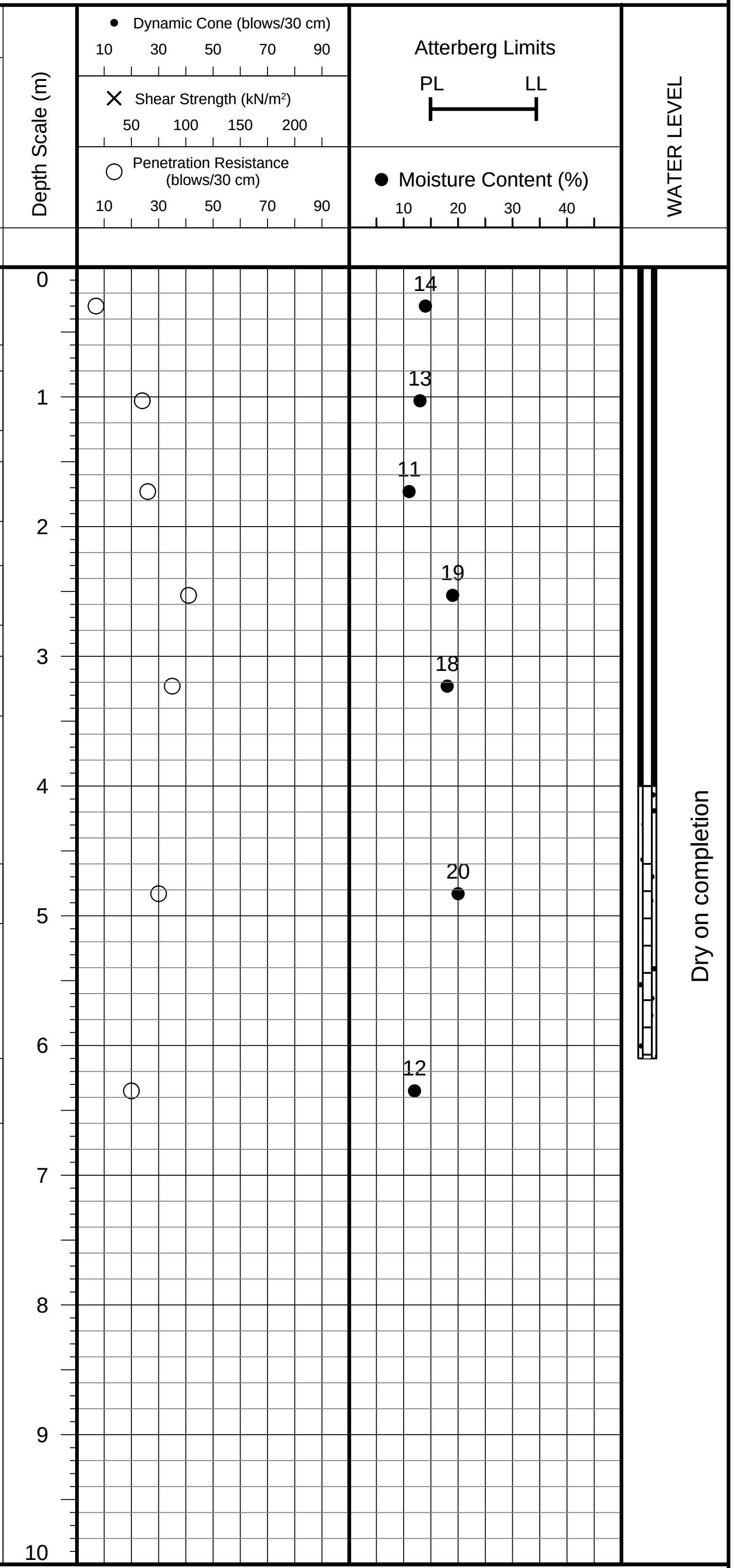
PROJECT DESCRIPTION: Proposed Pumping Station and
Stormwater Management Facilities

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

DRILLING DATE: October 19, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
260.6	Ground Surface			
0.0	**36 cm TOPSOIL** Brown, firm to very stiff **SILTY CLAY TILL** — weathered sandy a trace of gravel occ. sand and silt seams and layers, cobbles and boulders	1	DO	7
		2	DO	24
		3	DO	26
258.1 2.5	Grey, hard **SILTY CLAY** a trace to some sand occ. gravel	4	DO	41
		5	DO	35
256.6 4.0	Grey, compact, wet **SANDY SILT** a trace of clay	6	DO	30
255.0 5.6	Grey, compact, very moist **SANDY SILT TILL** traces of clay and gravel	7	DO	20
254.0 6.6	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen Sand backfill from 4.0 to 6.1 m Bentonite seal from 0.0 to 4.0 m Provided with a steel monument casing			



Soil Engineers Ltd.

JOB NO.: 2310-S040

LOG OF BOREHOLE: SVS-103

FIGURE NO.: 3

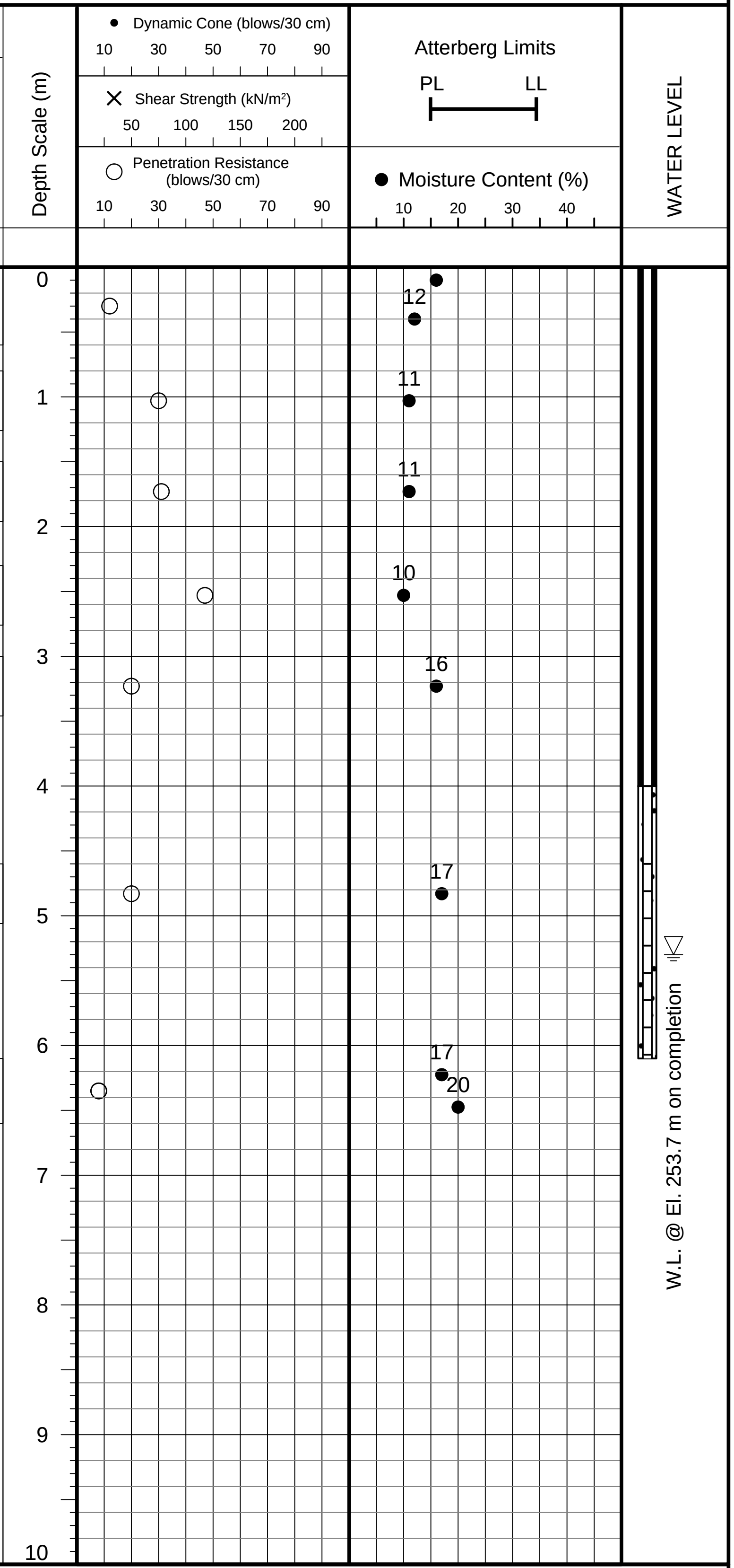
PROJECT DESCRIPTION: Proposed Pumping Station and Stormwater Management Facilities

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

DRILLING DATE: October 18, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
259.0	Ground Surface			
0.0	**20 cm TOPSOIL**	1A 1B	DO	12
	Brown, stiff to hard **SILTY CLAY TILL** — weathered sandy, a trace of gravel occ. sand and silt seams and layers, cobbles and boulders	2	DO	30
		3	DO	31
		4	DO	47
256.1 2.9	Very stiff — — brown / grey **SILTY CLAY** some sand, occ. gravel	5	DO	20
255.0 4.0	Grey, loose to compact, wet **SANDY SILT** a trace of clay	6	DO	20
	— clay layer	7A 7B	DO	8
252.4 6.6	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen Sand backfill from 4.0 to 6.1 m Bentonite seal from 0.0 to 4.0 m Provided with a steel monument casing			



Soil Engineers Ltd.

Page: 1 of 1

JOB NO.: 2310-S040

LOG OF BOREHOLE: SVS-104

FIGURE NO.: 4

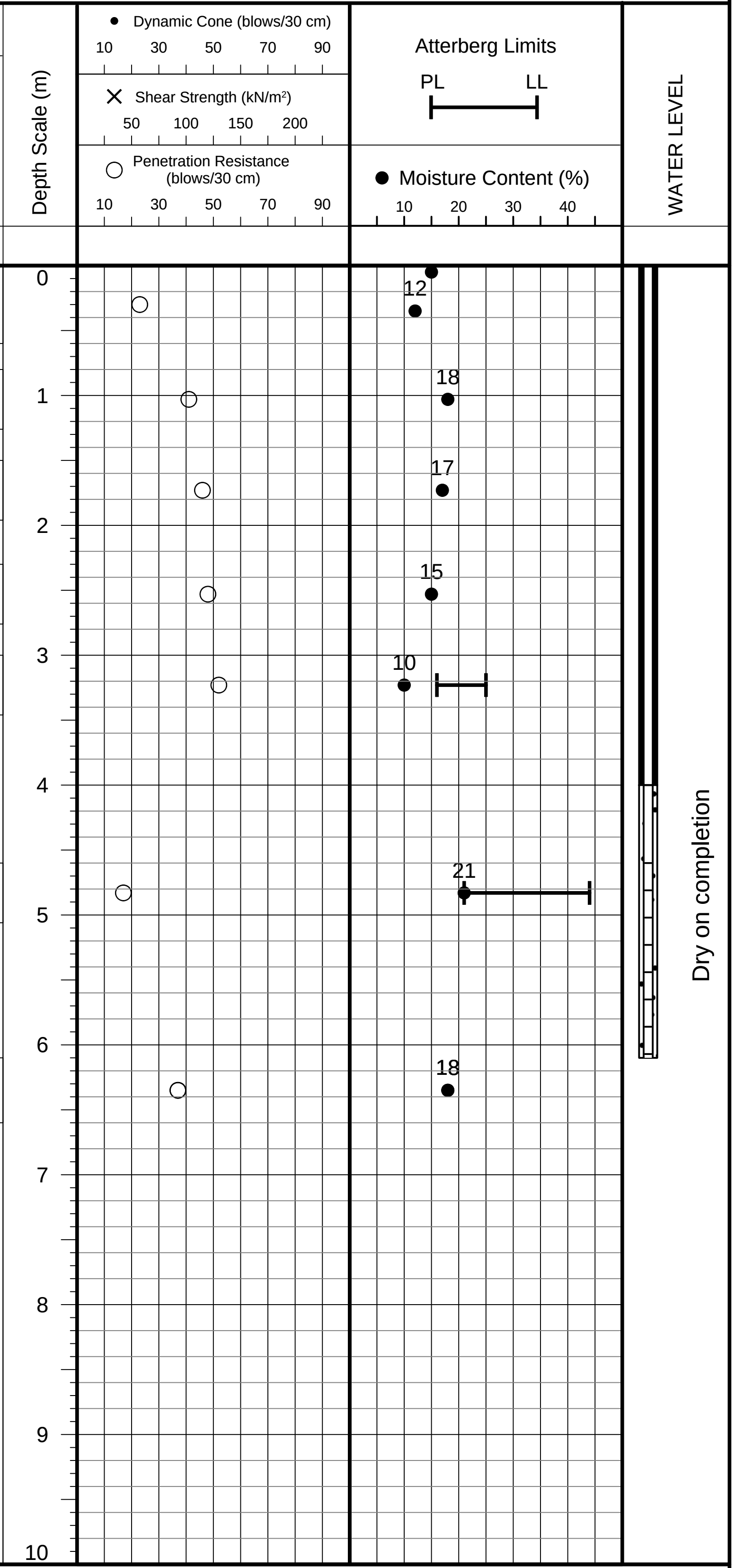
PROJECT DESCRIPTION: Proposed Pumping Station and
Stormwater Management Facilities

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

DRILLING DATE: October 16, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value	Moisture Content (%)
258.0 0.0	Ground Surface **10 cm TOPSOIL**	1A			
	Brown, very stiff **SILTY CLAY TILL** sandy, a trace of gravel	1B	DO	23	12
257.1 0.9	Brown, hard **SILTY CLAY** a trace to some sand, occ. gravel	2	DO	41	18
		3	DO	46	17
255.6 2.4	Brown, hard **SILTY CLAY TILL** sandy, a trace of gravel occ. sand and silt seams and layers	4	DO	48	15
		5	DO	52	10
254.0 4.0	Grey, very stiff **SILTY CLAY** a trace of sand occ. silt layers	6	DO	17	21
252.4 5.6	Grey, dense, very moist **SILT** a trace of sand, with clay layers	7	DO	37	18
251.4 6.6	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen Sand backfill from 4.0 to 6.1 m Bentonite seal from 0.0 to 4.0 m Provided with a steel monument casing				

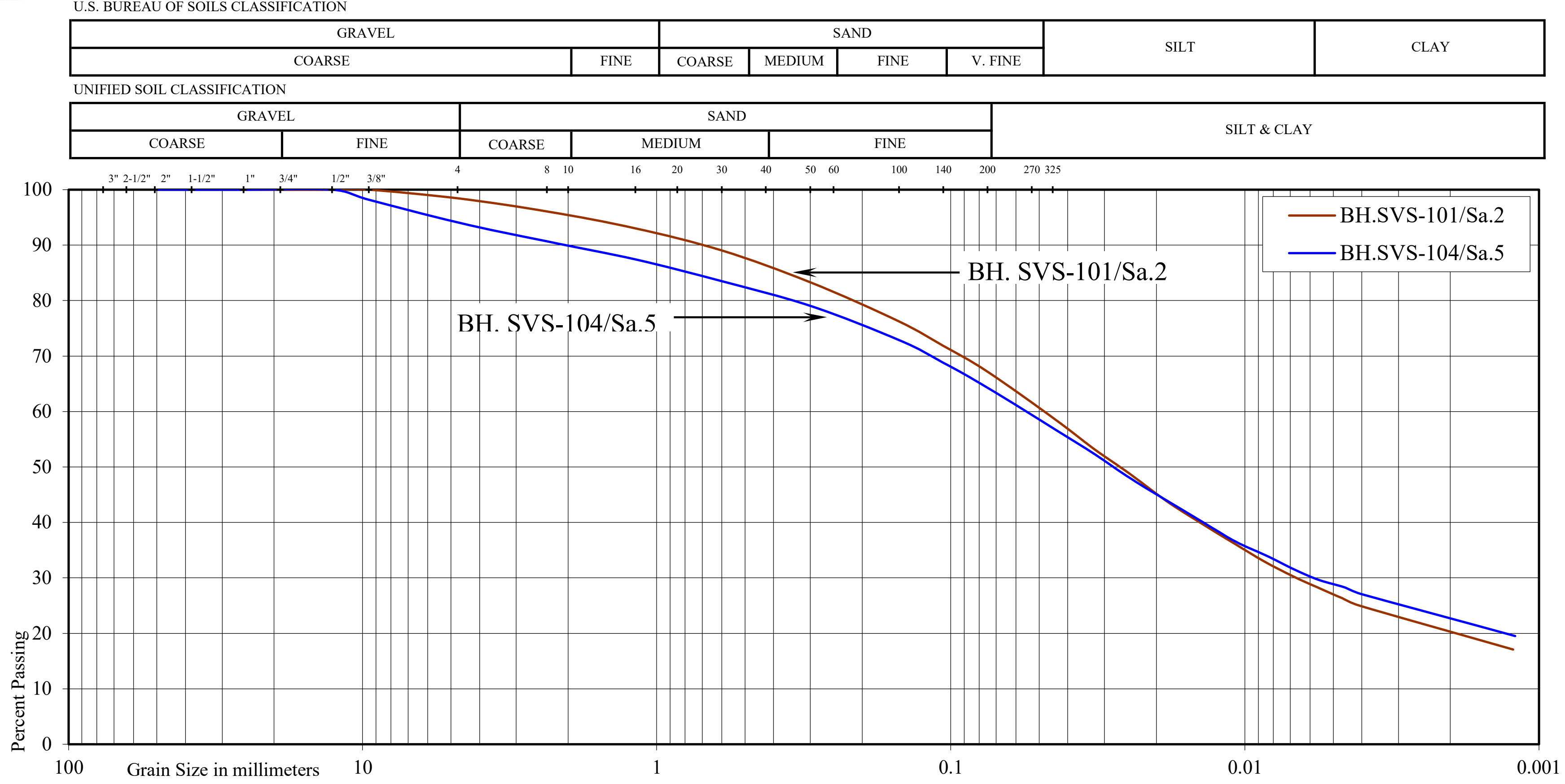


Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S040



Project: Proposed Pumping Station and Stormwater Management Facilities

Location: Southeast of Old School Road and McLaughlin Road, Town of Caledon

Borehole No: SVS-101 SVS-104

Sample No: 2 5

Depth (m): 1.0 3.2

Elevation (m): 260.6 254.8

	SVS-	SVS-
BH./Sa.	101/2	104/5
Liquid Limit (%) =	23	25
Plastic Limit (%) =	15	16
Plasticity Index (%) =	8	9
Moisture Content (%) =	17	10
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY TILL

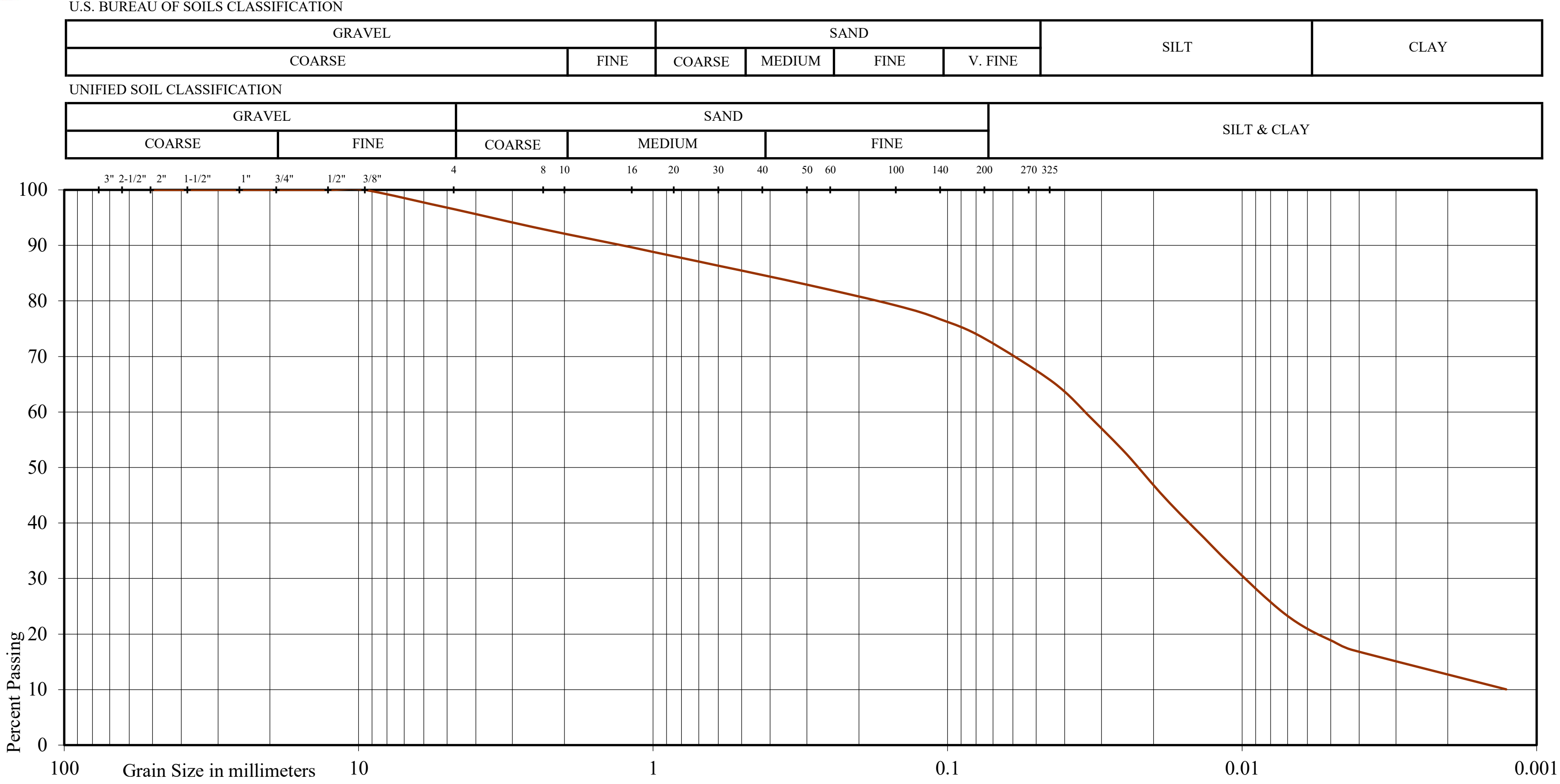
sandy, a trace of gravel

Figure: 5

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S040



Project: Proposed Pumping Station and Stormwater Management Facilities

SVS-

Location: Southeast of Old School Road and McLaughlin Road, Town of Caledon

BH./Sa. 101/11

Liquid Limit (%) = -

Borehole No: SVS-101

Plastic Limit (%) = -

Sample No: 11

Plasticity Index (%) = -

Depth (m): 12.3

Moisture Content (%) = 9

Elevation (m): 249.3

Estimated Permeability (cm./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SANDY SILT, TILL

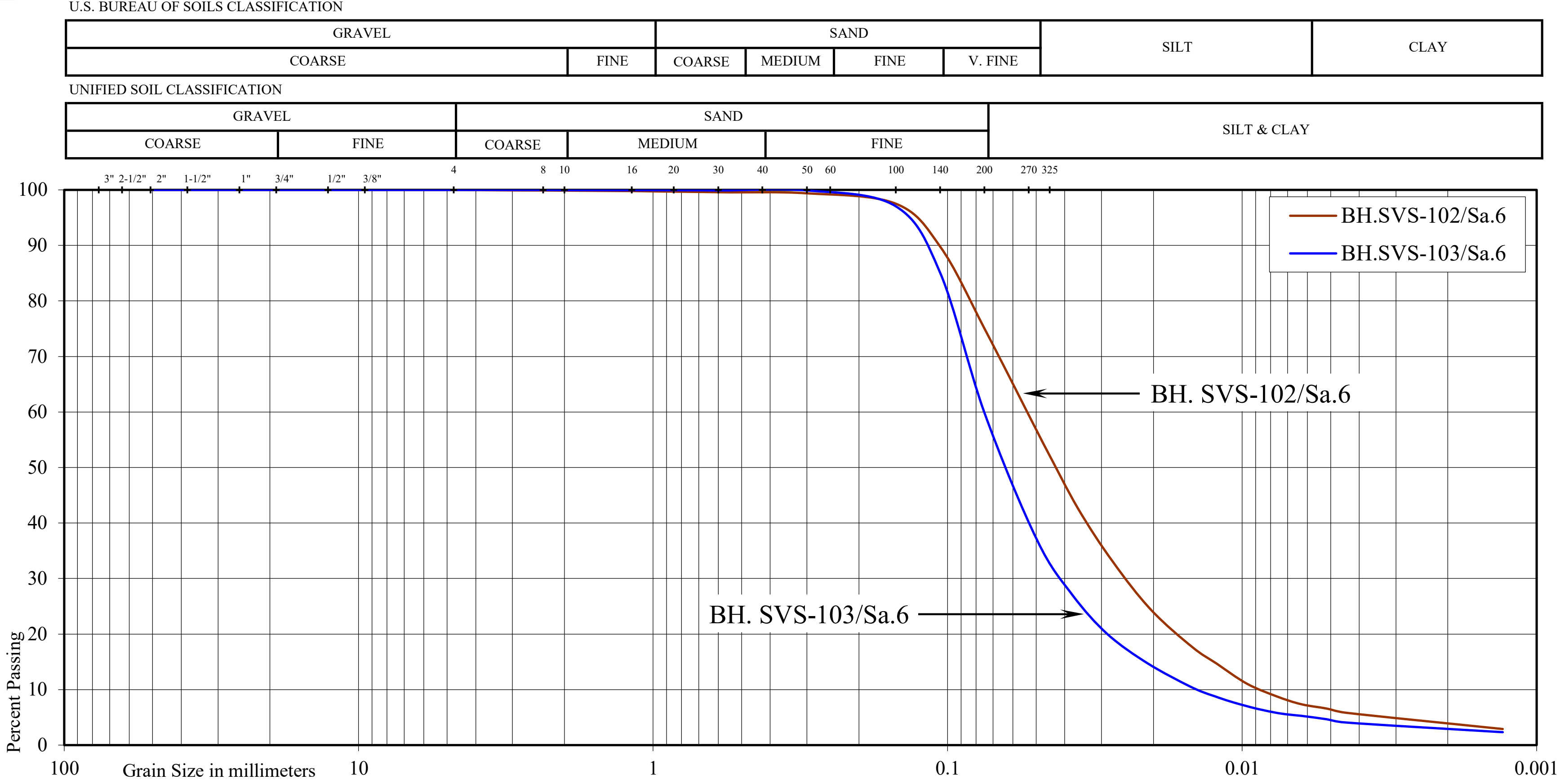
some clay, a trace of gravel

Figure: 6

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S040



Project: Proposed Pumping Station and Stormwater Management Facilities

Location: Southeast of Old School Road and McLaughlin Road, Town of Caledon

Borehole No:	SVS-102	SVS-103
Sample No:	6	6
Depth (m):	4.8	4.8
Elevation (m):	255.8	254.2

	SVS-	SVS-
BH./Sa.	102/6	103/6
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	20	17
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: SANDY SILT

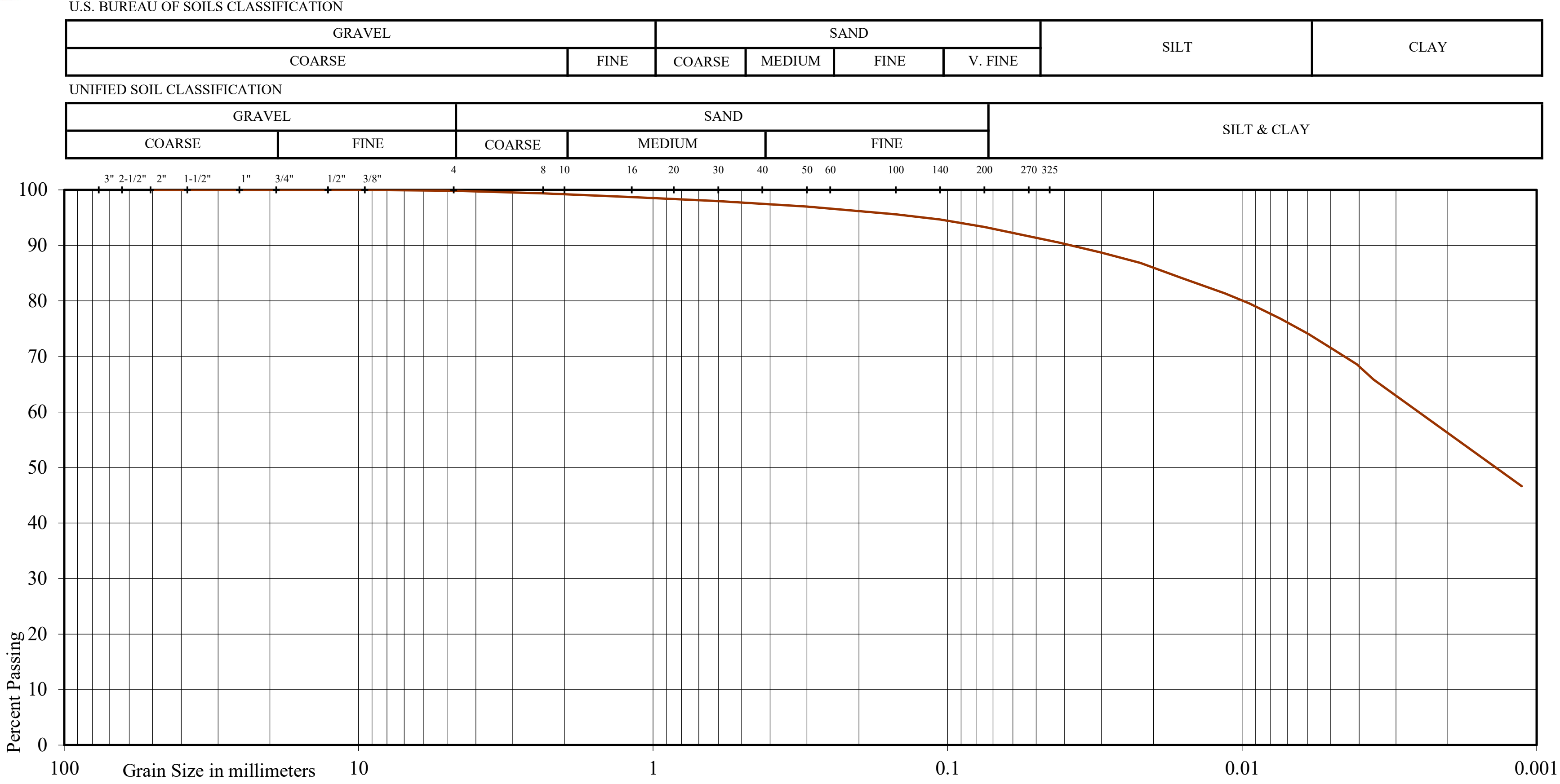
a trace of clay

Figure: 7

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S040



Project: Proposed Pumping Station and Stormwater Management Facilities

SVS-

Location: Southeast of Old School Road and McLaughlin Road, Town of Caledon

BH./Sa. 104/6

Liquid Limit (%) = 44

Borehole No: SVS-104

Plastic Limit (%) = 21

Sample No: 6

Plasticity Index (%) = 23

Depth (m): 4.8

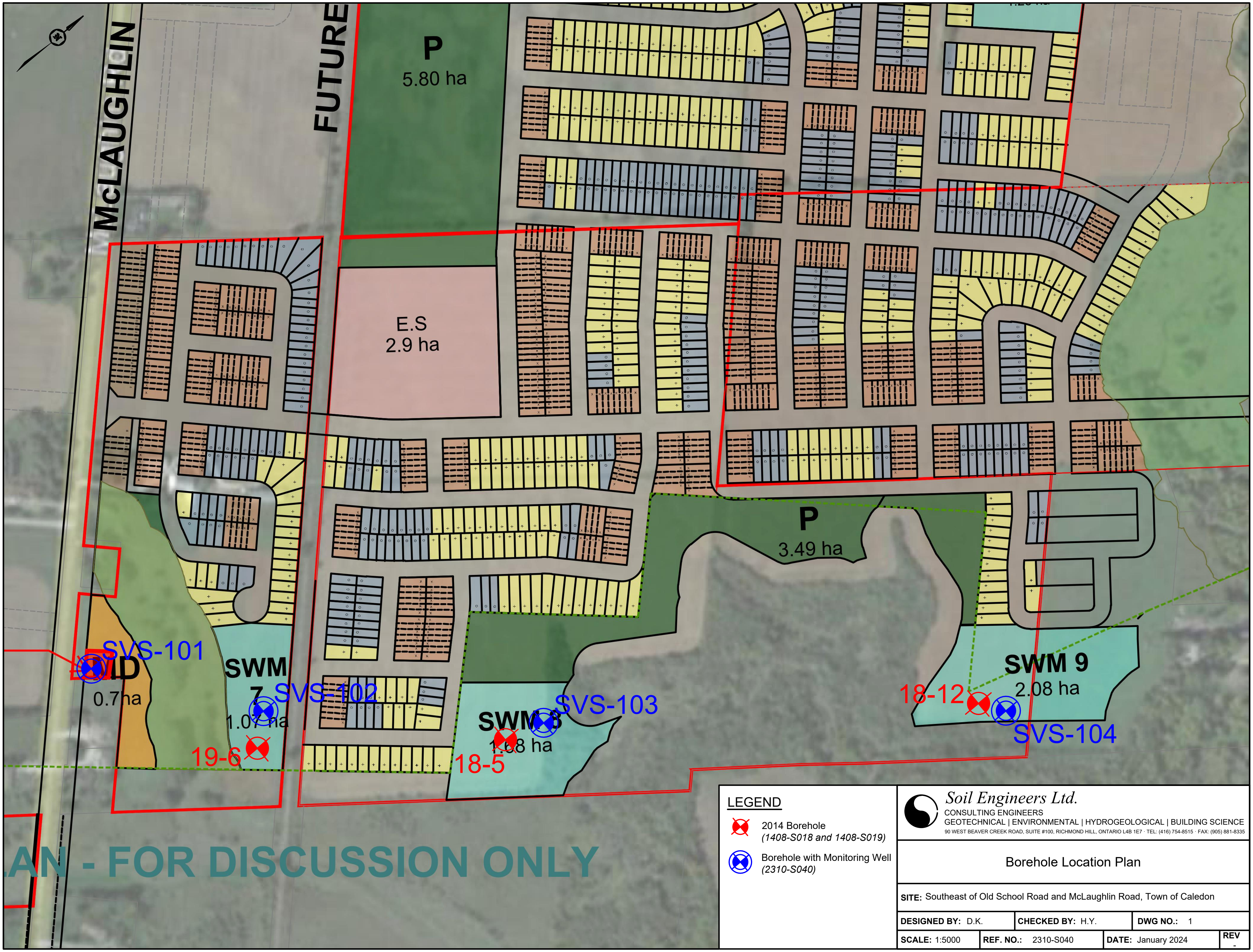
Moisture Content (%) = 21

Elevation (m): 253.2

Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY
a trace of sand

Figure: 8



LEGEND

⊗ 2014 Borehole *(1408-S018 and 1408-S019)*

⊗ Borehole with Monitoring Well *(2310-S040)*

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole Location Plan

SITE: Southeast of Old School Road and McLaughlin Road, Town of Caledon

DESIGNED BY: D.K.
CHECKED BY: H.Y.
DWG NO.: 1
SCALE: 1:5000
REF. NO.: 2310-S040
DATE: January 2024
REV -

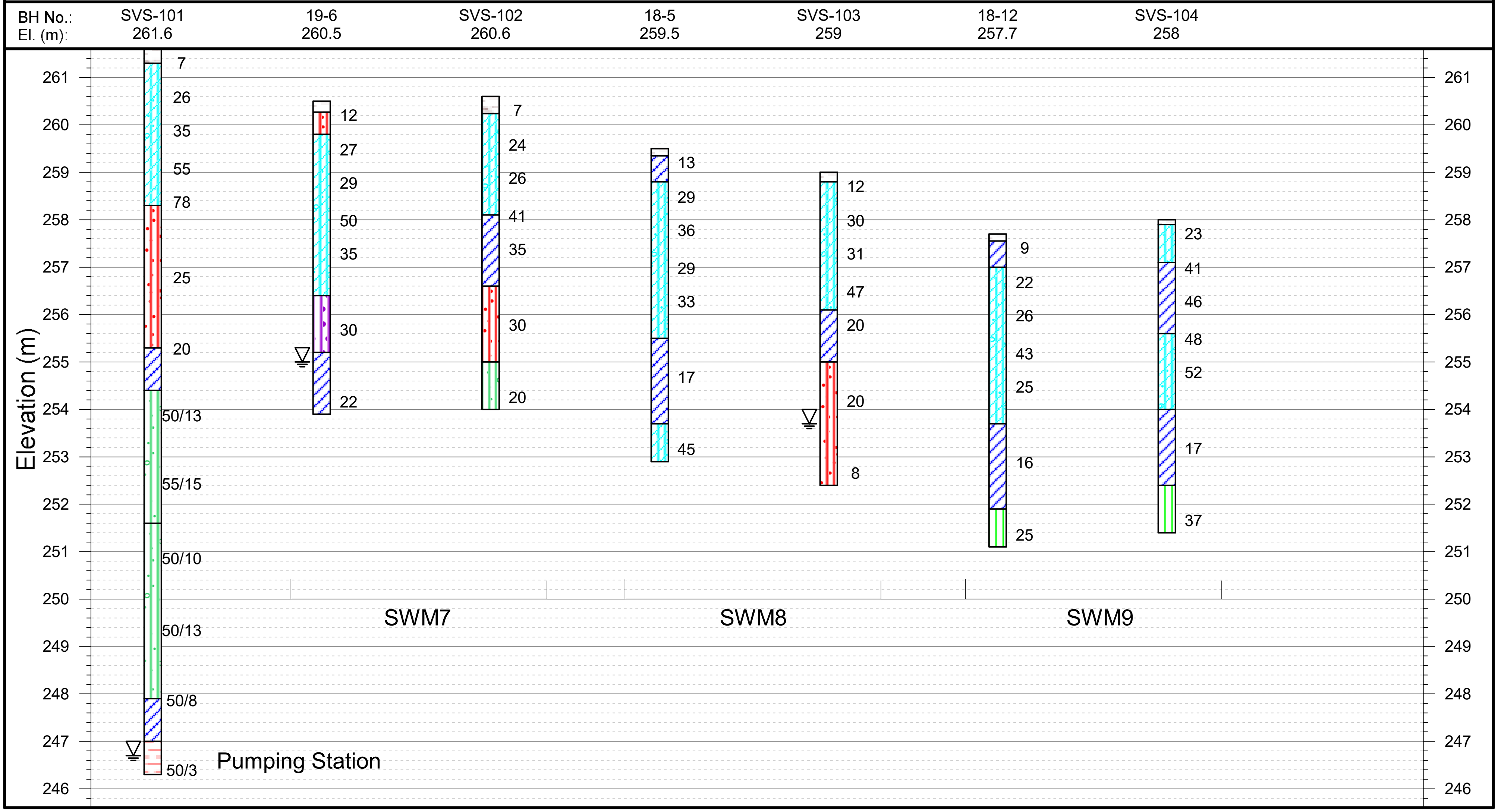
Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2310-S040
REPORT DATE: January 2024
PROJECT DESCRIPTION: Proposed Pumping Station and Stormwater Management Facilities
PROJECT LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

LEGEND

- ▨ SANDY SILT
- ▨ SANDY SILT TILL
- ▨ SHALE
- ▨ SILT
- ▨ SILTY CLAY
- ▨ SILTY CLAY TILL
- ▨ SILTY SAND
- ▨ TOPSOIL
- ▽ WATER LEVEL (END OF DRILLING)



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX

BORIEHOLE LOGS FROM 2014 GEOTECHNICAL INVESTIGATIONS (1408-S018 AND 1408-S019)

REFERENCE NO. 2310-S040

JOB NO: 1408-S018

LOG OF BOREHOLE NO: 5

FIGURE NO: 5

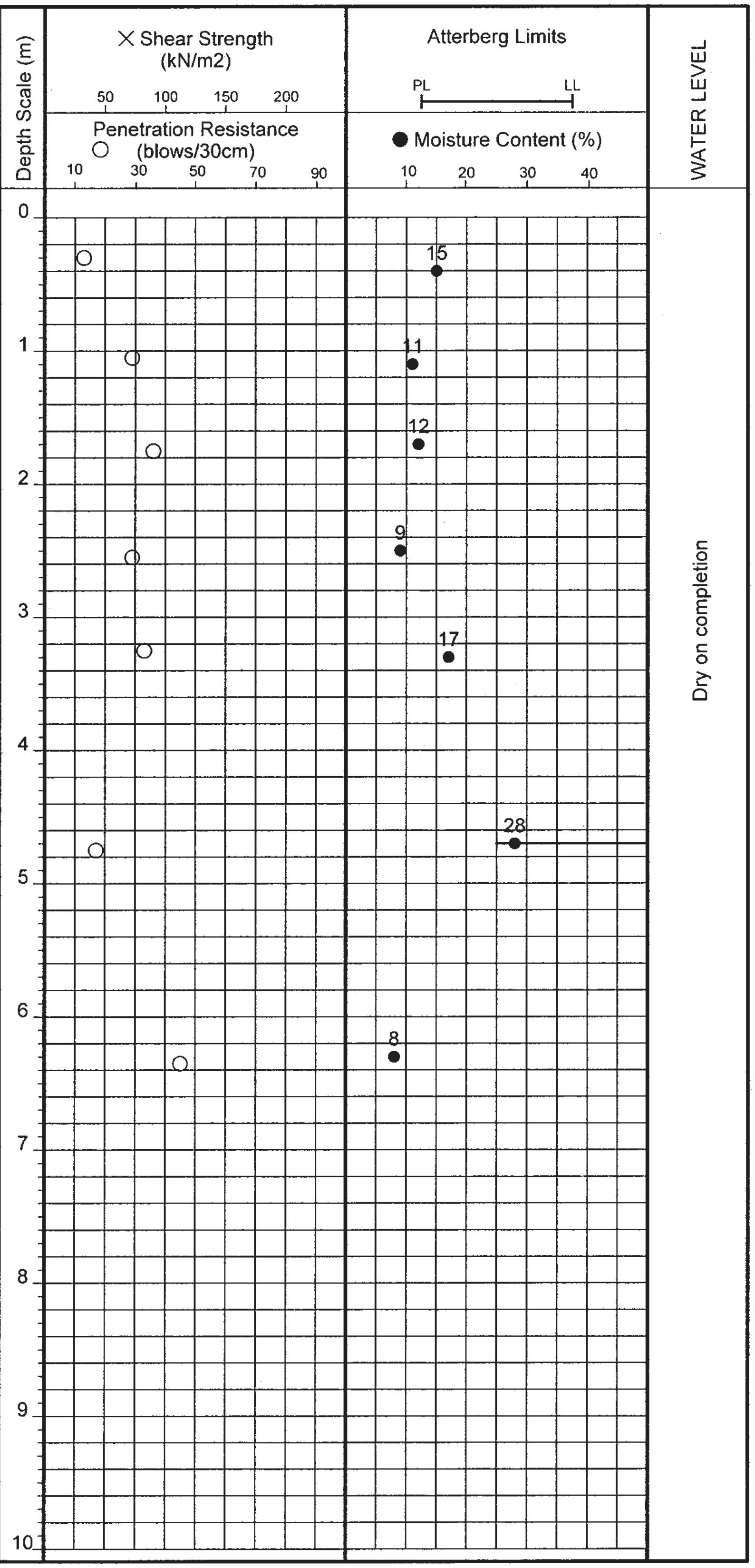
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	Number	Type	N-Value
0.0	Ground Surface			
259.5	**15 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	13
0.7 258.8	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	29
		3	DO	36
		4	DO	29
		5	DO	33
4.0 255.5	Grey, very stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	17
5.8 253.7	Grey, hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	7	DO	45
6.6 252.9	**END OF BOREHOLE**			



JOB NO: 1408-S018

LOG OF BOREHOLE NO: 12

FIGURE NO: 12

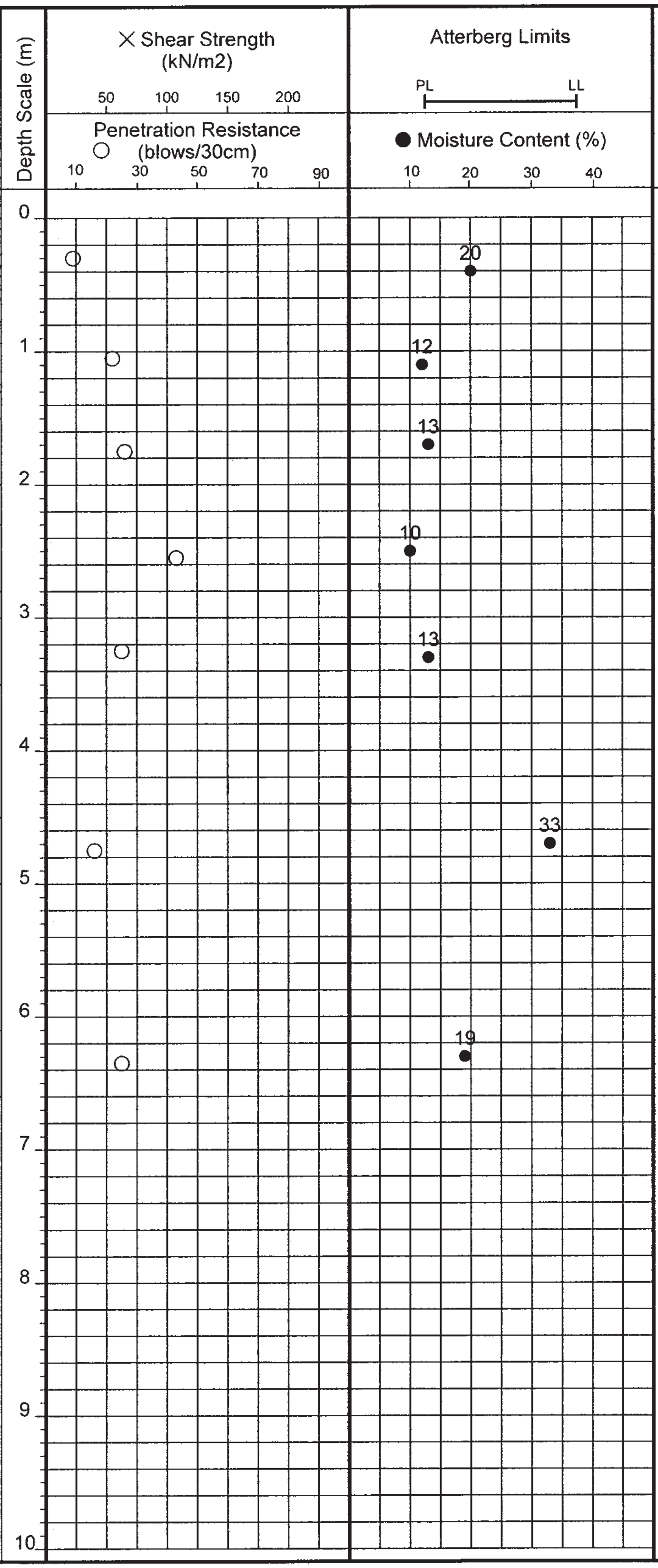
JOB DESCRIPTION: Proposed Residential Development

JOB LOCATION: Old School Road and Hurontario Street
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 26, 2014

Depth Elev. (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
0.0	Ground Surface			
257.7	**15 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY** occ. wet sand and silt seams and layers	1	DO	9
0.7 257.0	Brown, very stiff to hard **SILTY CLAY, Till** occ. wet sand and silt seams and layers, cobbles and boulders	2	DO	22
		3	DO	26
		4	DO	43
		5	DO	25
4.0 253.7	Grey, stiff **SILTY CLAY** occ. wet sand and silt seams and layers	6	DO	16
5.8 251.9	Grey, compact **SILT**	7	DO	25
6.6 251.1	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO: 1408-S019

LOG OF BOREHOLE NO: 6

FIGURE NO: 6

JOB DESCRIPTION: Due Diligence for Proposed Land Acquisition

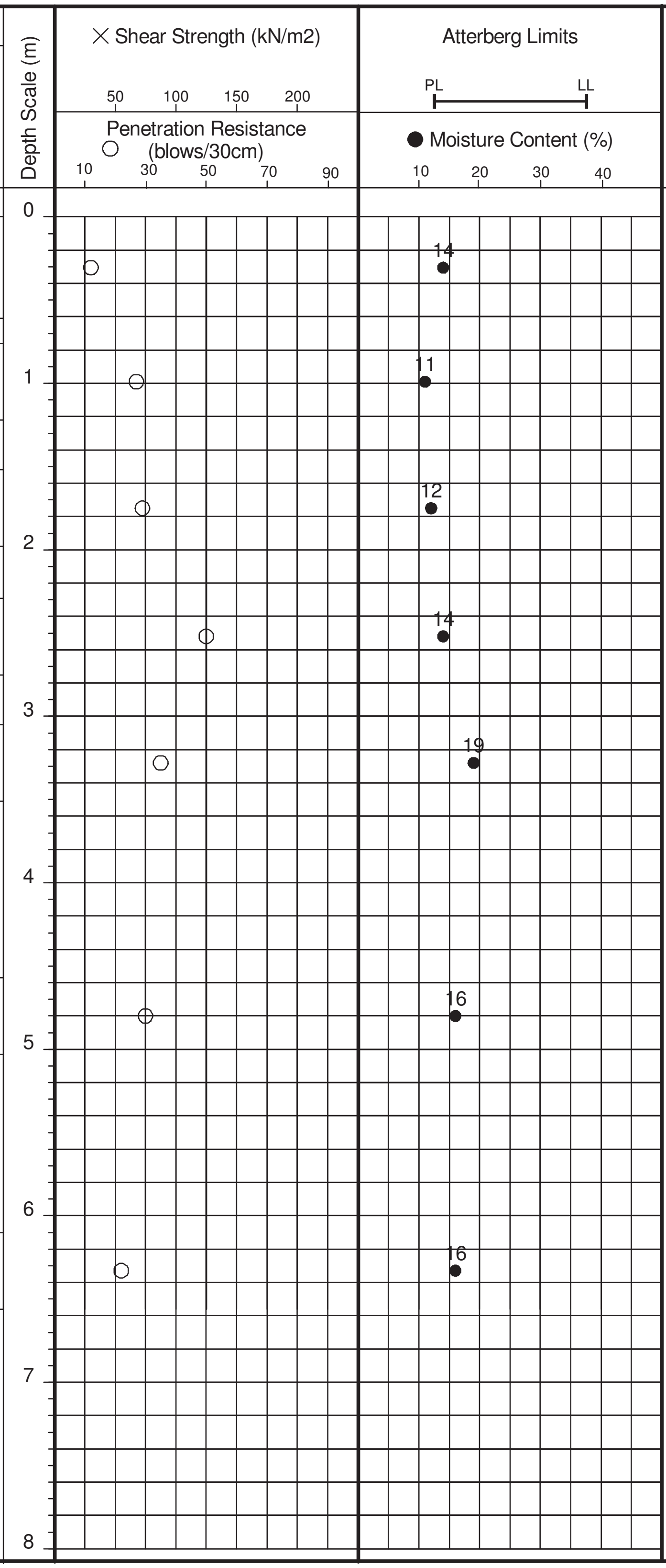
JOB LOCATION: Southeast of Old School Road and McLaughlin Road
Town of Caledon

METHOD OF BORING: Flight-Auger

DATE: August 21, 2014

Depth Elev. (m)	SOIL DESCRIPTION
0.0	Ground Surface
260.5	**23 cm TOPSOIL**
	Brown, compact **SANDY SILT** weathered, a trace of rootlets a trace of clay
0.7 259.8	Very stiff to hard **SILTY CLAY, Till** some sand to sandy a trace of gravel occ. rock fragments contains sand seams weathered brown / grey
4.1 256.4	Grey, compact **SILTY FINE SAND** a trace of clay
5.3 255.2	Grey, very stiff **SILTY CLAY**
6.6 253.9	**END OF BOREHOLE**

SAMPLES Number	Type	N-Value
1	DO	12
2	DO	27
3	DO	29
4	DO	50
5	DO	35
6	DO	30
7	DO	22



WATER LEVEL

W.L. @ El. 255.0 m upon completion

Cave-in @ El. 254.7 m upon completion

Soil Engineers Ltd.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

A REPORT TO
SCHOOL VALLEY DEVELOPMENTS LTD.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

SOUTHWEST OF OLD SCHOOL ROAD AND
HURONTARIO STREET

TOWN OF CALEDON

REFERENCE NO. 2310-S041

JANUARY 2024

DISTRIBUTION

Digital Copy - School Valley Developments Ltd.

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the email authorization dated October 2, 2023, from Mr. Frank Filippo of School Valley Developments Ltd., a geotechnical investigation was carried out for a property located southwest of Old School Road and Hurontario Street in the Town of Caledon.

The purpose of the investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of a proposed residential development.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located on the south side of Old School Road, approximately 325 m west of Hurontario Street in the southern region of Town of Caledon. It is located within a physiographic region known as the South Slope, situated in between the Oak Ridges Moraine and the Peel Plain. The soil stratigraphy in the area is characterized by sand and silt deposits layered in between an upper Halton Till and a lower Newmarket Till. The sand and silt deposits in the area were identified as part of the Oak Ridges Moraine (ORM) or equivalent unit in the Hydrogeological Assessment for Mayfield West, Phase 2 Stage 3 Lands, prepared by Palmer Environmental Consulting Group Inc. (PECG) in 2018.

At the time of investigation, the property consists of mainly farm fields. The northern and southern portions of site is separated by a forested natural system of the tributaries to the Etobicoke Creek.

Based on the conceptual site plan, the site will be developed as a low- to medium-density residential subdivision, with park and stormwater management (SWM) pond blocks.

3.0 FIELD WORK

The field work, consisting of 12 boreholes extending to a depth ranging from 6.6 to 12.3 m, was carried out between October 10 and 16, 2023. To facilitate the hydrogeological study by PECG, 50-mm diameter monitoring wells were installed at 7 selected borehole locations. The depth and details of the monitoring wells are shown on the corresponding Borehole Logs. The locations of the boreholes and monitoring wells are shown on Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted machine equipped with solid and hollow stem augers for soil sampling. Split-spoon samples were recovered for soil classification and laboratory testing. Standard Penetration Tests using the procedures described on the enclosed "List of Abbreviations and Terms" were performed at the sampling depths. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the 'N' values. The field work was supervised and the findings were recorded by a geotechnical technician.

The ground elevation at each borehole location was determined using a handheld equipment of the Global Navigation Satellite System.

4.0 SUBSURFACE CONDITIONS

Beneath the topsoil veneer, the subsoil profile consists of silty clay till in the upper stratigraphy, overlying a sand and silt unit and interstratified with silty clay layers at various depths and locations. At Boreholes SV-105 and 106, a sandy silt till stratum was observed beneath the sands and silts in the lower stratigraphy. Fine/fine to coarse sand deposits were observed in the northeast quadrant of the site.

Detailed descriptions of the encountered subsurface conditions are presented on the Logs of Borehole, comprising of Figures 1 to 12, inclusive. The soil stratigraphy is illustrated on the Subsurface Profile, Drawing No. 2.

Previous borehole investigations and monitoring well installations were carried out by Terraprobe Inc. and PECG in 2009 and 2017. Relevant borehole data from these investigations have been incorporated in this report, and the associated borehole logs are enclosed in the Appendix for reference. A prefix of T- and MW- refers to the boreholes and monitoring wells installed by Terraprobe and PECG, respectively.

The engineering properties of the disclosed soils are discussed herein.

4.1 Topsoil

The revealed topsoil thickness ranges from 15 to 41 cm. Thicker topsoil may be encountered in areas beyond the borehole locations, especially in local low-lying areas. In MW-4, a surficial topsoil layer has a thickness of 1.07 m.

4.2 Silty Clay/Clayey Silt Till and Silty Clay/Clay

The silty clay till/clayey silt till was generally encountered in the upper stratigraphy across the site except in MW-4, where the borehole was terminated in the clay till mantle at a depth of 10.9 m below grade. The till consists of a mixture of particle sizes ranging from clay to gravel, with silt and clay being the dominant fraction. The silty clay, containing a trace of fine sand, was encountered at various depths and locations. Grain size analyses were performed on 2 representative samples of the silty clay till and on a sample of the silty clay, and the results are plotted on Figures 13 and 14, respectively.

The Atterberg Limits of 2 clay till and 1 clay samples and the natural water content values of all the samples were determined; the results are plotted on the Borehole Logs and summarized below:

	Silty Clay Till	**Silty Clay**
Liquid Limit	30% and 37%	42%
Plastic Limit	17% and 20%	21%
Natural Water Content	10% to 24% (median 15%)	18% to 26% (median 20%)

The results indicate that the clay till is low to medium in plasticity and clay is medium in plasticity. Both the clay and clay till are in moist conditions with natural water content values generally below their plastic limits.

The recorded 'N' values of the clay till range from 3 to 70 (blows per 25 cm of penetration), with a median of 23 blows per 30 cm of penetration. This indicates that the clay till is soft to hard, generally being very stiff in consistency. The obtained 'N' values of the clay range from 15 to 38, with a median of 20 blows per 30 cm of penetration, showing that the clay is very stiff to hard, generally being very stiff in consistency. The low 'N' values are generally encountered near the ground surface where the soil was likely disturbed by farming activities and/or weakened by the weathering process. Intermittent hard resistance to augering was encountered in places, indicating the presence of cobbles in the till mantle.

The engineering properties of the silty clay till and clay are listed below:

- High frost susceptibility and low water erodibility.
- In excavation, the clays will be stable in relatively steep cuts; however, prolonged exposure may lead to localized sloughing.

4.3 Silty Fine Sand/Sandy Silt/Silt/Sand and Silt

Beneath the surficial topsoil, a sandy silt/silt deposit was contacted in Boreholes SV-102, SV-103, SV-104, SV-105, SV-106, SV-110 and SV-111. Furthermore, a silty fine sand/sandy silt/silt/sand and silt deposit was encountered in the lower stratigraphy across the site beneath the silty clay till and silty clay, except in MW-4 where sand and silt deposits dominate the soil stratigraphy. Grain size analyses were performed on representative samples of the silty fine sand, sandy silt and silt, and the results are plotted on Figures 15 to 17, respectively.

The obtained natural water content values range from 3% to 25%, with a median of 20%, indicating that the sands and silts are dry to wet, generally in a very moist to wet condition. Sample examination revealed that the lower zone of the unit, below depths of 4.0 to 6.0 m, is generally water bearing.

The recorded ‘N’ values range from 5 to 70, with a median of 23 blows per 30 cm penetration, indicating relative densities of loose to very dense, generally being compact. The loose soils encountered near the ground surface were likely disturbed or weakened by weathering.

The engineering properties of the silty fine sand/sandy silt/sand and silt are listed below:

- High capillarity and water retention capability.
- Highly frost susceptible, with high soil-adfreezing potential.
- High water erodibility, the fine particles will migrate through small openings under seepage pressure.
- The shear strength is mainly derived from internal friction. The wet silts and sands are susceptible to dynamic disturbance, which will induce a build-up of pore water pressure, resulting in soil dilation and a reduction in shear strength.
- In excavation, the silts and sands will remain stable for a short period of time and may slough readily. The wet silts and sands will run with seepage, and boil under an approximate piezometric head of 0.4 m.

4.4 **Sand**

Fine and fine to coarse grained sand layers were found in Boreholes SV-107, SV-108 and MW-8, generally in the northeast quadrant of the site. Both Boreholes SV-107 and MW-8 were terminated in the sand stratum. Occasional fine sand layers were also observed embedded in the silty sand/sandy silt deposit in other boreholes. The sand contains a trace to some silt and a trace of clay. Grain size analyses were performed on 3 sand samples; the gradations are plotted on Figure 18.

Sample examination revealed that the sand is moist in the upper stratigraphy, becoming wet in the lower zone, with natural water content values varying from 6% to 22% and a median of 7%. The sand at the bottom of Boreholes SV-107 and MW-8 is wet.

The sand is loose to dense, generally being compact in relative density, with obtained 'N' values ranging from 9 to 37, and a median of 25 blows per 30 cm of penetration.

The engineering properties of the sand are listed below:

- Water erodible material.
- In excavation, the sand will slough to its angle of repose, run with water seepage and boil with a piezometric head of about 0.3 to 0.4 m.

4.5 Sandy Silt Till

Sandy silt till was encountered beneath the clay till in Borehole SV-109 overlying the silty fine sand/sandy silt stratum. In Boreholes SV-105 and SV-106, the silt till stratum was encountered beneath the sand/silt and clay deposits; both boreholes were terminated in the till stratum. The till is cemented with a trace to some clay, and is laminated with sand and silt seams and layers. Hard resistance to augering was encountered in the lower zone of the boreholes, indicating the presence of cobbles in the till mantle. A grain size analysis was performed on a representative sample of the till; the result is plotted on Figure 19.

The natural water content values of the till range from 7% to 14%, with a median of 8%, indicating that the till is generally in a moist condition.

The obtained 'N' values range from 47 to over 50, with a median of over 50 blows per 30 cm penetration, indicating that the relative density of the till is dense to very dense, being generally very dense.

The engineering properties of the sandy silt till are listed below:

- Highly frost susceptible and moderately low water erodibility.
- The till will be relatively stable in relatively steep excavation; however, if remained open for an extended period of time, localized sloughing may occur.

4.6 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	**Determined Natural Water Content (%)**	**Water Content (%) for Standard Proctor Compaction**	
		100% (optimum)	**Range for 95% or +**
Silty Clay Till	10 to 24 (median 15)	18	15 to 22
Silty Clay	18 to 26 (median 20)	20	16 to 24
Sandy Silt Till	7 to 14 (median 8)	10	6 to 15
Silty Fine Sand/Sandy Silt/ Silt/Sand and Silt	3 to 58 (median 20)	12	8 to 16
Fine/Fine to Coarse Sand	6 to 22 (median 7)	8 to 9	6 to 11

The above values show that the tills and clay are generally suitable for structural backfill, and the addition of water may be required prior to structural compaction in the dry and warm seasons and in areas where compaction is best performed on the wet side of the optimum. Wet silts and sands can be stockpiled to drain the excess water prior to structural compaction.

The lifts for compaction should be limited to 20 cm, or to a suitable thickness assessed by test strips performed by the compaction equipment. Boulders larger than 15cm in size must be sorted and removed from the backfill.

5.0 GROUNDWATER CONDITION

Groundwater levels were detected in 5 of the 12 boreholes upon completion of drilling in October 2023. In December 2023, stabilized groundwater levels were recorded from the installed monitoring wells in by PECG; these levels are tabulated in Table 2.

Stabilized water levels were recorded at depths ranging from 3.54 to 8.83 metres below ground surface (mbgs), or from El. 262.08 to 255.44 m. The groundwater records are generally consistent with or near the observed wet sands and silts at the boreholes. The groundwater regime is subject to seasonal fluctuations. Detailed groundwater profile and monitoring records should be referred to the hydrogeological study by PECG.

Table 2 - Groundwater Levels

Borehole/ Monitoring Well No.	Ground El. (m)	Well Depth (m)	Measured Groundwater Levels					
			On Completion		Dec. 6, 2023		Dec. 12-13, 2023	
			Depth (m)	El. (m)	Depth (m)	El. (m)	Depth (m)	El. (m)
SV-101	266.1	-	3.7	262.4	No Well			
SV-102	264.6	5.8	N/A[a]	-	4.02	262.08	-	-
SV-103	264.1	6.1	N/A[a]	-	3.54	260.56	-	-
SV-104	264.1	-	5.5	258.6	No Well			
SV-105	264.7	-	Dry	-	No Well			
SV-106	264.9	9.1	N/A[a]	-	6.13	258.77	6.11	258.79
SV-107	265.1	10.7	10.1	255.0	8.65	256.45	-	-
SV-108	264.3	10.7	9.1	255.2	7.00	257.30	7.96	256.34
SV-109	263.6	6.1	5.9	257.7	4.61	258.99	4.64	258.96
SV-110	263.6	-	Dry	-	No Well			
SV-111	263.7	-	Dry	-	No Well			
SV-112	262.9	6.1	Dry	-	Dry	-	Dry	-
T-1	263.0	9.6	6.4[b]	256.6	6.59	256.65	-	-
T-2	264.3	9.6	8.8[b]	255.5	8.70	255.44	-	-
MW-4	266.0	7.92	4.59[c]	261.41	4.48	261.52	-	-
MW-8	265.0	11.28	9.00[c]	256.00	8.83	256.17	-	-

[a] Water was used during the drilling operation; measurement of groundwater level was not feasible upon completion of drilling.

[b] Water level measured on completion on February 12, 2009.

[c] Water level measured on completion on November 15, 2017.

6.0 DISCUSSION AND RECOMMENDATIONS

Beneath the topsoil veneer, the subsoil profile consists of generally very stiff silty clay till in the upper stratigraphy, overlying a generally compact sand and silt unit and interstratified with very stiff silty clay at various depths and locations. At Boreholes SV-105 and 106, a very dense sandy silt till stratum was observed beneath the sands and silts in the lower stratigraphy. Generally compact sand deposits were observed in the northeast quadrant of the site. The surficial weathered zone extends to depths of 0.6 to 1.2 m below grade.

Stabilized water levels were recorded at depths ranging from 3.54 to 8.83 mbgs, or from El. 262.08 to 255.44 m. The groundwater records are generally consistent with or near the observed wet sands and silts at the boreholes. The groundwater regime is subject to seasonal fluctuations.

It is understood that the site will be developed as a low- to medium-density residential subdivision with park and SWM pond blocks. A bridge crossing will also be constructed in the vicinity of Boreholes SV-105 and SV-106 to connect the development north and south of the natural tributaries system. The development will be provided with municipal services and paved roadways meeting municipal standards. The following geotechnical considerations warrant special attention:

1. The topsoil must be stripped for development; it can be reused for general landscaping purposes only.
2. The weathered soil should be inspected prior to any placement of earth fill for site grading purpose. Where required, the weathered soil should be subexcavated, sorted free of any organic, topsoil, and/or other deleterious material, before reusing for structural backfill.
3. Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction.
4. The engineered fill and the sound native soils are suitable for supporting structures founded on conventional spread and strip footings.
5. In view of the underlying wet sands and silts, it is recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level. Otherwise, underfloor subdrain systems and/or waterproofing of basements should be implemented to relieve any groundwater upfiltration due to seasonal fluctuation of the groundwater.
6. A Class ‘B’ bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL), is recommended for the construction of underground services. Where services installation extends into the saturated sands and silts, or where dewatering is required, a Class ‘A’ concrete bedding should be considered for pipe support.
7. Groundwater seepage from the tills and clay will likely be removable by conventional pumping from sumps during construction. Excavation extending into the saturated soils will require construction dewatering.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes, and the assessment given herein is general in nature based on the borehole findings. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Site Preparation

The topsoil and vegetation at the ground surface must be removed for development. Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction. The engineering requirements for a certifiable fill are presented below:

1. The subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils should also be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts of 20 cm thick to at least 98% Standard Proctor Dry Density (SPDD) up to the proposed finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% SPDD.
3. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.
4. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue or contamination. Any potential imported earth fill from off-site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before being hauled to the site.
5. The fill operation must be inspected on a full-time basis by a technician under direction of a geotechnical engineer.
6. The engineered fill should not be placed during period when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.

7. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors.
8. The foundations and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
9. Despite stringent control in the placement of the engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the foundations must be properly reinforced, or be designed by the structural engineer for the project. The total and differential settlements of 25 mm and 20 mm, respectively, should be considered in the design of the foundation founded on engineered fill.
10. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of the excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.

6.2 Foundation

Based on the borehole information, the following bearing pressures are recommended for house structures supported on conventional strip and spread footings founded onto engineered fill or sound native soils below the disturbed or weathered soils.

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 100 kPa
- Factored Ultimate Bearing Pressure at Ultimate Limit State (ULS) = 150 kPa

The total and differential settlements of footing designed for the recommended bearing pressure at SLS are estimated at 25 mm and 20 mm, respectively.

The footing subgrade must be inspected by a geotechnical engineer, or a senior geotechnical technician, under the supervision of a geotechnical engineer, to ensure that the revealed conditions are compatible with the design of the foundation.

Footings exposed to weathering, or in unheated areas, should have at least 1.2 m of earth cover for protection against frost action.

Where the footing excavation consists of wet sands and/or silts, or the footing subgrade is saturated, a concrete mud-slab of lean mix concrete, 8 to 10 cm in thickness, should be poured immediately after subgrade preparation and inspection to protect the approved subgrade against disturbance by the construction traffic.

The foundation should meet the requirements specified by the latest Ontario Building Code, and the structures can be designed to resist a minimum earthquake force using Site Classification 'D' (stiff soil).

Higher bearing pressures may be provided depending on location and foundation design depth. This can be confirmed once the design and grading specifications are available for review.

6.3 **Basement Structure**

Where house basements are proposed, they should be designed for the lateral earth pressure using the soil parameters provided in Table 5.

Wet sand and silt deposits were observed throughout the site at various depths. It is therefore recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level. In conventional basement design, perimeter walls of the basement structure should be damp-proofed and provided with perimeter subdrains at the wall base. Backfill of the open excavation should consist of free-draining granular material (Drawing No. 3) unless prefabricated drainage board is installed over the entire wall below grade.

Should the basement floor be founded less than 1.0 m above the groundwater table, underfloor subdrains (Drawing No. 4) should be provided to supplement the perimeter subdrain system to relieve any groundwater upfiltration due to seasonal fluctuation. If the basement floor is to be founded less than 0.5 m above the groundwater table, the basement structure should be waterproofed and designed for hydrostatic uplift pressure. The subdrains, connected to a positive outlet, should be encased in a fabric filter to protect them against blockage by silting.

The subgrade of the basement slab must consist of sound native soil or well compacted inorganic earth fill or engineered fill. The subgrade should be inspected and assessed by proof-rolling prior to slab-on-grade construction. Where loose or soft subgrade is detected, it should be subexcavated and replaced with inorganic material, compacted to at least 98% SPDD.

The concrete slab should be constructed on a minimum 15 cm thick granular base, consisting of 19-mm CRL, or equivalent, compacted to its maximum SPDD. Where underfloor weepers are required, the bedding should be increased to 30 cm in thickness. In addition, a vapor barrier should be placed between the granular bedding and the concrete slab to prevent upfiltration of water vapour.

The external grading must be designed to drain surface runoff away from the structures to minimize the frost heave phenomenon generally associated with the disclosed soils.

6.4 **Underground Services**

A Class 'B' bedding is recommended for construction of the underground services. The bedding material should consist of compacted 19-mm CRL, or equivalent, compacted to at least 98% SPDD. In the saturated sand and silt deposits, a Class 'A' bedding should be considered for proper pipe support.

The subgrade for underground services should consist of sound native soils or properly compacted earth fill. Where soft or loose soil is encountered at the invert level, it must be subexcavated and replaced with properly compacted bedding material.

The pipe joints connecting into manholes and catch basins should be leak-proof or wrapped with an appropriate waterproof membrane to prevent migration of fines due to leakage, leading to a loss of subgrade support and subsequent pipe collapse.

Openings to subdrains and catch basins should be shielded by a fabric filter to prevent silting. In order to prevent pipe floatation when the service trench is deluged with water derived from precipitation, a soil cover with a thickness of at least the diameter of the pipe should be in place at all times after completion of the pipe installation.

The service pipes and metal fittings should be protected against corrosion. For estimation of anode weight requirements, the electrical resistivities of the disclosed soils presented in Table 5 can be used. The proposed anode weight must meet the minimum requirements as specified by the Town of Caledon or Region of Peel.

6.5 **Backfilling Trenches and Excavated Areas**

The on-site inorganic soils are suitable for trench backfill. The addition of water may be required for the tills and clay prior to structural compaction during dry and warm weather and in areas where compaction is best performed on the wet side of the optimum. Wet sands and silts will require aeration prior to their use as structural backfill. The tills should be sorted free of large cobbles and boulders (over 15 cm in size).

The backfill material should be compacted to at least 95% SPDD. In areas below the slab-on-grade and in the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% SPDD with a moisture content 2% to 3% drier than the optimum. This is to provide the required stiffness for floor or pavement construction. The lift of each backfill layer should be limited to a thickness of 20 cm, or the thickness should be determined by test strips at the time of compaction.

In normal construction practice, the problem areas of pavement settlement largely occur adjacent to foundation walls, columns, manholes, catch basins and services crossings. In areas which are inaccessible to a heavy compactor, sand backfill which can be appropriately compacted using a smaller vibratory compactor should be used.

One must be aware of possible consequences during trench backfilling and exercise caution as described below:

- To backfill a deep trench, one must be aware that the future settlement is to be expected, unless the sides is flattened to 1V:2H, and the lifts of the fill and its moisture content are stringently controlled; i.e. lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 98% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand and the compaction must be carried out diligently, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to the final surfacing of the new pavement and slab-on-grade construction.
- When construction is carried out in the winter, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction.

Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement that may become evident within several years after construction.

- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.6 Pavement Design

The recommended pavement design for residential local and neighbourhood collector/through roads, satisfying the minimum requirement from the Town of Caledon, is provided in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface		
Local Residential	40	HL3
Collector/Through Road	40	HL3
Asphalt Binder		
Local Residential	65	HL8
Collector/Through Road	90	HL8
Granular Base	150	Granular ‘A’ or equivalent
Granular Sub-base		Granular ‘B’ or equivalent
Local Residential	300	
Collector/Through Road	450	

In preparation of the pavement subgrade, all topsoil and compressible material should be removed. The subgrade should be proof-rolled and inspected. Any soft spots identified must be subexcavated and replaced with inorganic earth fill. The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with a water content at 2% to 3% drier than the optimum. All the granular bases should be compacted to 100% SPDD.

The pavement subgrade will suffer a strength regression if water is allowed to infiltrate the mantle. The following measures should be incorporated in the construction procedures and pavement design:

- The pavement subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.

- Lots areas adjacent to the road should be properly graded to prevent ponding of large amounts of water. Otherwise, the water will seep into the subgrade mantle and induce a regression of the subgrade strength, with costly consequences for the pavement construction.
- In extreme cases during the wet seasons, if soft or weak subgrade is identified, it can be replaced by compacted granular material to compensate for the inadequate strength of the soft or weak subgrade. This can be assessed during construction.
- Fabric filter-encased curb subdrains are required to meet the Town of Caledon requirements.

6.7 Bridge Crossing

A new bridge crossing will be constructed across the natural system in the vicinity of Boreholes SV-105 and SV-106. Detail design of the bridge crossing is not available for review at the time of report preparation.

Shallow Foundation

The bridge abutments may be supported on conventional spread footings with restricted bearing capacities, founded onto the stiff to very stiff silty clay and silty clay till while remaining above the sandy/silty deposit. The recommended bearing pressures at or above an approximate founding depth of El. 261.0 m are as follows:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 200 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 300 kPa

The total and differential settlements of footing designing for SLS are estimated at 25 mm and 20 mm, respectively.

Deep Foundation for the Abutments and Piers

Due to the proximity of the tributary and wet subsoils with limited bearing capacity, construction of shallow foundations may be difficult. Deep foundation, such as driven H-piles, can be considered for bridge abutments and piers extending past the wet silty sand/silty sand unit and into the very dense sandy silt till below El. 254.0 m. The piles must not rest in the silty sand/sandy silt unit which is subject to dilation under vibratory driving forces. It is recommended that the piles be extended at least 3 m into the hard or very dense till with ‘N’ values greater than 50 blows. In view that there is insufficient subsoil data to support this design, deeper boreholes should be carried out once the bridge crossing location and details are confirmed.

For preliminary design with typical driven pile sizes of HP310x110 and HP360x174, the recommended geotechnical resistances are 625 kN (SLS) and 750 kN (ULS), and 875 kN (SLS) and 1000 kN (ULS), respectively. Other specific sizes and associated resistance capacities can be provided upon request. The actual refusal criteria of pile driving should be established once the chosen pile size and the design loads are known. Cast steel drive shoes, as per OPSD 3000.100, will be required in order to protect the driven pile toe into the till deposit. Full time monitoring of the pile driving operation by a geotechnical technician is necessary in order to assess the pile capacity at refusal. In order to verify the design pile capacity, static load test or Pile Driving Analyser (PDA) must be performed on selected piles at each abutment and pier. Integral abutments can also be supported on H-piles, with a minimum pile embedment of 0.6 m into the concrete cap.

The settlement of piles designed for the load resistance at SLS are estimated to be less than 25 mm.

Lateral Resistance

Lateral loading can be resisted fully or partially by the use of battered steel H-piles. For vertical piles, the resistance to lateral loading will have to be derived from the soil in front of the pile support. The geotechnical lateral resistance may be calculated using the coefficient of horizontal subgrade reaction (k_s) and the ultimate lateral resistance (p_{ult}):

Cohesive Soil: $k_s = 67\ S_u/D$ and $p_{ult} = 9\ S_u$
Cohesionless Soil: $k_s = n_h\ z/D$ and $p_{ulkt} = 3\ \gamma z\ K_p$

where S_u = undrained shear strength (kPa)
z = depth of pile embedment (m)
n_h = coefficient related to soil relative density (MN/m^3)
D = pile width/diameter (m)
γ = bulk unit weight of soil in overburden [or γ' in submerged condition] (kN/m^3)
K_p = coefficient of passive earth pressure

The soil parameters for the calculation of k_s are summarized in Table 4.

Table 4 - Soil Parameters for Lateral Resistance of Pile

Soil Type	γ (kN/m^3)	n_h (MN/m^3)	S_u (kPa)	K_p
Silty Clay	20.5	-	100	-
Silty Clay Till	22.0	-	150	-
Silty Sand/Sandy Silt	10.5 (submerged)	4.4	-	3.12
Sandy Silt Till	22.5	18	-	3.39

The computed resistance should be multiplied by a geotechnical resistance factor of 0.5. The design of piles and load capacities should be reviewed by the geotechnical engineer before finalization.

Group Pile Efficiency

Where multiple piles are required to support the structure, it is recommended that the spacing between piles must be at least 3 times the diameter or width of the pile. Pile group action for axial resistance should be considered, and can be evaluated by applying a reduction factor as listed below:

Pile Spacing:	8B	6B	4B	3B
Reduction Factor:	1.0	0.9	0.75	0.7

Pile group action for lateral resistance can also be evaluated as listed below:

Pile Spacing:	8B	6B	4B	3B
Reduction Factor:	1.0	0.7	0.4	0.25

Wing Wall Foundation

Wing walls, constructed with cast-in-place concrete, can be supported on strip footings founded below the frost penetration depth of at least 1.2 m below the proposed grade, onto the sound native soil or engineered fill with the following recommended soil bearing pressures:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of wall footings, designing for the bearing pressure at SLS, are estimated to be 25 mm and 20 mm, respectively.

Alternatively, Reinforced Soil Slope (RSS) wall can be used for the wing wall. The RSS wall should be designed in accordance with the MTO Guideline. A 300 mm thick granular bedding, consisting of Granular 'A' compacted to 100% SPDD, will be required beneath the wall facing units after the subgrade is inspected.

The footing subgrade must be inspected prior to the construction of the wing walls. Stepped down footings may be specified with a maximum step height of 0.6 m and a minimum step length of 1.2 m, founded on the sound native soil or engineered fill.

Frost and Scour Protection

All pile caps and footings should be founded below the frost penetration depth, with a soil cover not less than 1.2 m. Where the abutments are constructed in close proximity of the watercourse/tributary, the foundation should extend either below the scouring depth or the frost depth, whichever is greater.

Scouring protection scheme, such as using R10 Rip-Rap, at least 300 mm in thickness, should be provided along the watercourse.

Seismic Consideration

Based on the Canadian Highway Bridge Design Code, the bridge abutments on piles driven into the very dense tills should be designed to resist an earthquake force using Site Classification 'C'. Conventional shallow bridge foundation and wing wall foundations can be designed using Site Classification 'D' (stiff soil).

General Construction

A construction platform and access driveway will be required for the access of machinery and construction equipment near the crossing. Temporary erosion and sediment control plan must be implemented during construction to prevent unnecessary disturbance to the natural system and the tributary. The erosion and sediment control plan should be reviewed and approved by the Toronto and Regional Conservation Authority (TRCA).

For construction of the bridge abutments and piers, the tributary may be temporarily diverted, where necessary. Where excavation extends into the wet silty sand/sandy silt unit, dewatering will be required to draw down the groundwater to approximately 1 m below the intended bottom of excavation. Dewatering details such as the method, rate and volumes should be verified with the hydrogeologist and the dewatering contractor. Sheeting enclosures may also be required to limit the extent of excavation and disturbance into the natural system.

Embankment and Wing Wall Backfill

Should embankment heights be raised significantly higher than the original grade, consolidation settlement of the subsoils will occur. Primary consolidation settlement in the fine-grained subsoil can be expected. This should be further assessed once detailed embankment design is available for review.

Prior to the construction of embankment, the ground must be free of compressible topsoil and deleterious material. The subgrade must be proof-rolled and inspected before earth filling. Any soft/weak material as identified must be subexcavated and replaced with properly compacted inorganic earth fill.

The wing walls should be backfilled with free draining, non-frost susceptible granular fill to at least 1.2 m behind the wall structure. This is to prevent the build up of hydrostatic pressure and the development of any frost action against the wall structure. Weep holes and/or subdrains should be specified to dissipate any water collected behind the walls.

The road embankment towards the bridge crossing should be graded with a slope gradient of 1V:3H or gentler. Where applicable, flood protection should be considered for any portions of the embankment that will extend to below the flood line.

The sloping ground of embankment should be covered with 300-mm thick topsoil layer, sodded or vegetated to prevent surficial erosion. Prior to sodding and growth of vegetation, an erosion control blanket may be utilized.

6.8 Stormwater Management Ponds

Three SWM ponds (SWM 10, 11 and 12) are proposed in different regions of the subdivision, adjacent to the natural system. Detailed designs of the ponds were not available for review at the time of report preparation.

Pond Liner

SWM 10

Based on the findings of Borehole SV-112, the area of SWM 10 is underlain by firm to hard silty clay till, overlying moist, dense silty fine sand/sandy silt at or below an approximate depth of 5.6 m below grade. The borehole remained dry upon completion of drilling and the monitoring well remained dry during water level measurement in December 2023. The need of a clay liner is not anticipated should the pond design remain within the silty clay till deposit, with sufficient thickness of the low-permeable overburden above the underlying sand/silt unit. However, should the pond extend close to or into the sandy/silty deposit, an earthen clay liner (with an estimated permeability of 10^{-7} cm/sec or less) or a geosynthetic clay liner (GCL) with soil ballast will be required.

SWM 11 and 12

The subsoil profile at both SWM 11 (Borehole SV-104) and 12 (SV-108) consists of a clay or clay till cap within the surficial 2 m below grade, beyond which the ponds will likely extend into the silty fine sand/sandy silt deposit. The water level records from the nearby MW-4 and SV-108 suggests that the shallow groundwater regime lies within the sand/silt deposit at depths of 4.48 to 7.0 m, or at El. 261.52 m and El. 257.3 m, respectively, and may be higher during wet seasons. An earthen clay liner or GCL with a soil ballast will be required for SWM 11 and 12 construction.

The appropriate thickness of the clay liner or ballast to counteract hydrostatic uplift concerns, if any, and the extent of the liner can be established once the pond elevations are available for review.

Pond Berm Construction

The side slopes of the ponds should be graded at 1V:3H or flatter for stability above the wet perimeter, and 1V:4H or flatter below the wet perimeter. All exposed side slopes must be vegetated and/or sodded to prevent surface erosion.

Any proposed earth embankments should be constructed using selected on-site inorganic clay or clay till material, compacted to at least 98% SPDD in lifts of no more than 20 cm in thickness. The subgrade must be inspected and proof-rolled prior to any fill placement. The construction of the berms must be supervised and certified by the site geotechnical engineer. The pond side slopes should be surface compacted.

Control Structures

The following bearing pressures can be used for the design of control structures supported on conventional footings founded on sound native soils or on engineered fill:

- Soil Bearing Pressure at SLS: 120 kPa
- Factored Ultimate Soil Bearing Pressure at ULS: 600 kPa

The footings must be placed below the scouring depth and be provided with a minimum earth cover of 1.2 m to protect them from frost damage. The inlets and outlets of the ponds must be lined with gabion mats, rip rap or equivalent measures for protection against scouring.

The foundation for the control structures should meet the requirements specified by the latest Ontario Building Code, and the structures should be designed to resist a minimum earthquake force using Site Classification 'D' (stiff soil).

General Considerations

The excavation for the liner construction may extend below the groundwater table. During construction of the SWM ponds, the groundwater should be depressed, or any seepage must be removed by pumping from sumps to provide a stable subgrade for installation.

One should be aware that minor maintenance may be required after rapid drawdown as the water recedes from a flood level to normal level. Routine visual inspection and maintenance will be required to rectify any observed deficiency.

6.9 Soil Parameters

The recommended soil parameters for the project design are given in Table 5.

Table 5 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silty Clay Till	22.0	12.0	1.33	1.03
Sandy Silt Till	22.5	12.5	1.33	1.05
Silty Sand/Sandy Silt/Silt	20.5	10.5	1.20	1.00
Sand	20.0	10.0	1.25	1.00

Table 5 - Soil Parameters (Cont'd)

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Compacted Earth Fill and Silty Clay	0.40	0.55	2.50
Silty Clay Till	0.33	0.50	3.00
Sandy Silt Till	0.29	0.46	3.39
Silty Sand/Sandy Silt/Silt	0.32	0.48	3.12
Sand	0.29	0.46	3.39
Estimated Coefficients of Permeability (K) and Percolation Time (T)		**K (cm/sec)**	**T (min/cm)**
Silty Clay Till and Silty Clay		10^{-7}	80+
Sandy Silt Till		10^{-5} to 10^{-6}	20 to 50
Silty Sand/Sandy Silt		10^{-3} to 10^{-4}	8 to 12
Silt		10^{-5}	20
Sand		10^{-2} to 10^{-3}	4 to 8
Estimated Electrical Resistivities			**(ohm·cm)**
Silty Clay Till			4000
Silty Clay			3500
Sandy Silt Till			4500
Silty Sand/Sandy Silt/Silt			5500
Sand			5500
Coefficients of Friction			
Between Concrete and Granular Base			0.50
Between Concrete and Native Soils or Compacted Earth Fill			0.35

6.10 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils to be excavated are classified in Table 6.

Table 6 - Classification of Soils for Excavation

Material	Type
Sound Tills and Silty Clay	2
Weathered Soils, Silt and Sand (above groundwater)	3
Saturated Soils	4

In excavation, the groundwater seepage from the tills and clay will likely be limited in quantity and can be removed by conventional pumping from sumps. However, excavation extending into the saturated soils will require more extensive construction dewatering. The wet silty fine sand/sandy silt and silt, will slump readily, leading to sloughing and migrate/run with seepage and boil under an approximate piezometric head of 0.4 m.

In order to provide a stable subgrade for the services or foundation construction, the groundwater should be depressed to at least 1.0 m below the intended bottom of excavation. Detailed groundwater profile and dewatering needs should be referred to the hydrogeological report by PEGG.

Excavation into the very stiff to hard and dense to very dense tills containing cobbles and boulders will require extra effort and the use of a heavy-duty, properly equipped backhoe.

Prospective contractors should assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the intended bottom of excavation prior to excavating. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of School Valley Developments Ltd. and for review by its designated consultants, contractors and government agencies. The material in the report reflects the judgement of Hui Wing Yang, P.Eng. and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

Hui Wing Yang, P.Eng.

Kin Fung Li, P.Eng.
HWY/KFL

LICENSED PROFESSIONAL ENGINEER
Jan 18, 2024
H. W. YANG
100126690
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Jan 18, 2024
K. F. LI
100169280
PROVINCE OF ONTARIO

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—•—'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-101

FIGURE NO.: 1

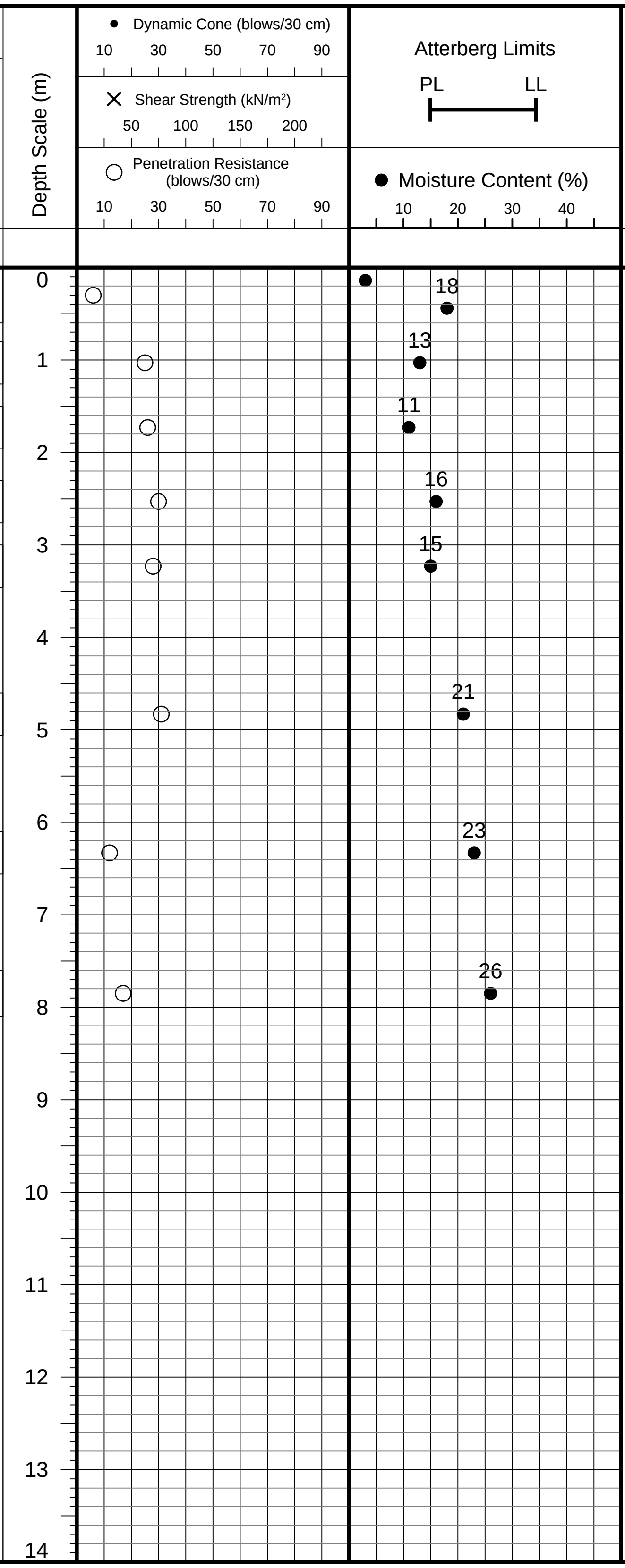
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 10, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
266.1	Ground Surface			
0.0	**28 cm TOPSOIL**	1A 1B	DO	6
	Firm to very stiff weathered **SILTY CLAY TILL** some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles brown grey	2	DO	25
		3	DO	26
		4	DO	30
		5	DO	28
262.1 4.0	Brown, compact to dense, wet **SILTY FINE SAND/SANDY SILT** a trace of clay occ. silt and sand layers	6	DO	31
		7	DO	12
258.9 7.2	Grey, compact, wet **SILT** occ. sand and clay layers	8	DO	17
258.0 8.1	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 262.4 m on completion

Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-102

FIGURE NO.: 2

PROJECT DESCRIPTION: Proposed Residential Development

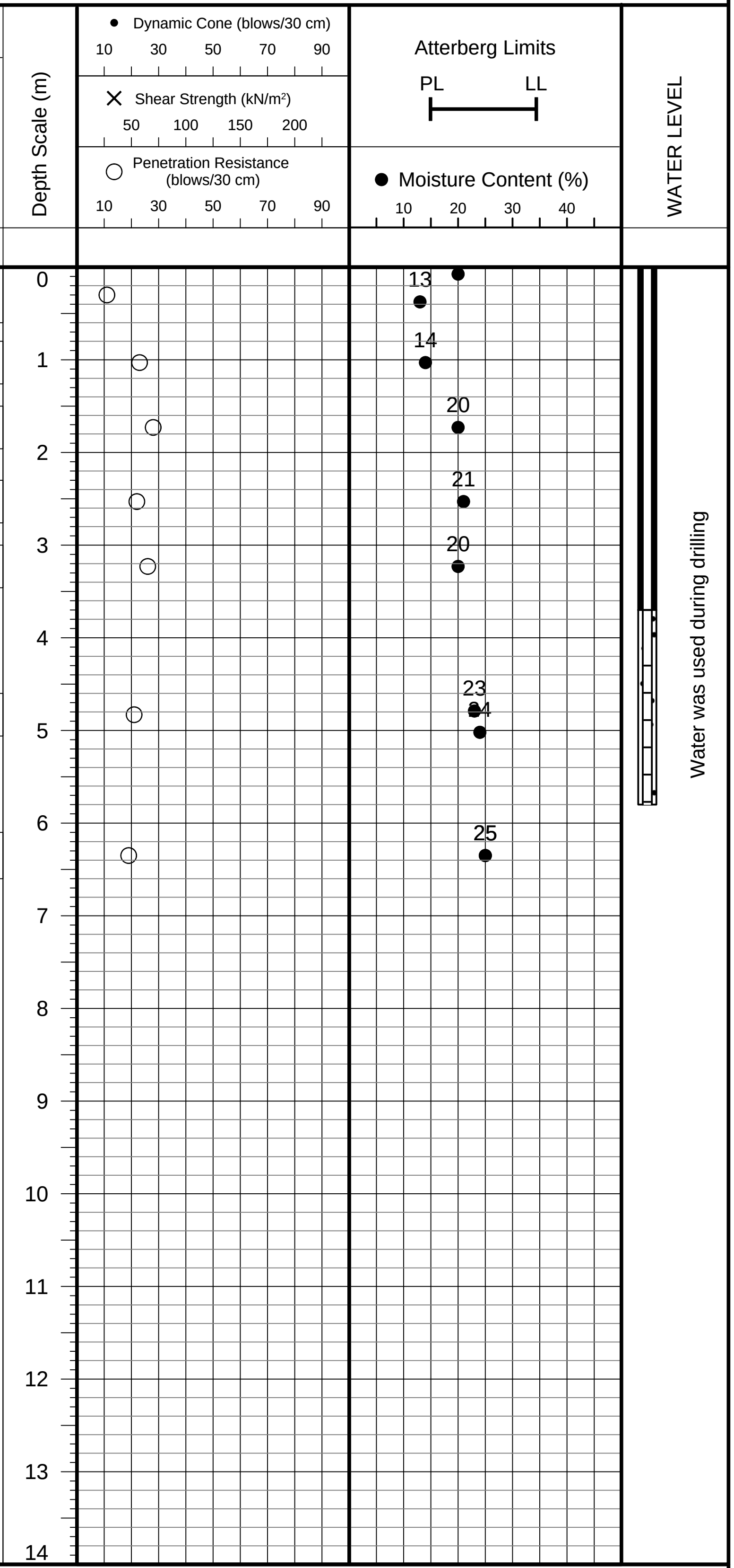
METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 11, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
264.6	Ground Surface			
0.0	**15 cm TOPSOIL**	1A		
	Brown, compact, weathered **SANDY SILT** with roots inclusions weathered	1B	DO	11
263.8 0.8	Brown, very stiff **SILTY CLAY TILL** some sand, a trace of gravel occ. sand and silt seams and layers	2	DO	23
		3	DO	28
262.5 2.1	Brown, compact, moist **SILTY FINE SAND/SANDY SILT** a trace of clay grey below 5.0 m possibly transitioning to till below 6.1 m	4	DO	22
		5	DO	26
	wet, occ. gravel grey clay layer	6A 6B	DO	21
	wet silt and clay layers	7	DO	19
258.0 6.6	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to 5.8 m, completed with 1.5 m screen
Sand backfill from 3.7 to 5.8 m
Bentonite seal from 0.0 to 3.7 m
Provided with a steel monument casing



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-103

FIGURE NO.: 3

PROJECT DESCRIPTION: Proposed Residential Development

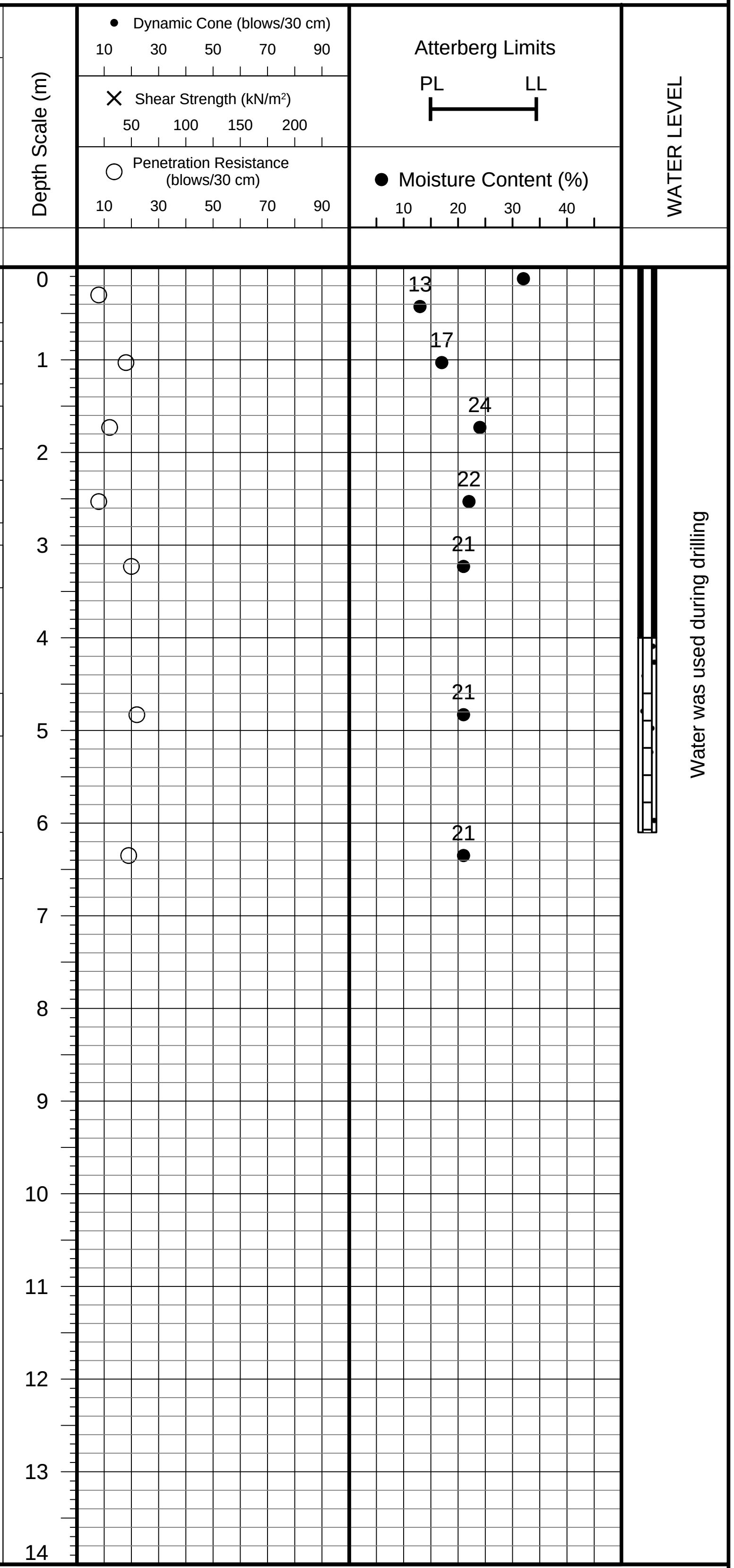
METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 11, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
264.1	Ground Surface			
0.0	**25 cm TOPSOIL**	1A	DO	8
	Brown, loose, weathered **SANDY SILT**	1B		
263.3 0.8	Brown, stiff to very stiff **SILTY CLAY TILL** some sand, a trace of gravel occ. sand seams and clay layers weathered	2	DO	18
		3	DO	12
262.0 2.1	Loose to compact, wet **SILTY FINE SAND/SANDY SILT** a trace of clay occ. fine sand layers	4	DO	8
		5	DO	20
	fine sand, some silt	6	DO	22
	brown grey			
		7	DO	19
257.5 6.6	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-104

FIGURE NO.: 4

PROJECT DESCRIPTION: Proposed Residential Development

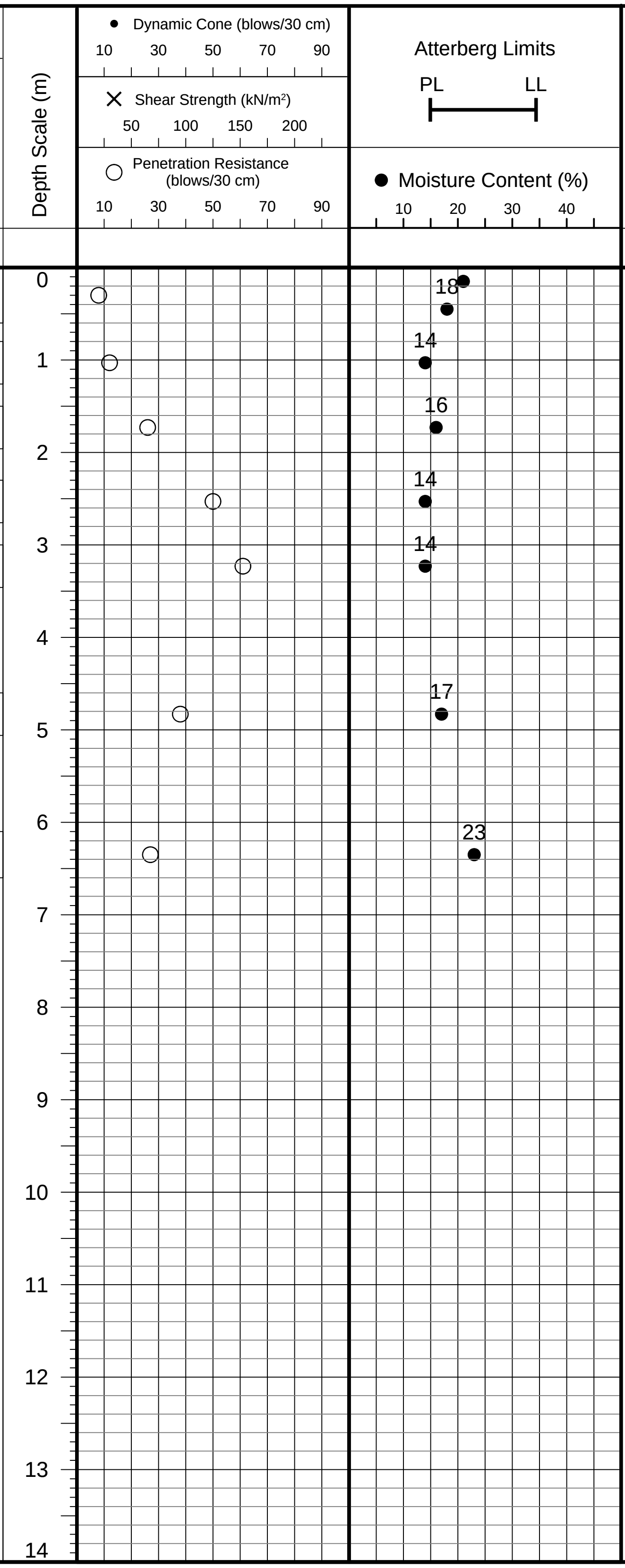
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 10, 2023

El. (m) Depth (m)	SOIL DESCRIPTION
264.1	Ground Surface
0.0	**30 cm TOPSOIL**
	Brown, loose, weathered **SANDY SILT**
263.3 0.8	Brown, stiff to very stiff weathered **SILTY CLAY TILL** some sand, a trace of gravel occ. sand seams and clay layers
262.0 2.1	Brown, compact to very dense, moist **SILTY FINE SAND/SANDY SILT** a trace of clay occ. silt and fine sand layers wet below 6.1 m
257.5 6.6	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1A 1B	DO	8
2	DO	12
3	DO	26
4	DO	50
5	DO	61
6	DO	38
7	DO	27



WATER LEVEL

W.L. @ El. 258.6 m on completion

Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-105

FIGURE NO.: 5

PROJECT DESCRIPTION: Proposed Residential Development

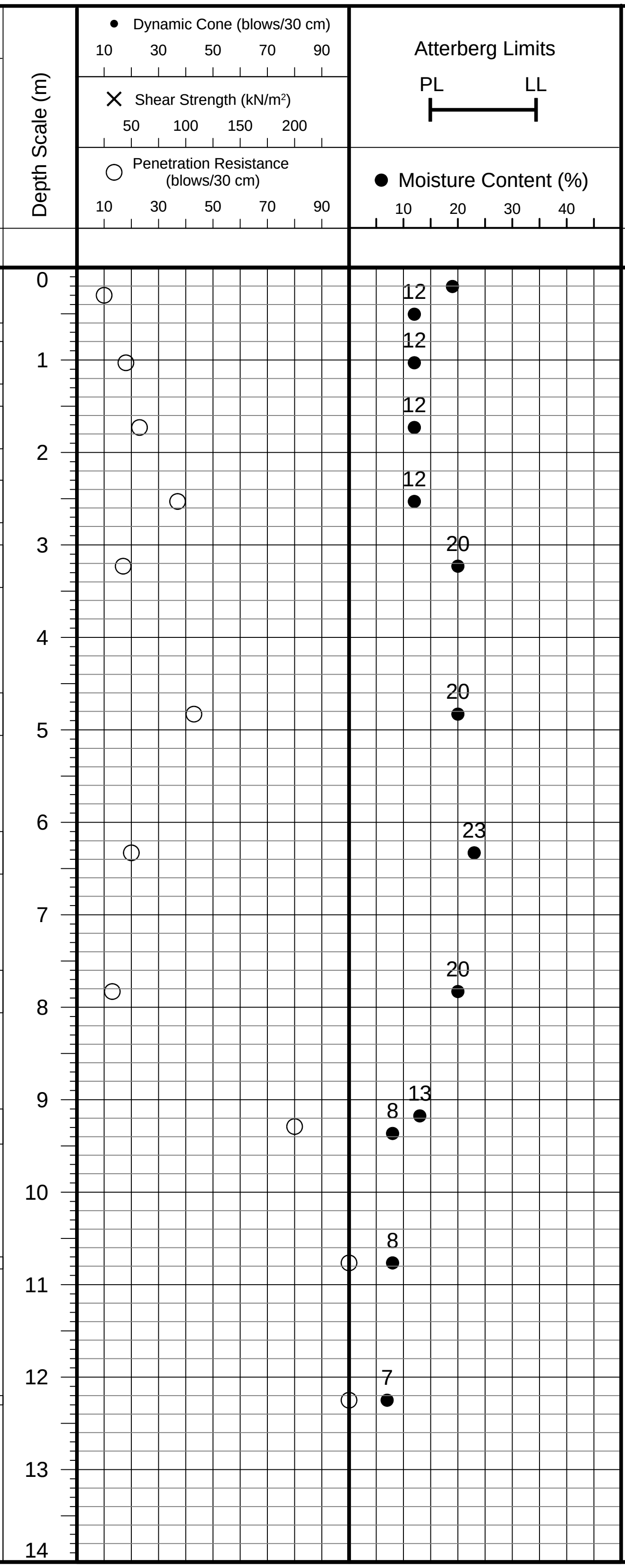
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 10, 2023

El. (m) Depth (m)	SOIL DESCRIPTION
264.7	Ground Surface
0.0	**41 cm TOPSOIL**
	Brown, loose, weathered **SANDY SILT** with clay and roots inclusions
263.9 0.8	weathered Brown, very stiff to hard **SILTY CLAY TILL** some sand, a trace of gravel occ. sand and silt seams and layers
261.8 2.9	Grey, very stiff **SILTY CLAY** a trace of sand
260.7 4.0	Compact to dense, wet **SILTY FINE SAND/SANDY SILT** a trace of clay brown grey
255.5 9.2	Brown, very dense **SANDY SILT TILL** traces of clay and gravel occ. sand seams and cobbles
252.4 12.3	**END OF BOREHOLE**

SAMPLES		
Number	Type	N-Value
1A 1B	DO	10
2	DO	18
3	DO	23
4	DO	37
5	DO	17
6	DO	43
7	DO	20
8	DO	13
9A 9B	DO	80/23
10	DO	50/13
11	DO	50/10



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

Page: 1 of 1

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-106

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

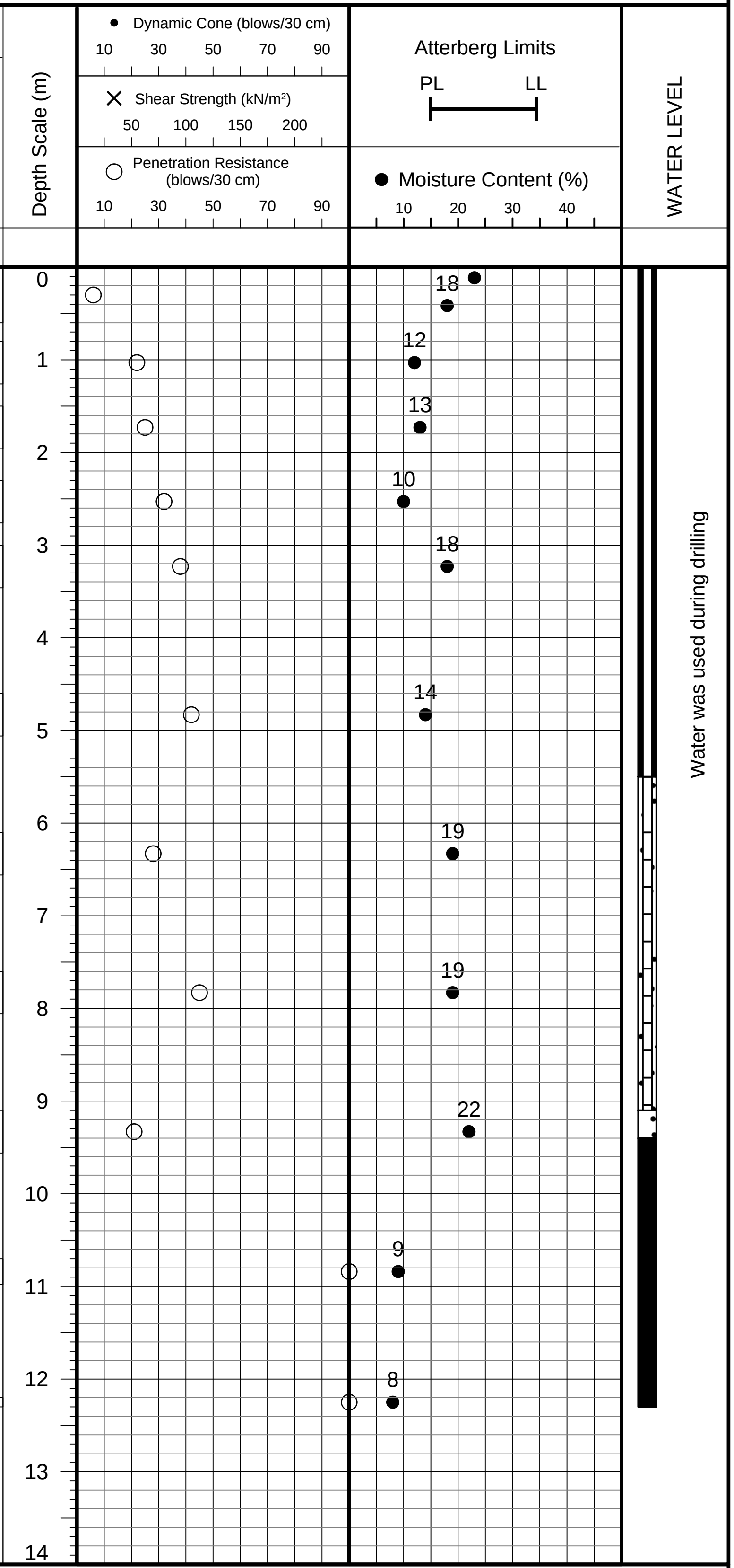
METHOD OF BORING: Hollow Stem Augers and Tricone

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 12, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
264.9	Ground Surface			
0.0	**23 cm TOPSOIL**	1A	DO	6
	Brown, loose, weathered **SANDY SILT** occ. gravel	1B		
264.1 0.8	Brown, very stiff to hard **SILTY CLAY TILL** some sand to sandy, a trace of gravel occ. sand and silt seams and layers (— weathered)	2	DO	22
		3	DO	25
		4	DO	32
261.9 3.0	Brown, hard **SILTY CLAY** a trace of sand, occ. sand seams	5	DO	38
260.9 4.0	Compact to dense, moist to wet **SILTY FINE SAND/SANDY SILT** a trace of clay occ. fine sand layers occ. clay and silt lenses (— — brown / grey)	6	DO	42
		7	DO	28
		8	DO	45
256.2 8.7	Grey, very stiff **SILTY CLAY** a trace of sand, with silt layers	9	DO	21
254.7 10.2	Brown, very dense **SANDY SILT TILL** a trace to some clay a trace of gravel occ. sand and silt seams and layers, cobbles	10	DO	50/13
		11	DO	50/13
252.6 12.3	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to 9.1 m, completed with 3.0 m screen. Backfill from 9.1 to 12.3 m. Sand backfill from 5.5 to 9.1 m. Bentonite seal from 0.0 to 5.5 m. Provided with a monument casing.



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-107

FIGURE NO.: 7

PROJECT DESCRIPTION: Proposed Residential Development

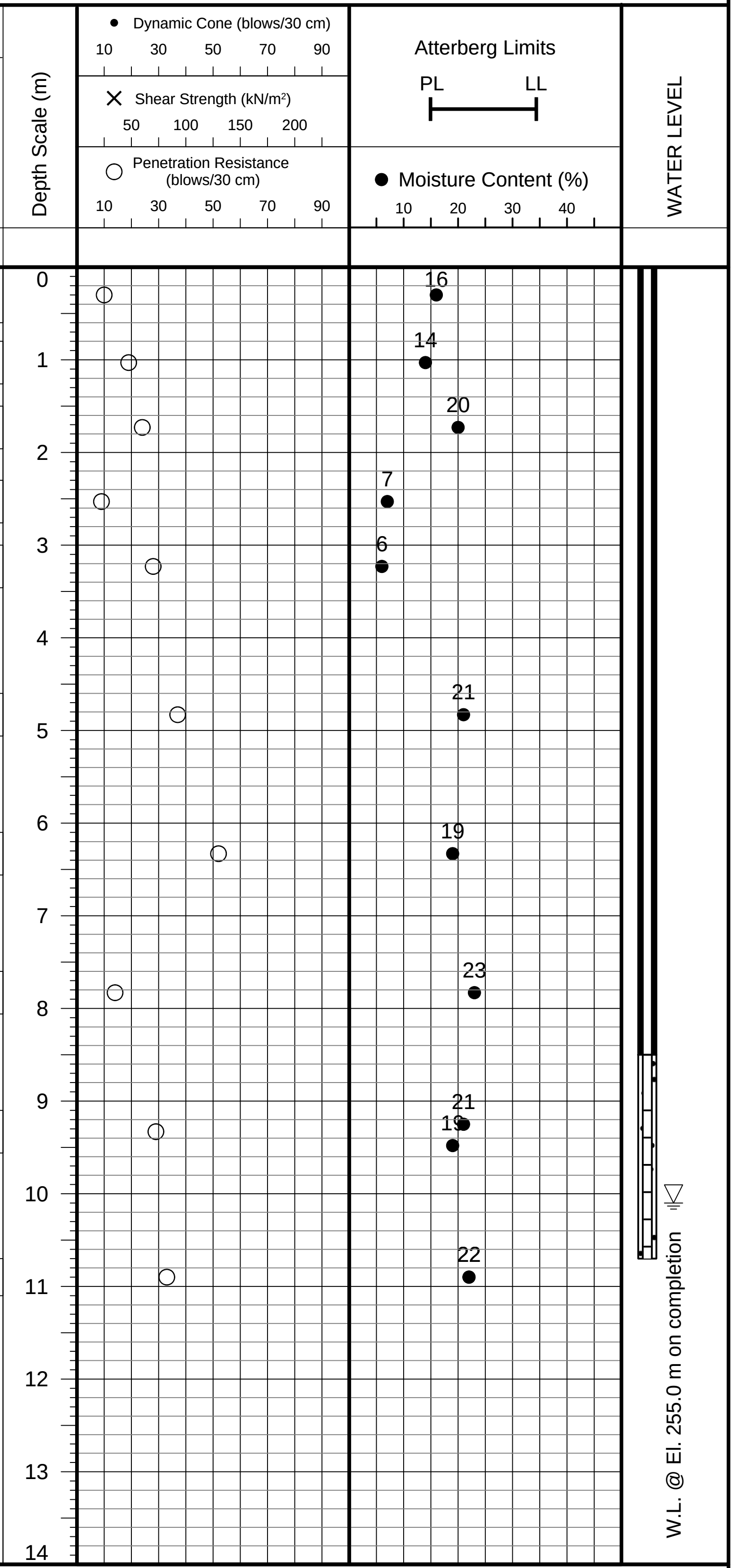
METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 16, 2023

El. (m) Depth (m)	SOIL DESCRIPTION
265.1	Ground Surface
0.0	**25 cm TOPSOIL** Brown, stiff to very stiff **SILTY CLAY TILL** — weathered some sand to sandy, a trace of gravel occ. sand and silt seams and layers
263.7 1.4	Brown, very stiff **SILTY CLAY** occ. gravel
263.0 2.1	Brown, loose to compact, moist **FINE SAND** some silt, a trace of clay
261.1 4.0	Brown, dense to very dense, moist to very moist **SILTY FINE SAND/SANDY SILT** a occ. silt layers
257.9 7.2	Grey, compact, very moist to wet **SILT** traces of clay and fine sand occ. sand and clay layers
254.9 10.2	Grey, dense, wet **FINE SAND** a trace of silt
254.0 11.1	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 10.7 m, completed with 1.5 m screen Sand backfill from 8.5 to 10.7 m Bentonite seal from 0.0 to 8.5 m Provided with a steel monument casing

SAMPLES		
Number	Type	N-Value
1	DO	10
2	DO	19
3	DO	24
4	DO	9
5	DO	28
6	DO	37
7	DO	52
8	DO	14
9A 9B	DO	29
10	DO	33



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-108

FIGURE NO.: 8

PROJECT DESCRIPTION: Proposed Residential Development

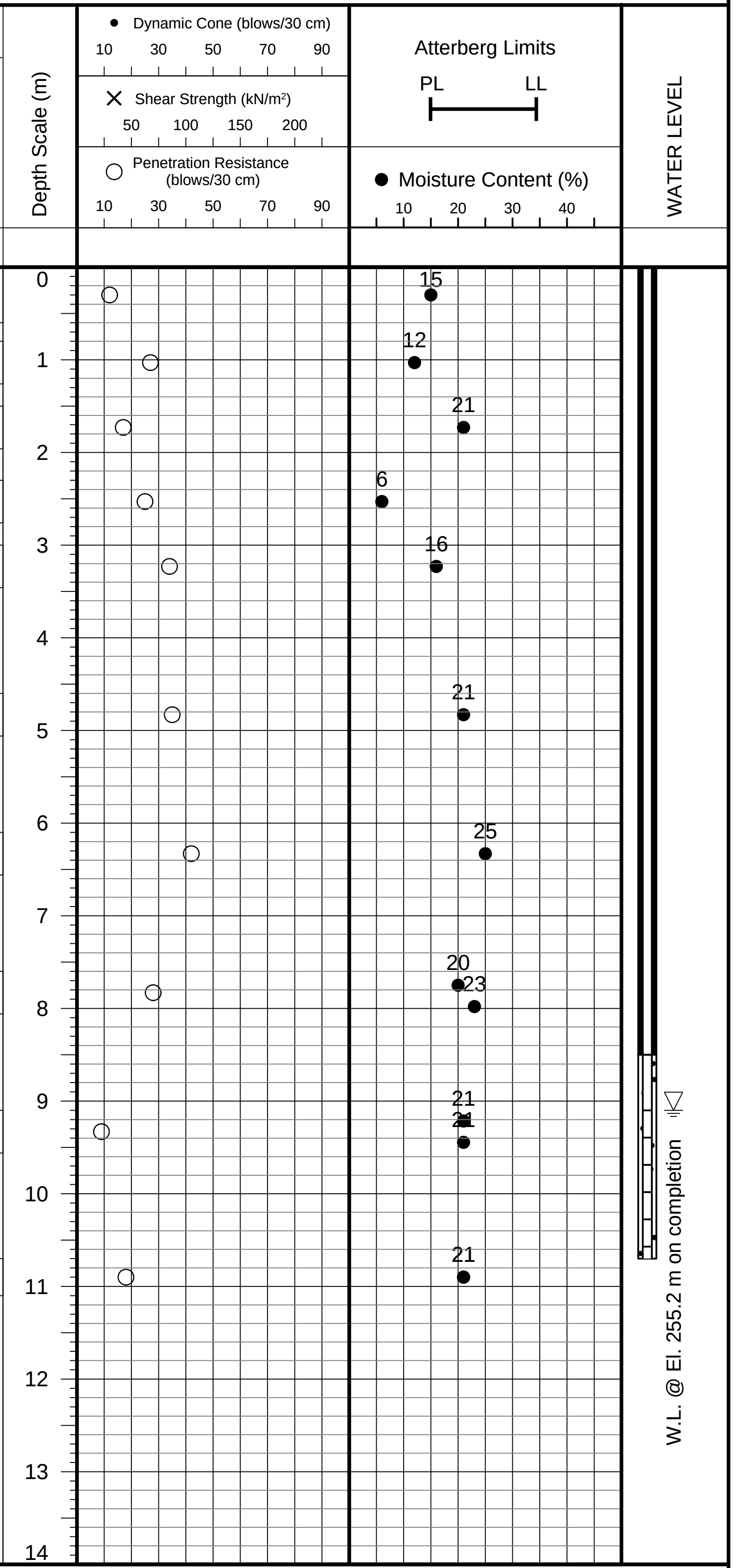
METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 16, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
264.3	Ground Surface			
0.0	**30 cm TOPSOIL**	1	DO	12
	Brown, stiff to very stiff **SILTY CLAY TILL** sandy, a trace of gravel occ. sand and silt seams and layers weathered	2	DO	27
262.9 1.4	Brown, very stiff **SILTY CLAY** occ. gravel	3	DO	17
262.2 2.1	Brown, compact to dense, moist **FINE SAND** a trace to some silt	4	DO	25
		5	DO	34
260.3 4.0	Brown, loose to very dense, very moist to wet **SILTY FINE SAND/SANDY SILT** a trace of clay occ. silt layers	6	DO	35
		7	DO	42
	grey clay	8A 8B	DO	28
255.0 9.3	Grey, compact, wet **SILT** some sand and clay occ. clay lenses	9A 9B	DO	9
		10	DO	18
253.2 11.1	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to 10.7 m, completed with 1.5 m screen
Sand backfill from 8.5 to 10.7 m
Bentonite seal from 0.0 to 8.5 m
Provided with a steel monument casing



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-109

FIGURE NO.: 9

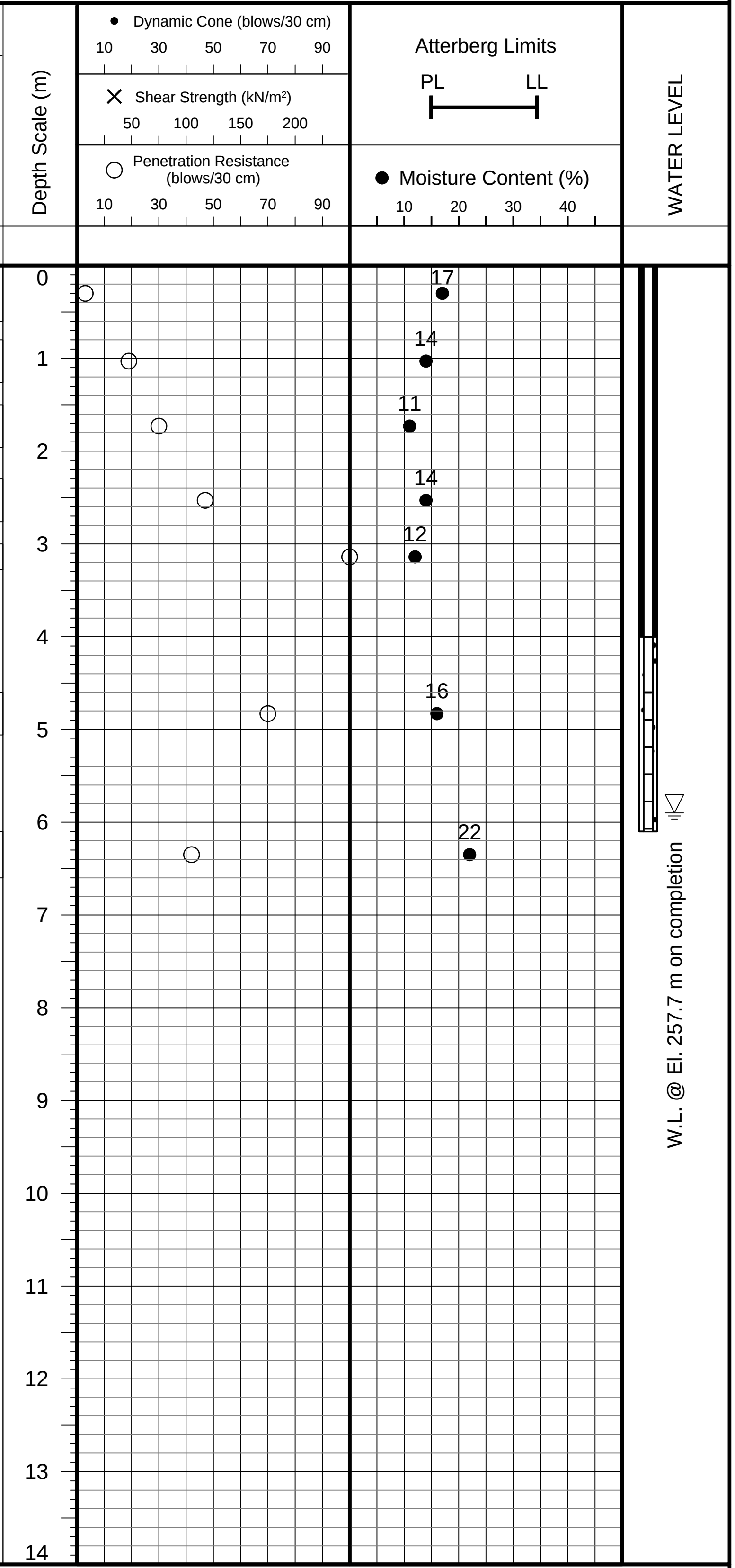
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 13, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
263.6	Ground Surface			
0.0	**38 cm TOPSOIL**	1	DO	3
	Brown, soft to very stiff **SILTY CLAY TILL** weathered some sand to sandy, a trace of gravel occ. sand and silt seams and layers	2	DO	19
		3	DO	30
261.5 2.1	Brown, dense to very dense **SANDY SILT TILL** silt a trace of clay occ. sand and silt seams and layers	4	DO	47
		5	DO	50/13
259.6 4.0	Dense to very dense, very moist to wet **SILTY FINE SAND/SANDY SILT** a trace of clay brown grey	6	DO	70
		7	DO	42
257.0 6.6	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen Sand backfill from 4.0 to 6.1 m Bentonite seal from 0.0 to 4.0 m Provided with a steel monument casing			



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-110

FIGURE NO.: 10

PROJECT DESCRIPTION: Proposed Residential Development

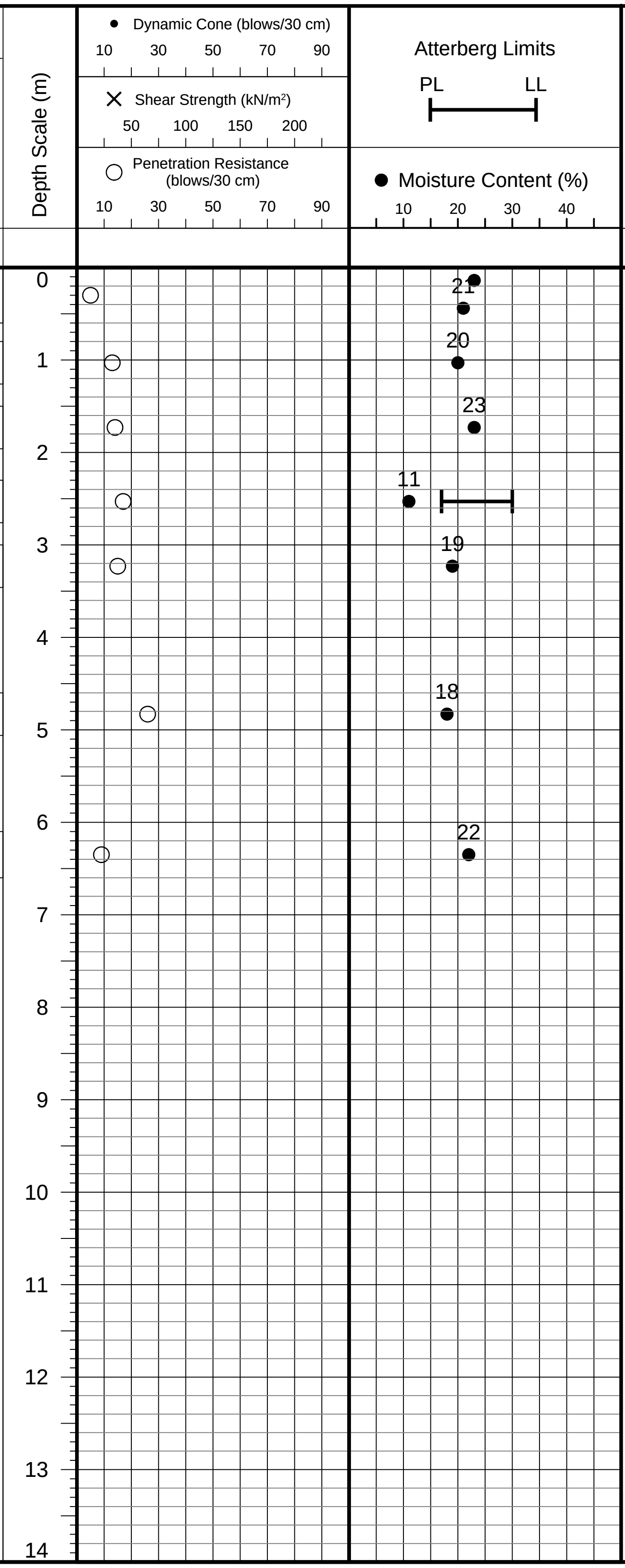
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 12, 2023

El. (m) Depth (m)	SOIL DESCRIPTION
263.6	Ground Surface
0.0	**28 cm TOPSOIL**
261.8 1.8	Brown, loose to compact **SILT** weathered some sand to sandy occ. clay lenses
260.7 2.9	Grey, very stiff **SILTY CLAY TILL** sandy, a trace of gravel
259.6 4.0	Grey, very stiff **SILTY CLAY** occ. gravel
257.0 6.6	Grey, loose to compact, wet **SILTY FINE SAND/SANDY SILT** occ. silt layers
	END OF BOREHOLE

SAMPLES Number	Type	N-Value
1A 1B	DO	5
2	DO	13
3	DO	14
4	DO	17
5	DO	15
6	DO	26
7	DO	9



WATER LEVEL: Dry on completion

Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-111

FIGURE NO.: 11

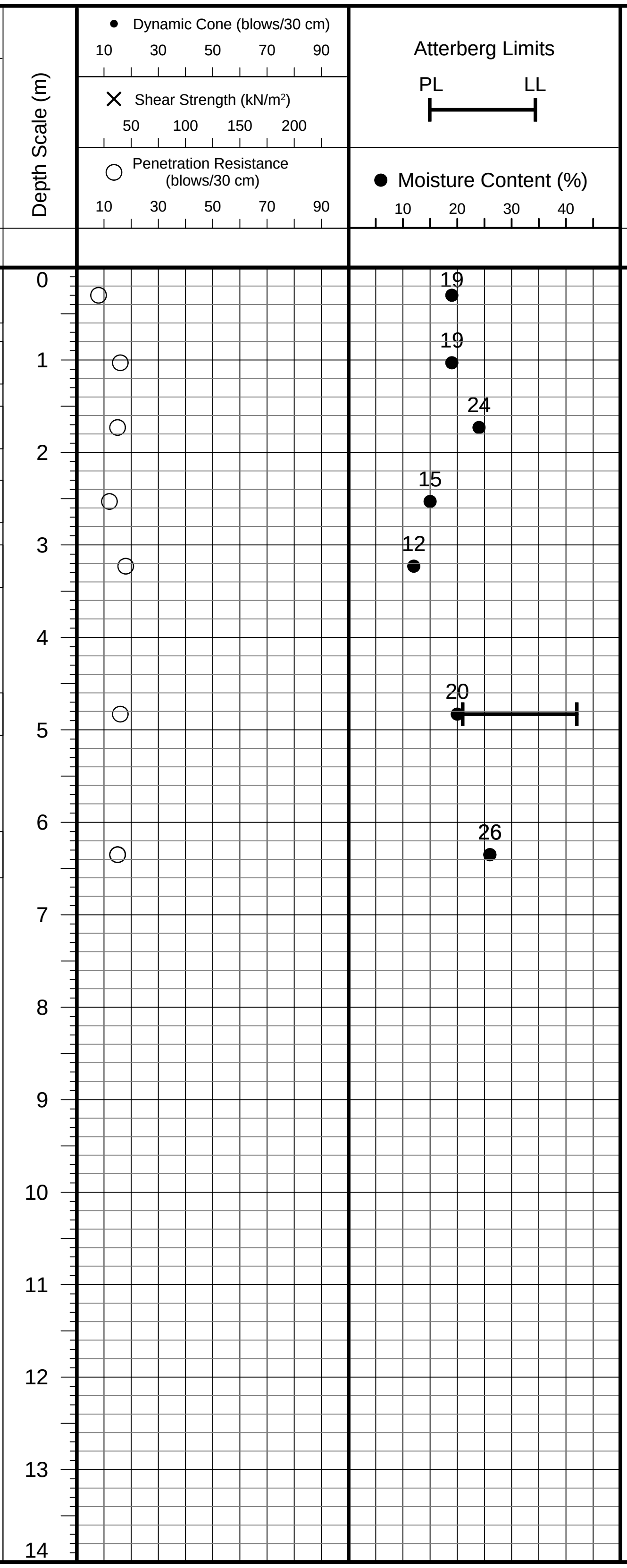
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 13, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
263.7	Ground Surface				
0.0	**33 cm TOPSOIL**	1	DO	8	Dry on completion
	Brown, loose to compact **SANDY SILT** a trace of clay weathered	2	DO	16	
262.3 1.4	Compact **SILT** a trace of clay, occ. sand seams brown grey	3	DO	15	
261.6 2.1	Grey, stiff to very stiff **SILTY CLAY TILL** sandy, a trace of gravel occ. sand seams and layers	4	DO	12	
		5	DO	18	
259.7 4.0	Grey, very stiff **SILTY CLAY** a trace of sand, occ. gravel occ. sand and silt seams	6	DO	16	
		7	DO	15	
257.1 6.6	**END OF BOREHOLE**				



Soil Engineers Ltd.

JOB NO.: 2310-S041

LOG OF BOREHOLE: SV-112

FIGURE NO.: 12

PROJECT DESCRIPTION: Proposed Residential Development

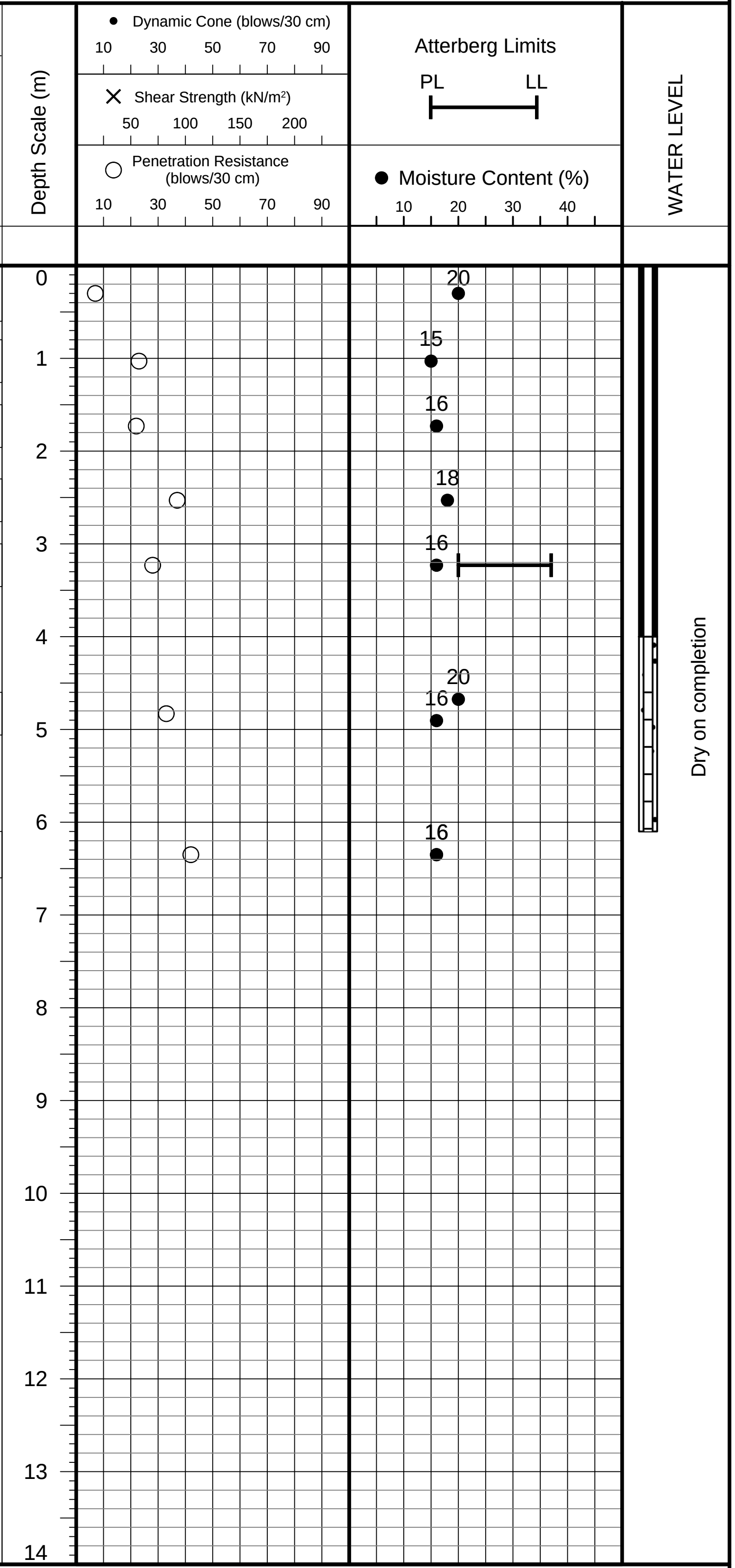
METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southwest of Old School Road and Hurontario Street
Town of Caledon

DRILLING DATE: October 13, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
262.9	Ground Surface			
0.0	**25 cm TOPSOIL**	1	DO	7
	Firm to hard weathered	2	DO	23
	SILTY CLAY TILL	3	DO	22
	some sand to sandy, a trace of gravel occ. sand and silt seams and layers	4	DO	37
		5	DO	28
	varved silt and clay structure	6A 6B	DO	33
257.3 5.6	Brown, dense, moist **SILTY FINE SAND/SANDY SILT** a trace of clay	7	DO	42
256.3 6.6	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to
6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing

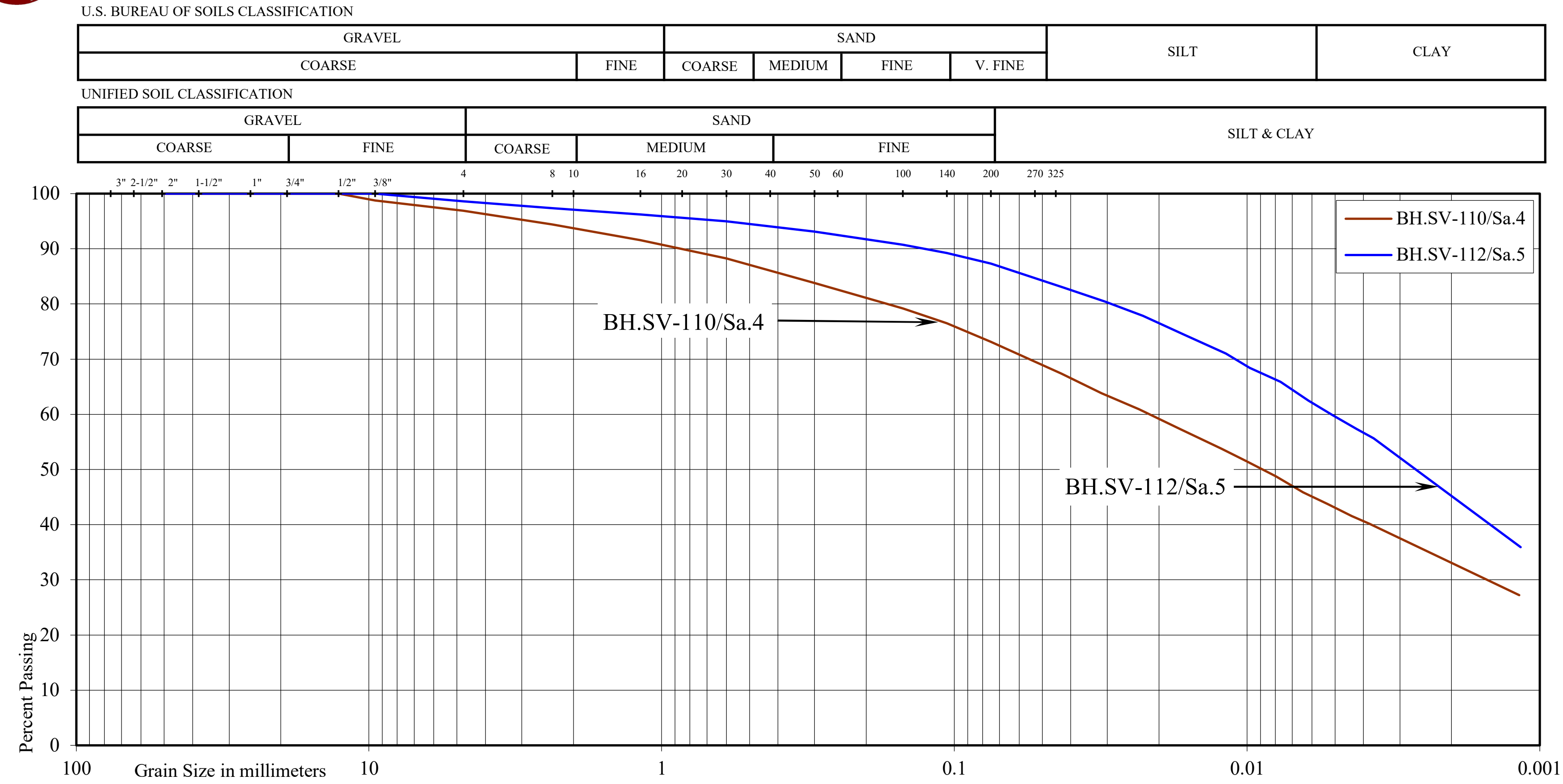


Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

Borehole No:	SV-110	SV-112
Sample No:	4	5
Depth (m):	2.5	3.2
Elevation (m):	261.1	259.7

	SV-	SV-
BH./Sa.	110/4	112/5
Liquid Limit (%) =	30	37
Plastic Limit (%) =	17	20
Plasticity Index (%) =	13	17
Moisture Content (%) =	11	16
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY TILL

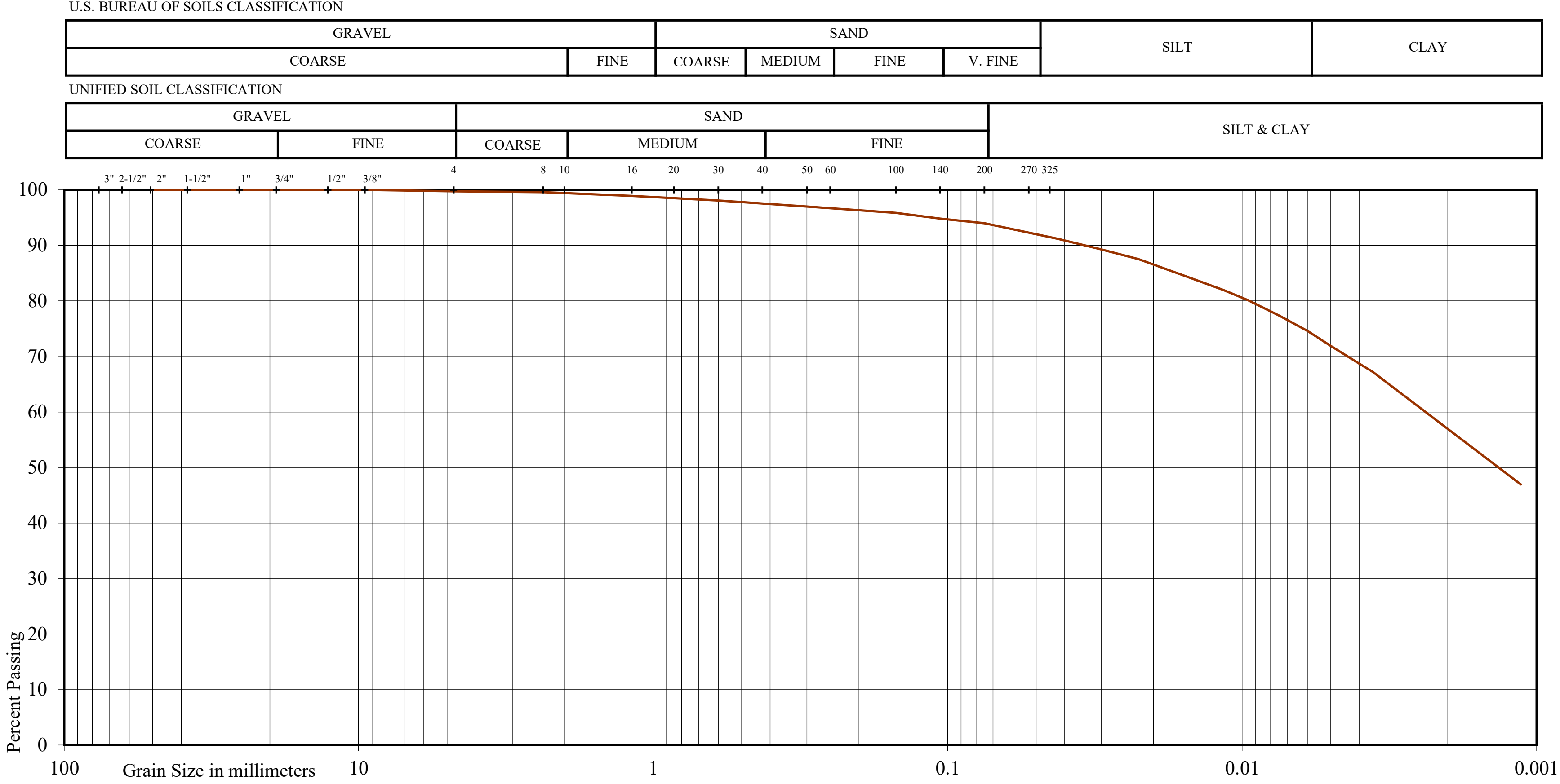
some sand to sandy, a trace of gravel

Figure: 13

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

SV-

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

BH./Sa. 111/6

Liquid Limit (%) = 42

Borehole No: SV-111

Plastic Limit (%) = 21

Sample No: 6

Plasticity Index (%) = 21

Depth (m): 4.8

Moisture Content (%) = 20

Elevation (m): 258.9

Estimated Permeability (cm./sec.) = 10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY

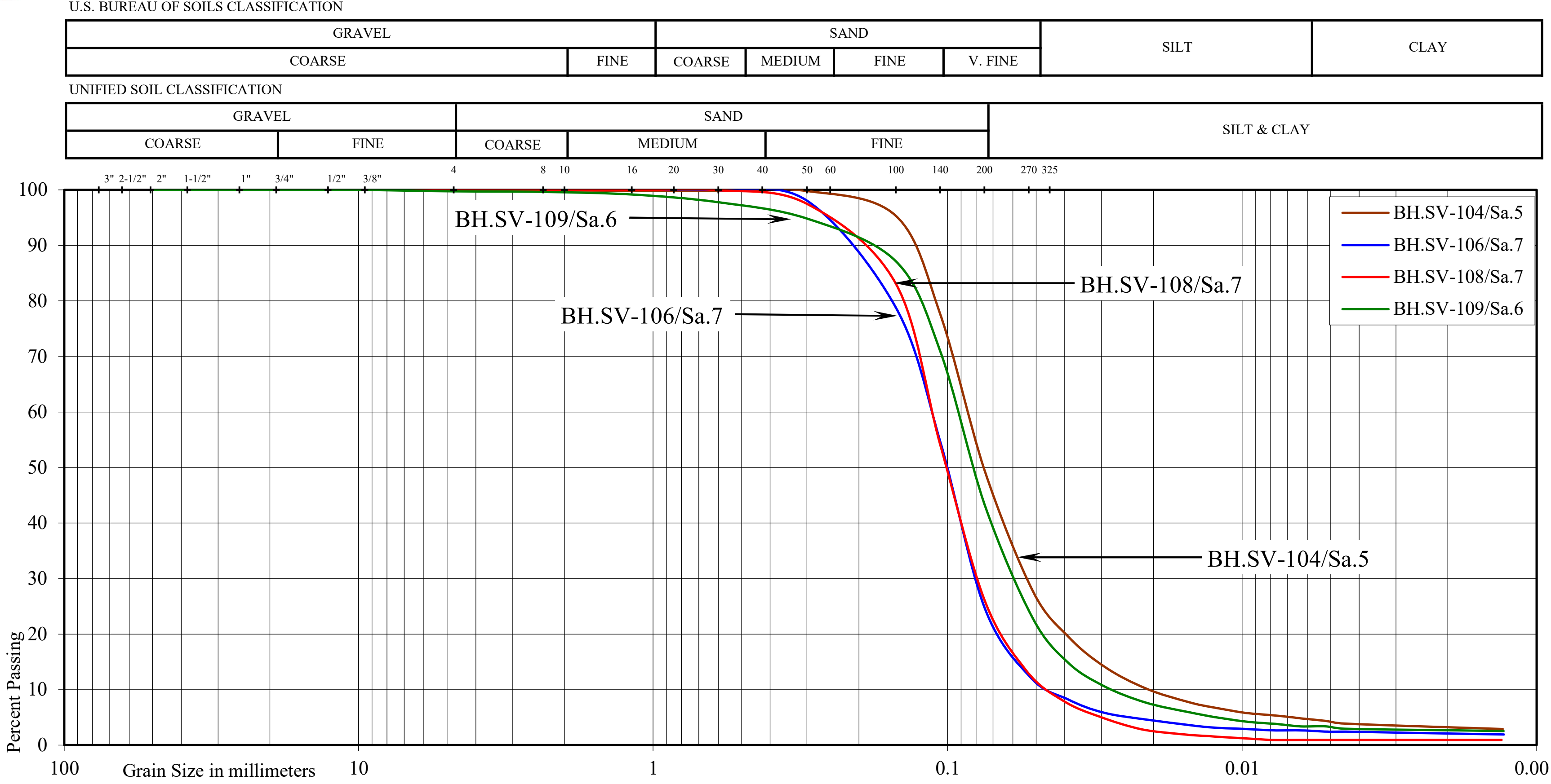
a trace of sand

Figure: 14

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

Borehole No:	SV-104	SV-106	SV-108	SV-109
Sample No:	5	7	7	6
Depth (m):	3.2	6.3	6.3	4.8
Elevation (m):	260.9	258.6	258.0	258.8

	SV-	SV-	SV-	SV-
BH./Sa.	104/5	106/7	108/7	109/6
Liquid Limit (%) =	-	-	-	-
Plastic Limit (%) =	-	-	-	-
Plasticity Index (%) =	-	-	-	-
Moisture Content (%) =	14	19	25	16
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}	10^{-3}	10^{-3}

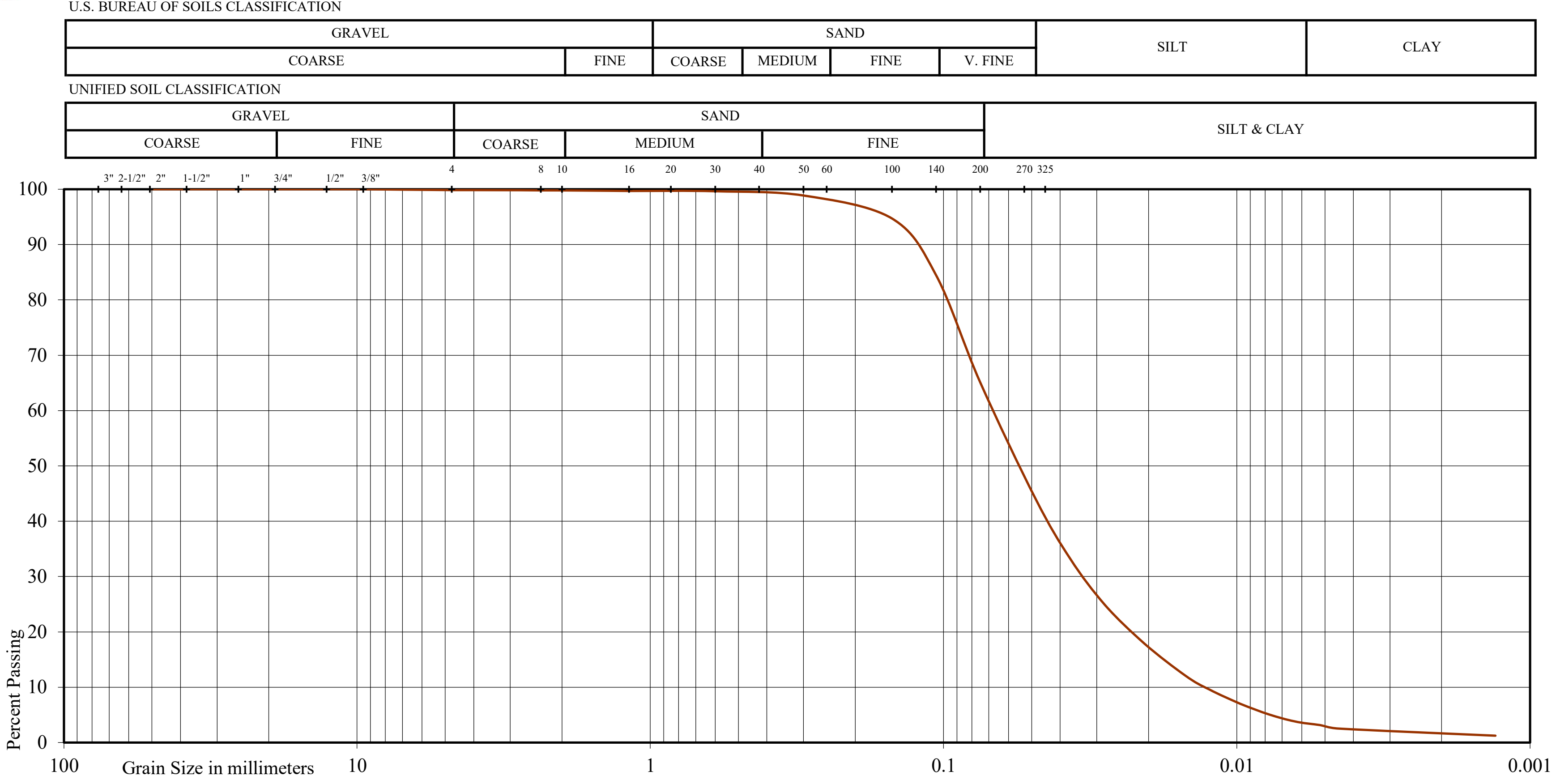
Classification of Sample [& Group Symbol]: SILTY FINE SAND
a trace of clay

Figure: 15

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project:	Proposed Residential Development		SV-
Location:	Southwest of Old School Road and Hurontario Street, Town of Caledon	BH./Sa.	102/5
		Liquid Limit (%) =	-
Borehole No:	SV-102	Plastic Limit (%) =	-
Sample No:	5	Plasticity Index (%) =	-
Depth (m):	3.2	Moisture Content (%) =	20
Elevation (m):	261.4	Estimated Permeability (cm./sec.) =	10^{-4}

Classification of Sample [& Group Symbol]: SANDY SILT

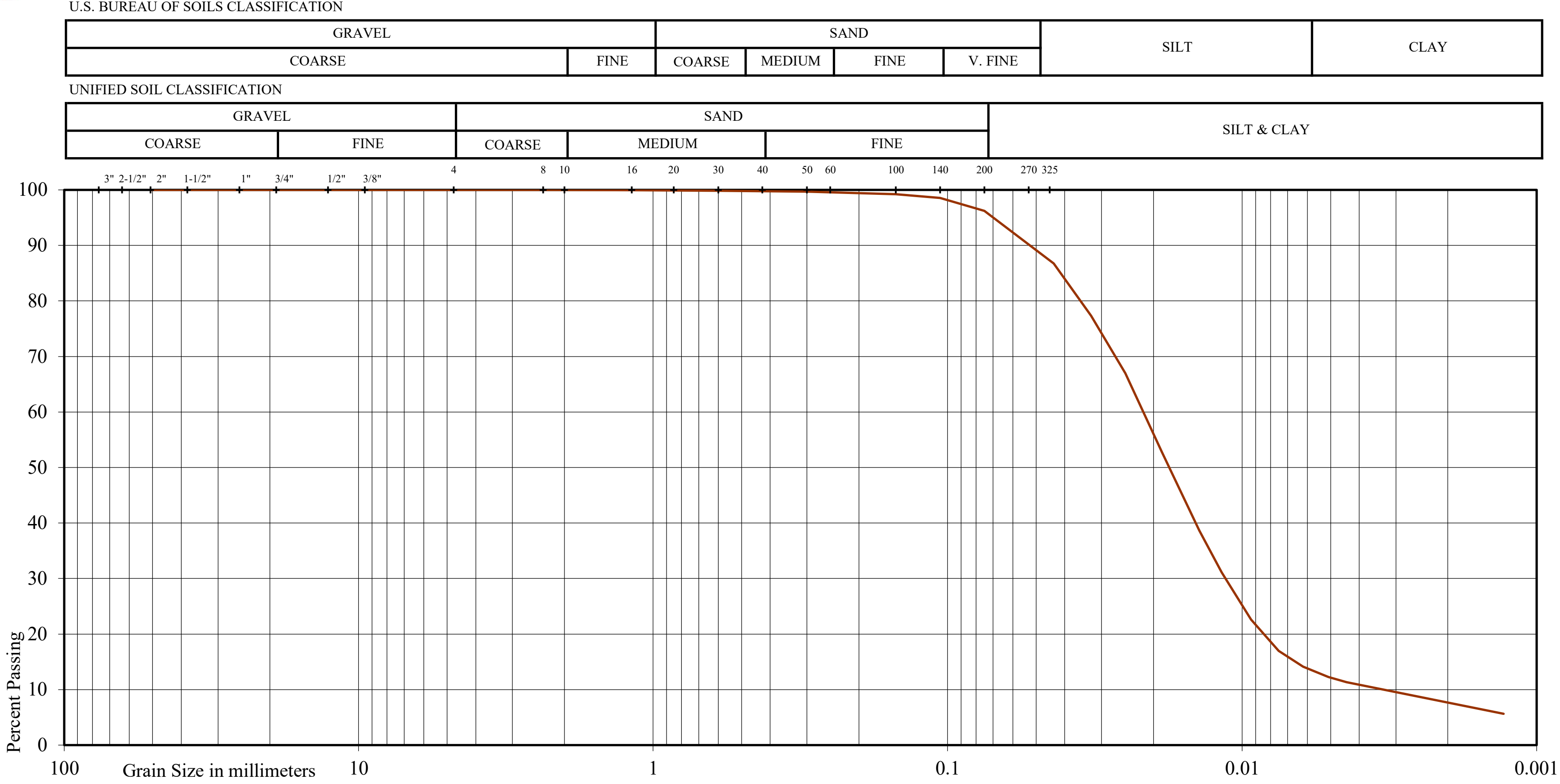
a trace of clay

Figure: 16

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

SV-

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

BH./Sa.107/9A

Liquid Limit (%) = -

Borehole No: SV-107

Plastic Limit (%) = -

Sample No: 9A

Plasticity Index (%) = -

Depth (m): 9.2

Moisture Content (%) = 21

Elevation (m): 255.9

Estimated Permeability (cm./sec.) = 10^{-5}

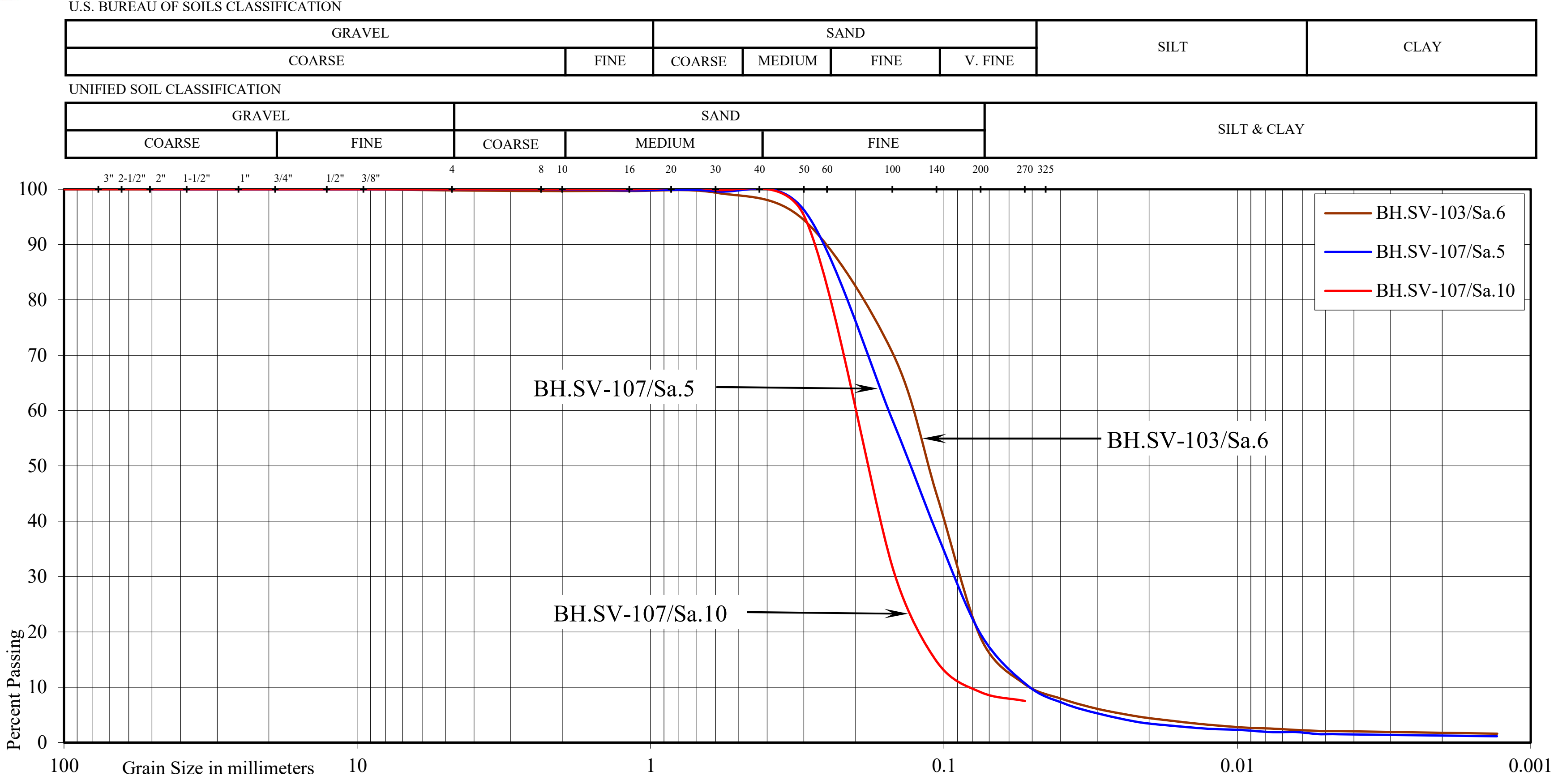
Classification of Sample [& Group Symbol]:	SILT traces of fine sand and clay

Figure: 17

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

Borehole No:	SV-103	SV-107	SV-107
Sample No:	6	5	10
Depth (m):	4.8	3.2	10.9
Elevation (m):	259.3	261.9	254.2

	SV-	SV-	SV-
BH./Sa.	103/6	107/5	107/10
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	21	6	22
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}	10^{-2}

Classification of Sample [& Group Symbol]: FINE SAND

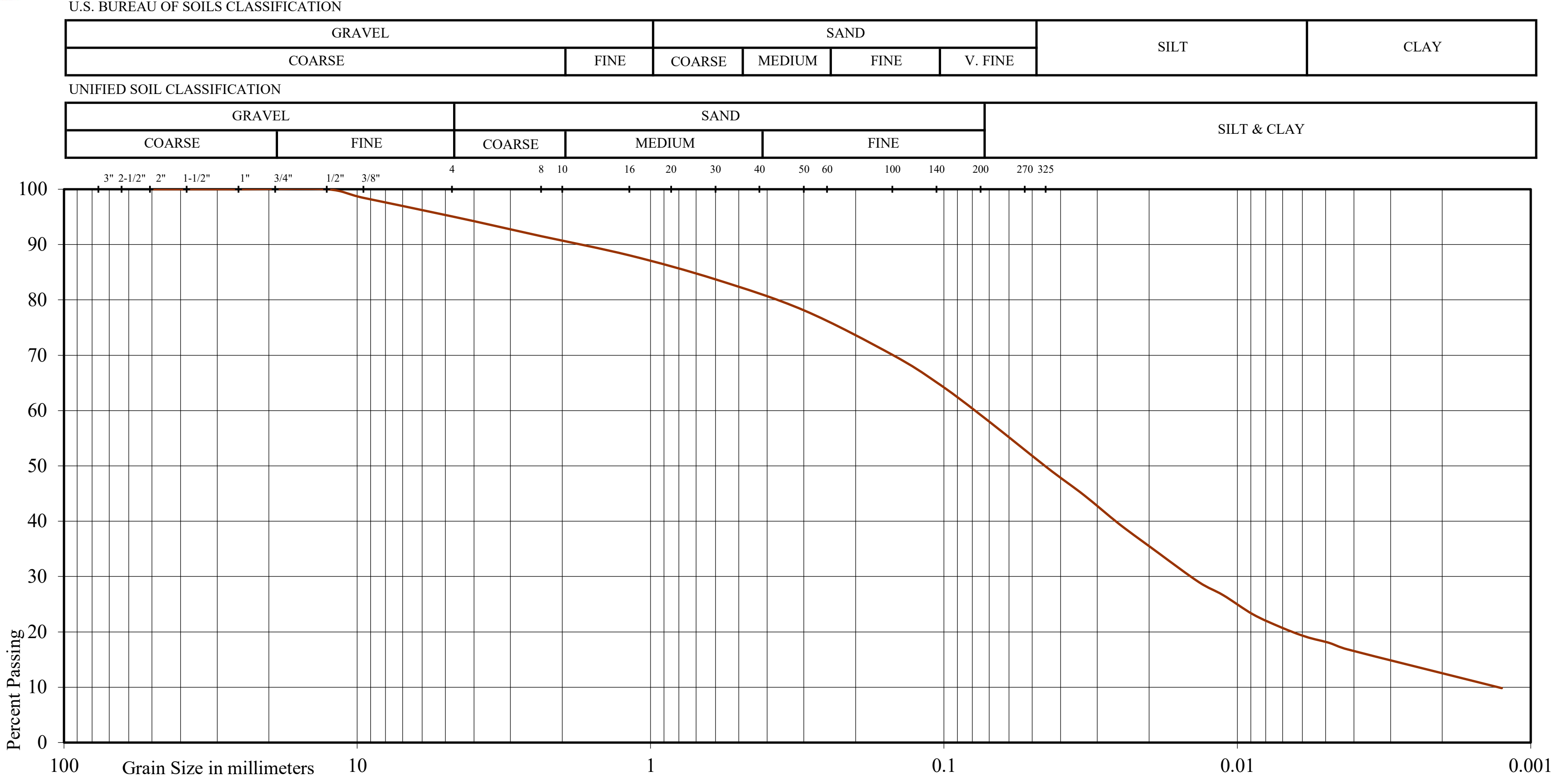
a trace to some silt, a trace of clay

Figure: 18

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S041



Project: Proposed Residential Development

SV-

Location: Southwest of Old School Road and Hurontario Street, Town of Caledon

BH./Sa. 106/10

Liquid Limit (%) = -

Borehole No: SV-106

Plastic Limit (%) = -

Sample No: 10

Plasticity Index (%) = -

Depth (m): 10.8

Moisture Content (%) = 9

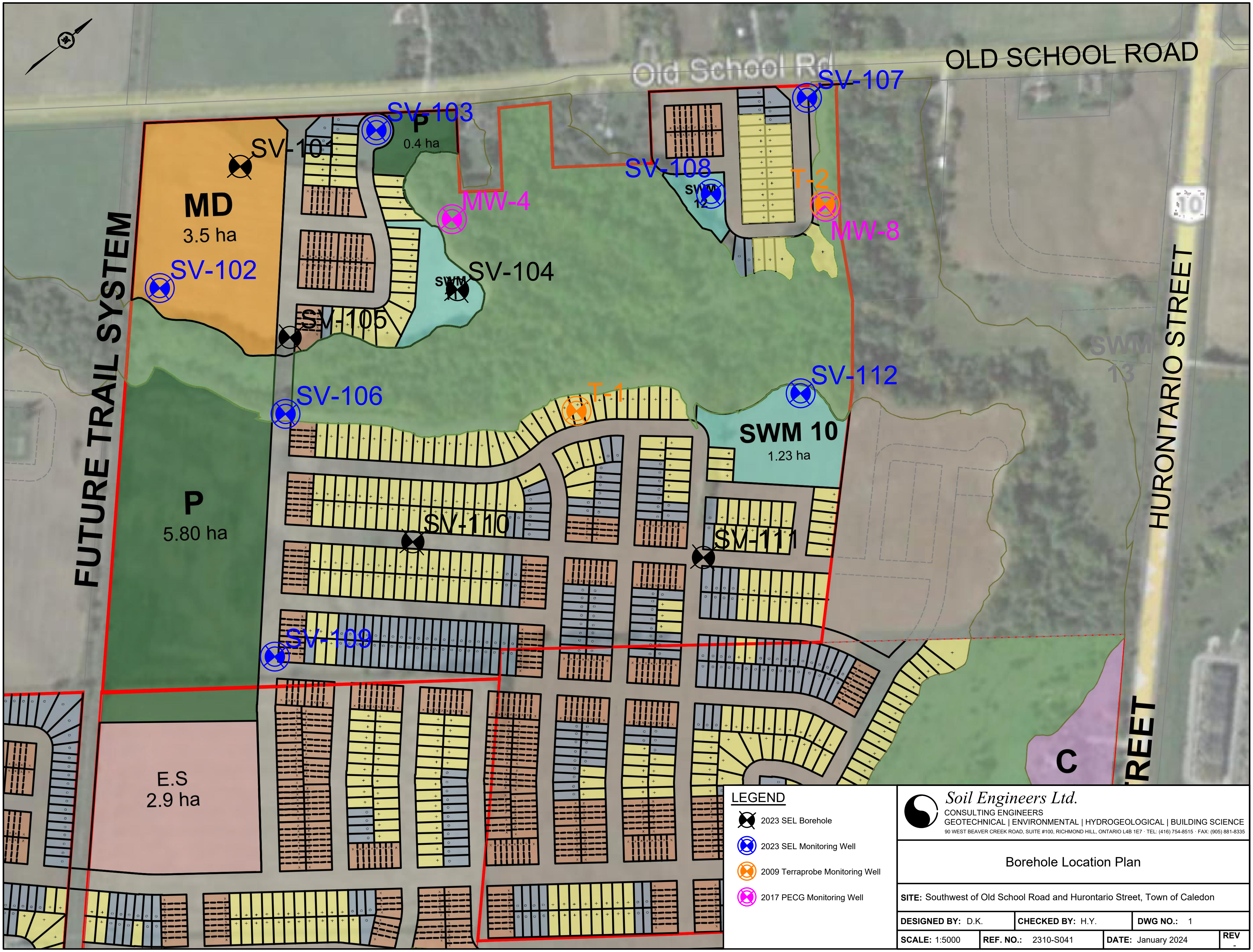
Elevation (m): 254.1

Estimated Permeability (cm./sec.) = 10^{-6}

Classification of Sample [& Group Symbol]: SANDY SILT TILL

some clay, a trace of gravel

Figure: 19



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole Location Plan

SITE: Southwest of Old School Road and Hurontario Street, Town of Caledon

DESIGNED BY: D.K.	**CHECKED BY:** H.Y.	**DWG NO.:** 1
SCALE: 1:5000	**REF. NO.:** 2310-S041	**DATE:** January 2024

REV -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

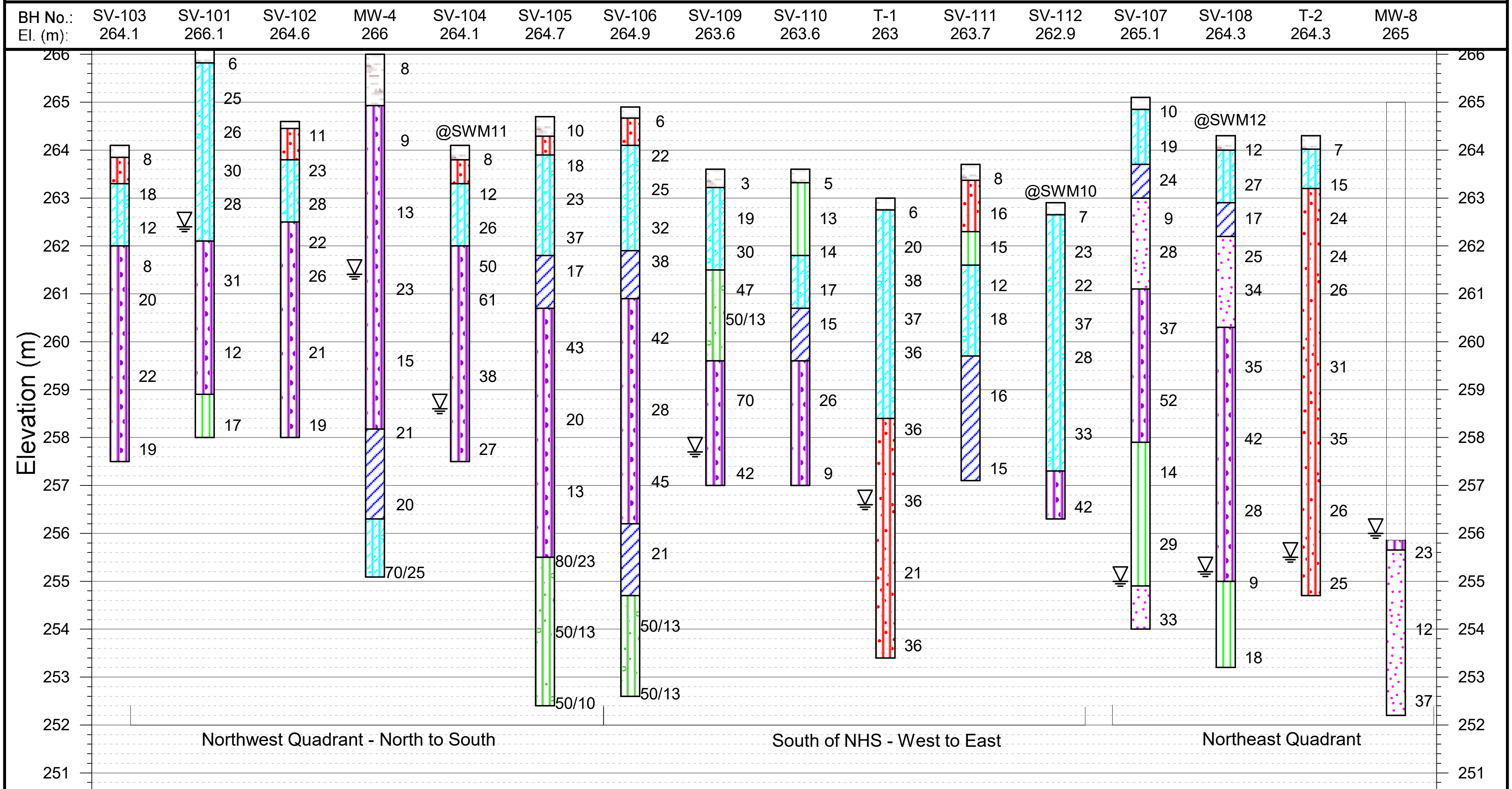
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.:	2310-S041
REPORT DATE:	January 2024
PROJECT DESCRIPTION:	Proposed Residential Development
PROJECT LOCATION:	Southwest of Old School Road and Hurontario Street Town of Caledon

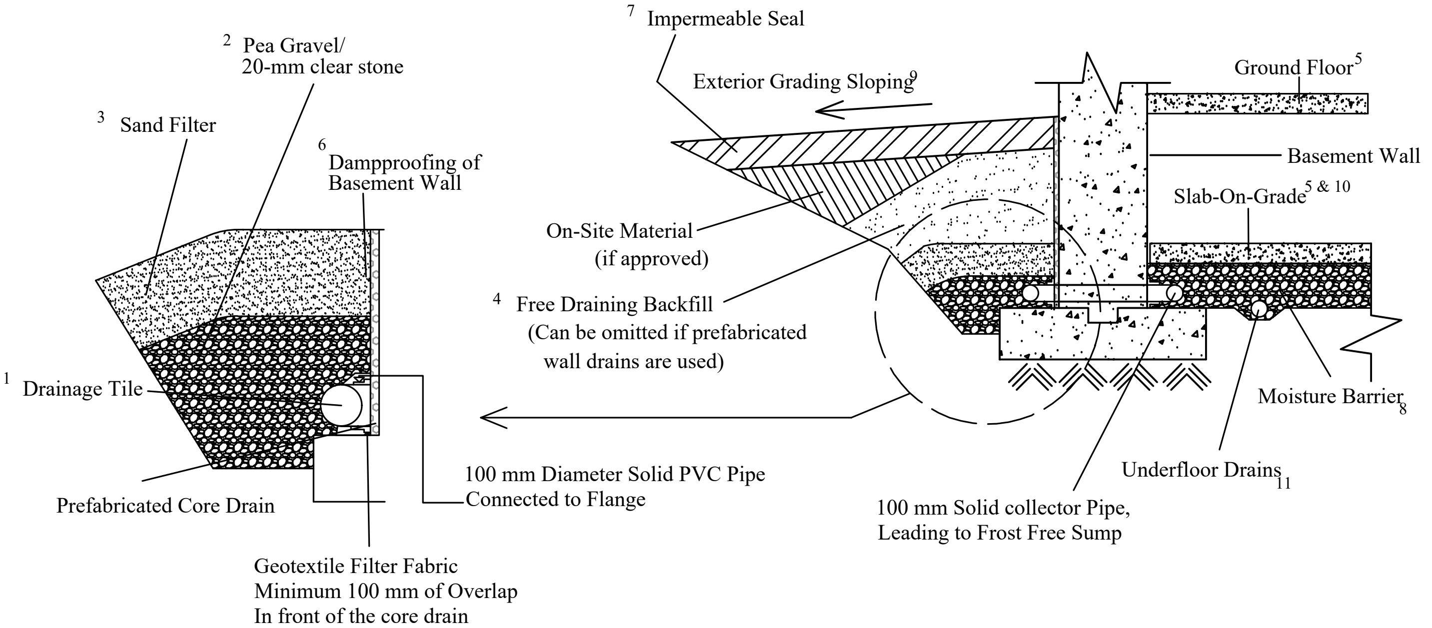
LEGEND

▨	TOPSOIL	▨	SAND AND SILT	▨	SANDY SILT TILL	▨	SILTY CLAY
▨	SAND	▨	SANDY SILT	▨	SILT	▨	SILTY CLAY TILL

▽ WATER LEVEL (END OF DRILLING)



Note: Subsurface profiles for T-1, T-2, MW-4 and MW-8 are derived from borehole logs prepared by Terraprobe Inc. and Palmer Environmental Consulting Group Inc.



NOTES:

1. **Drainage tile**: consists of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be at minimum of 150 mm (6") below underside of basement floor slab.

2. **Pea gravel**: at 150 mm (6") on the top and sides of drain. If drain is not placed on concrete footing, provide 100 mm (4") of pea gravel below drain. The pea gravel may be replaced by 19-mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270R or equivalent.

3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300 mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.

4. **Free-draining backfill**: OPSS Granular 'B' or equivalent, compacted to 95% to 98% (maximum) Standard Proctor dry density. Do not compact closer than 1.8 m (6') from wall with heavy equipment. This may be replaced by on-site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.

5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.

6. **Dampproofing** of the basement wall is required before backfilling

7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free-draining sand, the seal may be omitted.

8. **Moisture barrier**: 19-mm CRL or compacted OPSS Granular 'A', or equivalent. The thickness of this layer should be 150 mm (6") minimum.

9. **Exterior Grade**: slope away from basement wall on all the sides of the building.

10. **Slab-On-Grade** should not be structurally connected to walls or foundations.

11. **Underfloor drains*** should be placed in parallel rows at 6 to 8 m (20'-25') centre, on 100 mm (4") of pea gravel with 150 mm (6") of pea gravel on top and sides. The spacing should be at least 300 mm (12") between the underside of the floor slab and the top of the pipe. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

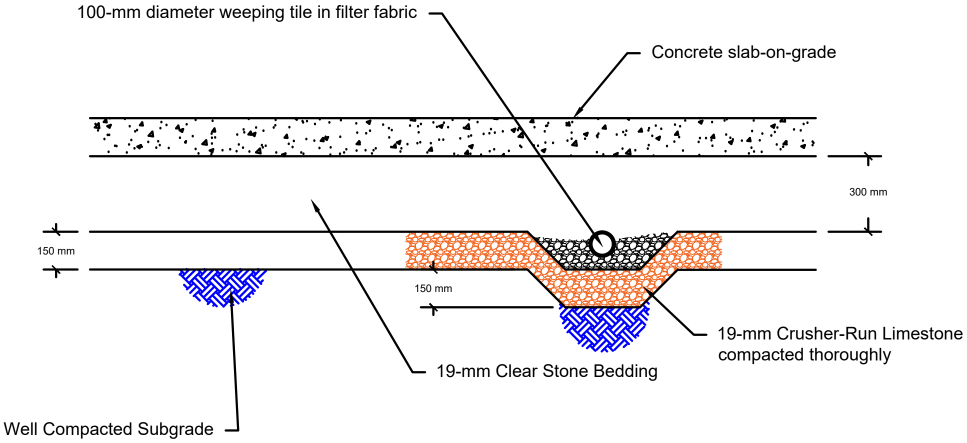
* Underfloor drains can be deleted where not required.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

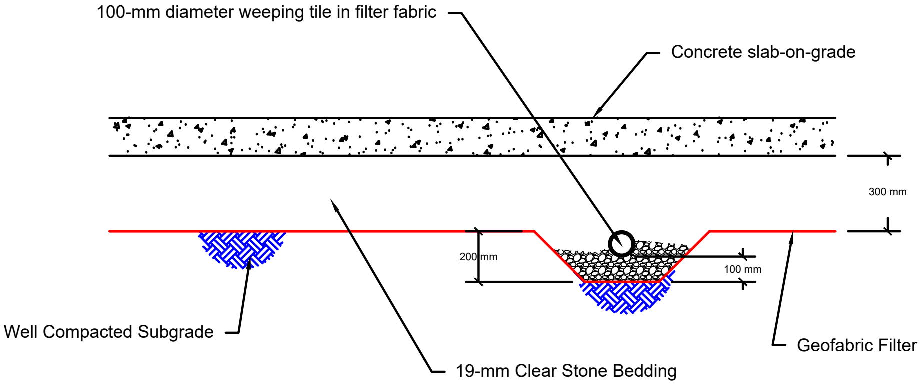
PERMANENT PERIMETER DRAINAGE SYSTEM
(FOR OPEN EXCAVATION)

SITE: SOUTHWEST OF OLD SCHOOL ROAD AND HURONTARIO STREET
TOWN OF CALEDON

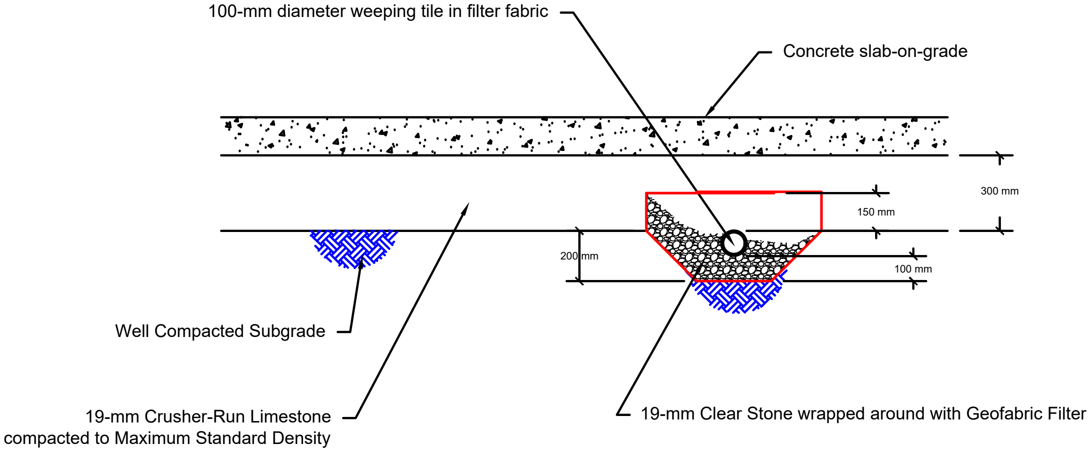
DESIGNED BY: K.L.
CHECKED BY: B.S.
DWG NO.: 3
SCALE: N.T.S.
REF. NO.: 2310-S041
DATE: JANUARY 2024
REV -



Option 'A'



Option 'B'



Option 'C'

Note:

1. Weepers should be placed in 6 m grids, draining in a positive gradient towards an outlet or a sump pit for removal by pumping.
2. A 10-mil polyethylene sheet should be specified between the gravel bedding and concrete slab.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

DETAILS OF UNDERFLOOR WEEPERS

SITE: SOUTHWEST OF OLD SCHOOL ROAD AND HURONTARIO STREET
TOWN OF CALEDON

DESIGNED BY: K.L.
CHECKED BY: B.S.
DWG NO.: 4
SCALE: N.T.S.
REF. NO.: 2310-S041
DATE: JANUARY 2024
REV -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 542-2769

APPENDIX

BOREHOLE LOGS BY TERRAPROBE INC. AND PECG

REFERENCE NO. 2310-S041

Terraprobe

LOG OF BOREHOLE 1

PROJECT: Mayfield West
LOCATION: Caledon, Ontario
CLIENT: Philips Engineering Ltd.

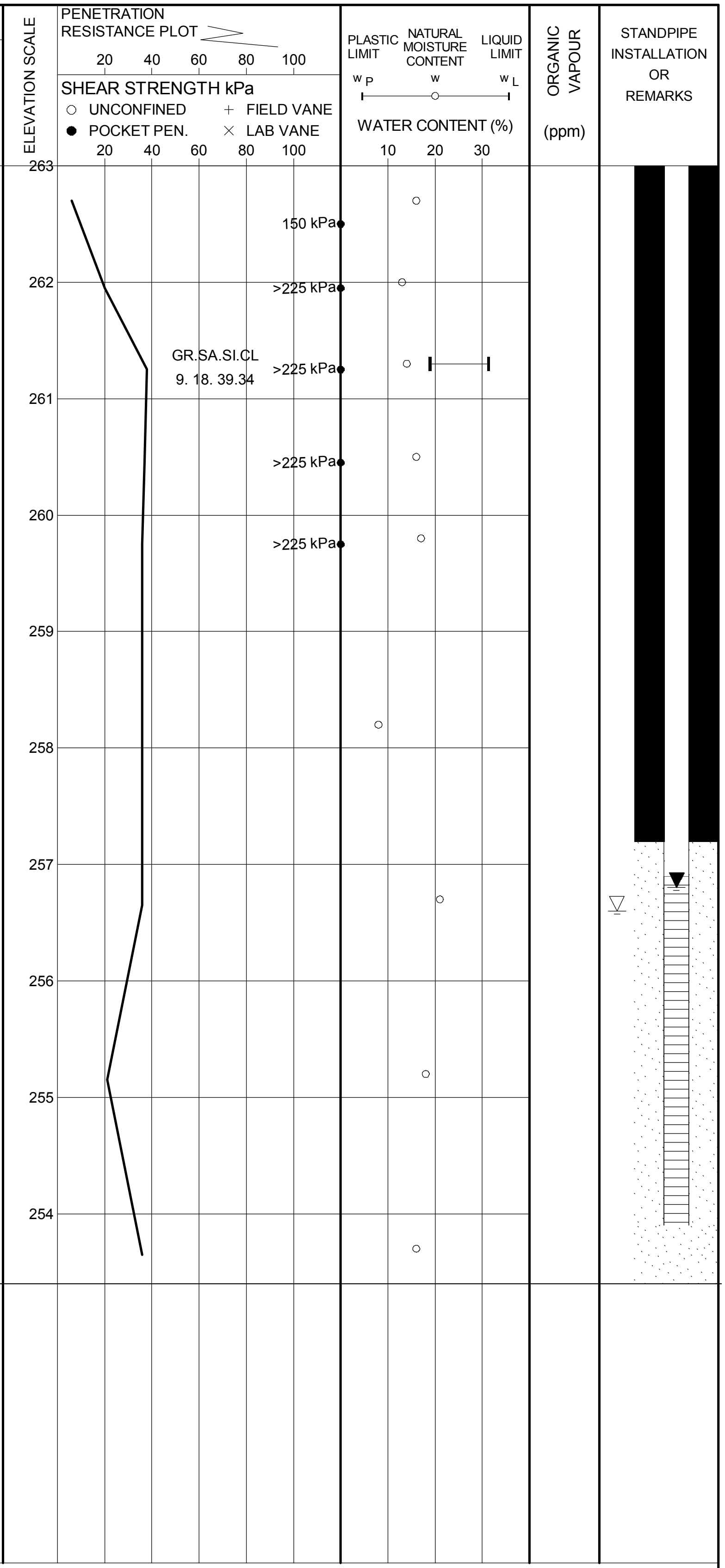
DATE: February 12, 2009
EQUIPMENT: Bombardier/Hollow Stem Augers
ELEVATION DATUM: Geodetic
FILE: 1-08-3053

SOIL PROFILE

ELEV DEPTH	DESCRIPTION
263.0 0.0	
262.8	250mm TOPSOIL
0.3	Weathered, firm ---- CLAYEY SILT embedded sand and gravel, very stiff to hard, brown, moist (GLACIAL TILL) ---- sandy
258.4 4.6	SANDY SILT trace gravel, trace clay, compact to dense, brown, moist ---- wet ---- grey
253.4 9.6	End of Borehole

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	6
2	SS	20
3	SS	38
4	SS	37
5	SS	36
6	SS	36
7	SS	36
8	SS	21
9	SS	36



NOTES:
Borehole was caving at 6.7m and unstabilized water level at 6.4m upon completion of drilling.
Water level in monitoring well at 6.2m (Elev. 256.8m) on April 23, 2009.

Terraprobe

LOG OF BOREHOLE 2

PROJECT: Mayfield West
LOCATION: Caledon, Ontario
CLIENT: Philips Engineering Ltd.

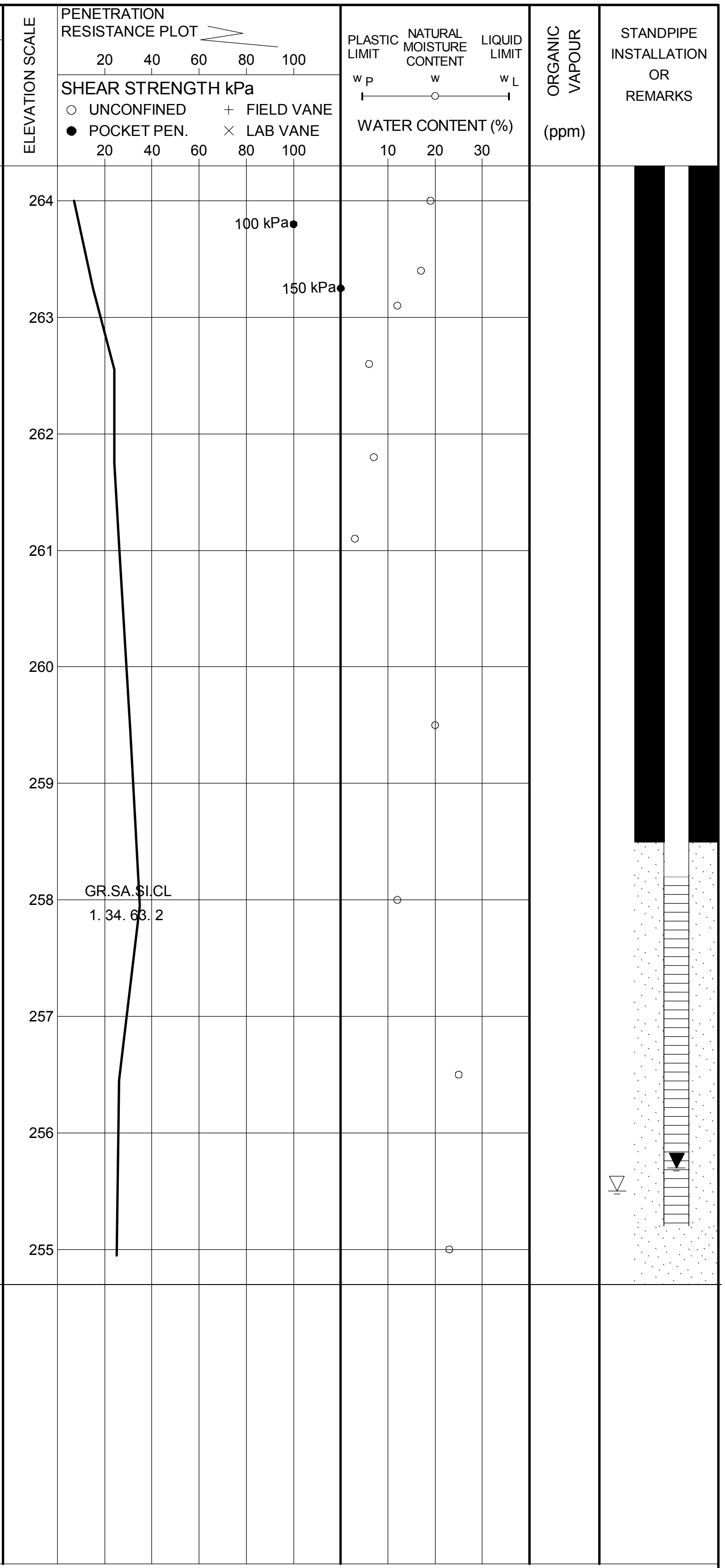
DATE: February 12, 2009
EQUIPMENT: Bombardier/Hollow Stem Augers
ELEVATION DATUM: Geodetic
FILE: 1-08-3053

SOIL PROFILE

ELEV / DEPTH	DESCRIPTION
264.3	
264.0 / 0.0	280mm TOPSOIL
0.3	CLAYEY SILT embedded sand and gravel, stiff to very stiff, brown, moist (GLACIAL TILL)
263.2 / 1.1	SANDY SILT trace gravel, trace clay, compact to dense, brown, moist ---- wet
254.7 / 9.6	End of Borehole

SAMPLES

NUMBER	TYPE	"N" VALUES
1	SS	7
2	SS	15
3	SS	24
4	SS	24
5	SS	26
6	SS	31
7	SS	35
8	SS	26
9	SS	25



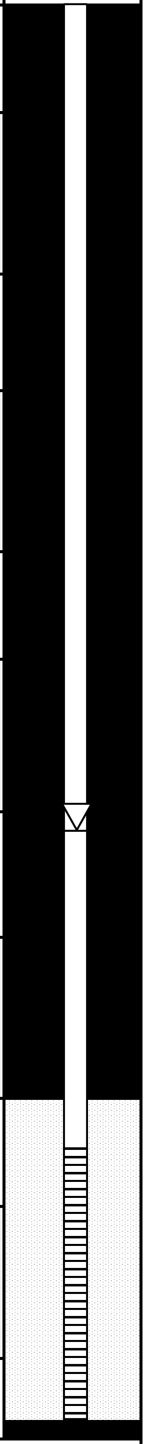
NOTES:
Borehole was caving at 8.8m and unstabilized water level at 8.8m upon completion of drilling.
Water level in monitoring well at 8.6m (Elev. 255.7m) on April 23, 2009.

BOREHOLE RECORD OF MW-4

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 592076.8 E, 4844412.8 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 15, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 6.40 m - 7.92 m

Depth (mbgs)	Soil Profile				Samples		Sample Description	
	Description	Strata	Elevation Depth	Sample depths	Number	Type	Recovery (m)	N-Value
0 – 1.07	Topsoil: clay and silt, organics, loose, moist, brown	▦	264.93 1.07	0 0.6	1	SS	0.330 / 0.609	8
				0.75 1.36				
1.07 – 7.82	Fine and medium sand and silt, laminae, loose to medium density, moist to wet, light brown *6.25 m: Grey*	░	258.18 7.82	1.52 2.13	2	SS	0.330 / 0.609	9
				2.28 2.89				
				3.04 3.65	3	SS	0.508 / 0.609	13
				4.57 5.18	4	SS	0.609 / 0.609	23
				6.09 6.7	5	SS	0.609 / 0.609	15
7.82 – 8	Clay, cohesive, very stiff, wet, grey	☰		7.62	6	SS	0.533 / 0.609	21

Piezometer Installation



Well Installation Details

Stick Up Height: 0.68 m	**W.L. upon Well Completion (D.):** 5.27 mbtoc, 4.59 mbgs
Ground Elevation: 266 masl	**W.L. upon Well Completion (S.):** N/A

BOREHOLE RECORD OF MW-4

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 592076.8 E, 4844412.8 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 15, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 6.40 m - 7.92 m

Depth (mbgs)	Soil Profile			Samples		Sample Description		Piezometer Installation
	Description	Strata	Elevation Depth	Number	Type	Recovery (m)	N-Value	
8.22	*Continued*	▤						■
9	Clay, cohesive, very stiff, wet, grey	▤						■
9.14		▤		7	SS	0.533 / 0.609	20	■
9.75		▤	256.3 9.7					■
10	Silty clay till, some gravel and cobbles, very dense, moist, red/brown	▨						■
10.66		▨	255.09 10.91	8	SS	0.254 / 0.254	70 / 0.25	■
11	END OF BOREHOLE AT 10.91 m							
11.27								
12								
12.19								
12.8								
13								
13.71								
14								
14.32								
15								
15.24								
15.84								
16								

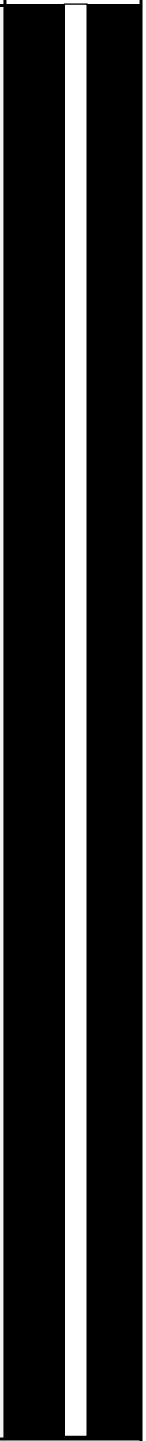
Well Installation Details

Stick Up Height: 0.68 m	**W.L. upon Well Completion (D.):** 5.27 mbtoc, 4.59 mbgs
Ground Elevation: 266 masl	**W.L. upon Well Completion (S.):** N/A

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

BOREHOLE RECORD OF MW-8

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 592322.7 E, 4844726.5 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 15, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 9.75 m - 11.28 m

Depth (mbgs)	Soil Profile			Samples		Sample Description		Piezometer Installation
	Description	Strata	Elevation Depth	Number	Type	Recovery (m)	N-Value	
0 0.6 0.75 1 1.36 1.52 2 2.13 2.28 2.89 3 3.04 3.65 4 4.57 5 5.18 6 6.09 6.7 7 7.62 8	*Note: Straight drill to 9.14 m, no samples collected. See TerraProbe BH2 for stratigraphy.*							

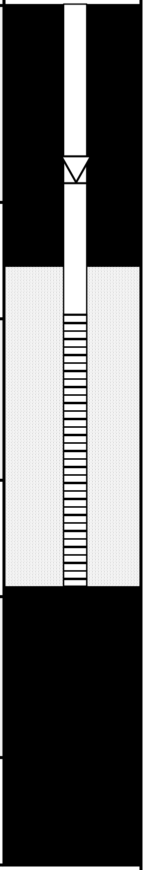
Well Installation Details

Stick Up Height: 0.73 m	**W.L. upon Well Completion (D.):** 9.73 mbtoc, 9.00 mbgs
Ground Elevation: 265 masl	**W.L. upon Well Completion (S.):** N/A

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

BOREHOLE RECORD OF MW-8

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 592322.7 E, 4844726.5 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 15, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 9.75 m - 11.28 m

Depth (mbgs)		Soil Profile			Samples		Sample Description		Piezometer Installation
		Description	Strata	Elevation Depth	Number	Type	Recovery (m)	N-Value	
	8.22			255.86					
9									
	9.14	Fine sand and silt, medium dense, dry, brown		9.14	1	SS	0.609 / 0.609	23	
	9.75	Fine to coarse sand, some silt, medium dense to dense, wet, grey							
10									
	10.66	*10.66 m: clay and silt, cohesive, medium soft, wet, grey*			2	SS	0.609 / 0.609	12	
11									
	11.27								
12									
	12.19	*12.34 m: gravel*		252.2	3	SS	0.609 / 0.609	37	
	12.8	END OF BOREHOLE AT 12.80 m		12.8					
13									
	13.71								
14									
	14.32								
15									
	15.24								
	15.84								
16									

Well Installation Details

Stick Up Height: 0.73 m	**W.L. upon Well Completion (D.):** 9.73 mbtoc, 9.00 mbgs
Ground Elevation: 265 masl	**W.L. upon Well Completion (S.):** N/A

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

A REPORT TO
BROOKVALLEY DEVELOPMENTS (HWY 10) LTD.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

12760 HURONTARIO STREET

TOWN OF CALEDON

REFERENCE NO. 2310-S042

JANUARY 2024

DISTRIBUTION

Digital Copy - Brookvalley Developments (Hwy 10) Ltd.

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the email authorization dated October 2, 2023, from Mr. Frank Filippo of Brookvalley Developments (Hwy 10) Ltd., a geotechnical investigation was carried out for a property located at 12760 Hurontario Street in the Town of Caledon.

The purpose of the investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of a proposed residential development.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located on the west side of Hurontario Street, approximately 600 m south of Old School Road, in the Town of Caledon. It is located within a physiographic region known as the South Slope, situated in between the Oak Ridges Moraine and the Peel Plain. The soil stratigraphy in the area is characterized by sand and silt deposits layered in between an upper Halton Till unit and a lower Newmarket Till formation. The sand and silt deposits in the area were identified as part of the Oak Ridges Moraine (ORM) or equivalent unit in the Hydrogeological Assessment for Mayfield West, Phase 2 Stage 3 Lands, prepared by Palmer Environmental Consulting Group Inc. (PECG) in 2018.

The Etobicoke Creek traverses through the eastern half of the site. The land west of the natural system is used for agricultural purposes while the land east of the creek is vacant and open. Historical photos show that previous residential establishments and farm structures fronting Hurontario Street on the property have been demolished, with the exception of an abandoned storage building. Based on the conceptual site plan, the proposed low-density residential development, with a commercial block fronting Hurontario Street, will adjoin with neighbouring developments to form a larger residential community. A bridge crossing will be constructed in the vicinity of Boreholes BC-105 and 106.

3.0 FIELD WORK

The field work, consisting of 7 boreholes extending to a depth ranging from 6.6 to 15.5 m, was carried out between October 13 and 17, 2023. To facilitate the hydrogeological study by PECG, single and nested 50-mm diameter monitoring wells were installed at 2 selected borehole locations. The monitoring wells with a suffix of ‘S’ or ‘D’ represent the shallow and deep well in a well cluster. The depth and details of the monitoring wells are shown on the corresponding Borehole Logs. The locations of the boreholes and monitoring wells are shown on Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted machine equipped with solid and hollow stem augers for soil sampling. Split-spoon samples were recovered for soil classification and laboratory testing. Standard Penetration Tests using the procedures described on the enclosed “List of Abbreviations and Terms” were performed at the sampling depths. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the ‘N’ values. The field work was supervised and the findings were recorded by a geotechnical technician.

The ground elevation at each borehole location was determined using a handheld equipment of the Global Navigation Satellite System.

4.0 SUBSURFACE CONDITIONS

Beneath the topsoil veneer and a surficial layer of weathered sandy silt within the farm field, the site is underlain by strata of silty clay till, silty clay and sandy silt till/silty sand till, interstratified with silt deposits in the lower stratigraphy.

Detailed descriptions of the encountered subsurface conditions are presented on the Logs of Borehole, comprising of Figures 1 to 8, inclusive. The stratigraphy is illustrated on the Subsurface Profile, Drawing No. 2. The engineering properties of the disclosed soils are discussed herein.

4.1 Topsoil

The revealed topsoil thickness ranges from 18 to 61 cm. Thicker topsoil may be encountered in areas beyond the borehole locations, especially in local low-lying areas.

4.2 Silty Clay Till and Silty Clay

The silty clay till and silty clay were generally encountered in the upper stratigraphy across the site. In deeper boreholes, such as Boreholes BC-104 and BC-105, lower silty clay/silty clay till layers were also contacted. The till consists of a mixture of particle sizes ranging from clay to gravel, with silt and clay being the dominant fraction. The silty clay contains a trace of fine sand and embedded silt layers. Grain size analyses were performed on 2 representative samples of the silty clay till and on a sample of the silty clay, and the results are plotted on Figures 9 and 10, respectively.

The Atterberg Limits of the tested till and clay samples and the natural water content values of all the samples were determined; the results are plotted on the Borehole Logs and summarized below:

	Silty Clay Till	**Silty Clay**
Liquid Limit	24% and 25%	45%
Plastic Limit	15% and 16%	22%
Natural Water Content	10% to 23% (median 12%)	19% to 29% (median 25%)

The results indicate that the clay till is low in plasticity and the clay is medium in plasticity. Sample examination revealed that the till and clay are in moist conditions.

The recorded 'N' values of the clay till range from 6 to over 50 blows, with a median of 30 blows per 30 cm of penetration. This indicates that the clay till is firm to hard, generally being very stiff in consistency. The firm material is restricted to the surficial weathered zone, which extends to depths of 0.8 to 1.4 m below grade. Intermittent hard resistance to augering was encountered in places in the till, indicating the presence of cobbles.

The obtained 'N' values of the clay range from 12 to 32, with a median of 17 blows per 30 cm of penetration. The consistency of the clay is stiff to hard, generally being very stiff.

The engineering properties of the silty clay till and clay are listed below:

- Moderate to high frost susceptibility and moderate soil adfreezing potential.
- Low water erodibility.
- In excavation, the clays will be stable in relatively steep cuts; however, prolonged exposure may lead to localized sloughing.

4.3 <u>Sandy Silt/Silt</u>

A surficial layer of weathered sandy silt was found at Boreholes BC-101 to 104 drilled at the farm field. A silt deposit, with some sand to being sandy, was found interstratified with the clay and tills in Boreholes BC-104 to BC-107 in the lower stratigraphy. Grain size analyses were performed on 3 representative samples of the silt; the results are plotted on Figure 11.

The obtained natural water content values range from 11% to 24%, with a median of 19%, indicating that the silt is moist to wet, generally in a wet condition.

The recorded ‘N’ values range from 5 to over 50, with a median of 11 blows per 30 cm penetration, indicating that the silt is loose to very dense, generally being compact in relative density.

The engineering properties of the silt are listed below:

- High capillarity and water retention capability.
- Highly frost susceptible, with high soil-adfreezing potential.
- High water erodibility, it will migrate through small openings under seepage pressure.
- The shear strength is mainly derived from internal friction. The wet silt is susceptible to dynamic disturbance, which will induce a build-up of pore water pressure, resulting in soil dilation and a reduction in shear strength.
- In excavation, the silt will remain stable for a short period of time, and will slough and run with seepage. The wet silt will boil under an approximate piezometric head of 0.4 m.

4.4 Sandy Silt Till/Silty Sand Till

Sandy silt till/silty sand till was encountered beneath the clay till or silt deposits in Boreholes BC-105D and 106. The till is cemented with a trace of clay, and is laminated with sand and silt seams and layers. Hard resistance to augering was encountered in the till, indicating the presence of cobbles. Grain size analyses were performed on representative samples of the till; the results are plotted on Figure 12.

The natural water content values of the till range from 10% to 16%, with a median of 11%, indicating that the till is in a moist to wet, generally moist condition.

The obtained ‘N’ values range from 44 to over 50, with a median of 89 blows per 30 cm penetration, indicating that the relative density of the till is dense to very dense, being generally very dense.

The engineering properties of the sandy silt till/silty sand till are listed below:

- Highly frost susceptible and moderately low water erodibility.
- The till will be relatively stable in relatively steep excavation; however, if remained open for an extended period of time, localized sloughing may occur.

4.5 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Silty Clay Till	10 to 23 (median 12)	17	13 to 22
Silty Clay	19 to 29 (median 25)	21 to 22	17 to 25
Sandy Silt Till/ Silty Sand Till	10 to 16 (median 11)	10	6 to 15
Silt	11 to 24 (median 19)	12	8 to 16

The above values show that the tills and clay are generally suitable for structural backfill, and the addition of water may be required prior to structural compaction in the dry and warm seasons and in areas where compaction is best performed on the wet side of the optimum. Portions of the silty clay and sandy silt till/silty sand till may require aeration and the wet silt can be stockpiled to drain the excess water prior to structural compaction.

The weathered soil must be screened and sorted free of topsoil inclusions and deleterious materials, if any, prior to reuse for structural backfill.

The lifts for compaction should be limited to 20 cm, or to a suitable thickness assessed by test strips performed by the compaction equipment. Boulders larger than 15cm in size must be sorted and removed from the backfill.

5.0 GROUNDWATER CONDITION

Groundwater levels were measured in the wet silt deposit, found in Boreholes BC-104 and 106 in the vicinity of the creek. In December 2023, stabilized groundwater levels were recorded from the installed monitoring wells in by PECG; these levels are tabulated in Table 2.

Stabilized water levels were recorded at a depth of 5.27 metres below ground surface (mbgs), or at El. 257.13 m at Borehole BC-101, and at depths of 6.91 to 7.40 mbgs, or El. 253.19 to 252.70 m at the well cluster at Borehole BC-105, suggesting a drainage trend towards the Etobicoke Creek. The groundwater regime is subject to seasonal fluctuations. Detailed groundwater profile and monitoring records should be referred to the hydrogeological study by PECG.

Table 2 - Groundwater Levels

Borehole/ Monitoring Well No.	Ground El. (m)	Well Depth (m)	Measured Groundwater Levels					
			On Completion		Dec. 6, 2023		Dec. 12-13, 2023	
			Depth (m)	El. (m)	Depth (m)	El. (m)	Depth (m)	El. (m)
BC-101	262.4	6.1	Dry	-	5.27	257.13	-	-
BC-102	261.3	-	Dry	-	No Well			
BC-103	261.3	-	Dry	-	No Well			
BC-104	259.5	-	5.9	253.6	No Well			
BC-105D	260.1	15.2	N/A[a]	-	7.35	252.75	7.40	252.70
BC-105S	260.1	7.6	Dry	-	6.91	253.19	6.91	253.19
BC-106	256.6	-	6.7	249.9	No Well			
BC-107	260.6	-	Dry	-	No Well			

[a] Water was used during the drilling operation; measurement of groundwater level was not feasible upon completion of drilling.

6.0 DISCUSSION AND RECOMMENDATIONS

Beneath the topsoil veneer and a surficial layer of weathered sandy silt within the farm field, the site is underlain by strata of generally very stiff silty clay till and silty clay, and very dense sandy silt till/silty sand till, interstratified with generally compact silt deposits in the lower stratigraphy. The surficial weathered zone extends to depths of 0.8 to 1.4 m below grade.

Stabilized water levels were recorded at the monitoring wells at depths ranging from 5.27 to 7.40 mbgs, or from El. 257.13 m at Borehole BC-101 to El. 252.70 m at Borehole BC-105D, suggesting a drainage trend that follows the topography towards the Etobicoke Creek. The groundwater regime is subject to seasonal fluctuations.

Based on the conceptual site plan, the subject site will be developed to a low-density residential subdivision with a commercial block fronting Hurontario Street, and will be provided with municipal services and paved roadways meeting municipal standards. The development will adjoin with neighbouring developments to form a larger residential community. A bridge crossing will be constructed in the area of Boreholes BC-105 and 106.

The following geotechnical considerations warrant special attention:

1. The topsoil must be stripped for development; it can be reused for general landscaping purposes only.
2. The weathered soil should be inspected prior to any placement of earth fill for site grading purpose. Where required, the weathered soil should be subexcavated, sorted free of any organic, topsoil, and/or other deleterious material, before reusing for structural backfill.
3. After removal of the existing building and associated foundation, the debris should be disposed off-site. All loose and disturbed soils should also be removed and the cavities should be backfilled with engineered fill.
4. Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction.
5. The engineered fill and the sound native soils are suitable for supporting structures founded on conventional spread and strip footings.
6. It is recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level, particularly in the vicinity of Boreholes BC-104, 105D and 106. Otherwise, underfloor subdrain systems and/or waterproofing of basements should be implemented to relieve any groundwater upfiltration due to seasonal fluctuation of the groundwater.
7. A Class ‘B’ bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL), is recommended for the construction of underground services. Where services installation extends into the wet silt, or where dewatering is required, a Class ‘A’ concrete bedding should be considered for pipe support.
8. Groundwater seepage from the tills and clay will likely be removable by conventional pumping from sumps during construction. Excavation extending into the saturated soils will require construction dewatering.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes, and the assessment given herein is general in nature based on the borehole findings. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Site Preparation

The topsoil and vegetation at the ground surface must be removed for development. Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction. The engineering requirements for a certifiable fill are presented below:

1. The subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils should also be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts of 20 cm thick to at least 98% Standard Proctor Dry Density (SPDD) up to the proposed finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% SPDD.
3. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.
4. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue or contamination. Any potential imported earth fill from off-site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before being hauled to the site.
5. The fill operation must be inspected on a full-time basis by a technician under direction of a geotechnical engineer.
6. The engineered fill should not be placed during period when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.
7. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors.
8. The foundations and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to

ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.

9. Despite stringent control in the placement of the engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the foundations must be properly reinforced, or be designed by the structural engineer for the project. The total and differential settlements of 25 mm and 20 mm, respectively, should be considered in the design of the foundation founded on engineered fill.
10. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the locations of the excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.

6.2 **Foundation**

Based on the borehole information, the following bearing pressures are recommended for house structures supported on conventional strip and spread footings founded onto engineered fill or sound native soils below the surficial disturbed or weathered soils.

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Ultimate Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of footing designed for the recommended bearing pressure at SLS are estimated at 25 mm and 20 mm, respectively.

Higher bearing pressures may be provided depending on location and foundation design depth. This can be confirmed once the design and grading specifications are available for review.

The footing subgrade must be inspected by a geotechnical engineer, or a senior geotechnical technician, under the supervision of a geotechnical engineer, to ensure that the revealed conditions are compatible with the design of the foundation.

Footings exposed to weathering, or in unheated areas, should have at least 1.2 m of earth cover for protection against frost action.

Where the footing excavation consists of wet sands and/or silts, or the footing subgrade is saturated, a concrete mud-slab of lean mix concrete, 8 to 10 cm in thickness, should be poured immediately after subgrade preparation and inspection to protect the approved subgrade against disturbance by the construction traffic.

The foundation should meet the requirements specified by the latest Ontario Building Code, and the structures can be designed to resist a minimum earthquake force using Site Classification 'D' (stiff soil).

The external grading must be designed to drain surface runoff away from the structures to minimize the frost heave phenomenon generally associated with the disclosed soils.

6.3 **Basement Structure**

Where house basements are proposed, they should be designed for the lateral earth pressure using the soil parameters provided in Table 6.

In conventional basement design, perimeter walls of the basement structure should be damp-proofed and provided with perimeter subdrains at the wall base. Backfill of the open excavation should consist of free-draining granular material (Drawing No. 3) unless prefabricated drainage board is installed over the entire wall below grade.

As previously noted, wet silt deposits were observed in the eastern half of the site It is recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level in the vicinity. Should the basement floor be founded less than 1.0 m above the groundwater table, underfloor subdrains (Drawing No. 4) should be provided to supplement the perimeter subdrain system to relieve any groundwater upfiltration due to seasonal fluctuation. The subdrains, connected to a positive outlet, should be encased in a fabric filter to protect them against blockage by silting. If the basement floor is to be founded less than 0.5 m above the groundwater table, the basement structure should be waterproofed and designed for hydrostatic uplift pressure. Where necessary, additional boreholes can be performed to further delineate the horizontal extent of the wet silt layer during the detail design stage once the site grading plan is available for review.

The subgrade of the basement slab must consist of sound native soil or well compacted inorganic earth fill or engineered fill. The subgrade should be inspected and assessed by proof-rolling prior to slab-on-grade construction. Where loose or soft subgrade is detected, it should be subexcavated and replaced with inorganic material, compacted to at least 98% SPDD.

The concrete slab should be constructed on a minimum 15 cm thick granular base, consisting of 19-mm CRL, or equivalent, compacted to its maximum SPDD. Where underfloor weepers are required, the bedding should be increased to 30 cm in thickness. In addition, a vapor barrier should be placed between the granular bedding and the concrete slab to prevent upfiltration of water vapour.

6.4 Underground Services

A Class 'B' bedding is recommended for construction of the underground services. The bedding material should consist of compacted 19-mm CRL, or equivalent, compacted to at least 98% SPDD. In the saturated silt deposits, a Class 'A' bedding should be considered for proper pipe support.

The subgrade for underground services should consist of sound native soils or properly compacted earth fill. Where soft or loose soil is encountered at the invert level, it must be subexcavated and replaced with properly compacted bedding material.

The pipe joints connecting into manholes and catch basins should be leak-proof or wrapped with an appropriate waterproof membrane to prevent migration of fines due to leakage, leading to a loss of subgrade support and subsequent pipe collapse.

Openings to subdrains and catch basins should be shielded by a fabric filter to prevent silting. In order to prevent pipe floatation when the service trench is deluged with water derived from precipitation, a soil cover with a thickness of at least the diameter of the pipe should be in place at all times after completion of the pipe installation.

The service pipes and metal fittings should be protected against corrosion. For estimation of anode weight requirements, the electrical resistivities of the disclosed soils presented in Table 6 can be used. The proposed anode weight must meet the minimum requirements as specified by the Town of Caledon or Region of Peel.

6.5 Backfilling Trenches and Excavated Areas

The on-site inorganic soils are suitable for trench backfill. The addition of water may be required for the clay till prior to structural compaction during dry and warm weather and in areas where compaction is best performed on the wet side of the optimum. The wet silt and portions of the silty clay and sandy silt till/silty sand till will require aeration prior to their use as structural backfill. The tills should be sorted free of large cobbles and boulders (over

15 cm in size). The weathered soil must be sorted free of topsoil inclusions and deleterious materials prior to reuse for structural backfill.

The backfill material should be compacted to at least 95% SPDD. In areas below the slab-on-grade and in the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% SPDD with a moisture content 2% to 3% drier than the optimum. This is to provide the required stiffness for floor or pavement construction. The lift of each backfill layer should be limited to a thickness of 20 cm, or the thickness should be determined by test strips at the time of compaction.

In normal construction practice, the problem areas of pavement settlement largely occur adjacent to foundation walls, columns, manholes, catch basins and services crossings. In areas which are inaccessible to a heavy compactor, sand backfill which can be appropriately compacted using a smaller vibratory compactor should be used.

One must be aware of possible consequences during trench backfilling and exercise caution as described below:

- To backfill a deep trench, one must be aware that the future settlement is to be expected, unless the sides is flattened to 1V:2H, and the lifts of the fill and its moisture content are stringently controlled; i.e. lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 98% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand and the compaction must be carried out diligently, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to the final surfacing of the new pavement and slab-on-grade construction.
- When construction is carried out in the winter, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction.

Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement that may become evident within several years after construction.

- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.6 Pavement Design

The recommended pavement design for residential local and neighbourhood collector/through roads, satisfying the minimum requirement from the Town of Caledon, is provided in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL3
Asphalt Binder		
Local Residential	65	HL8
Collector/Through Road	90	HL8
Granular Base	150	Granular ‘A’ or equivalent
Granular Sub-base		Granular ‘B’ or equivalent
Local Residential	300	
Collector/Through Road	450	

In preparation of the pavement subgrade, all topsoil and compressible material should be removed. The subgrade should be proof-rolled and inspected. Any soft spots identified must be subexcavated and replaced with inorganic earth fill. The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with a water content at 2% to 3% drier than the optimum. All the granular bases should be compacted to 100% SPDD.

The pavement subgrade will suffer a strength regression if water is allowed to infiltrate the mantle. The following measures should be incorporated in the construction procedures and pavement design:

- The pavement subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.
- Lots areas adjacent to the road should be properly graded to prevent ponding of large amounts of water. Otherwise, the water will seep into the subgrade mantle and induce a

regression of the subgrade strength, with costly consequences for the pavement construction.

- In extreme cases during the wet seasons, if soft or weak subgrade is identified, it can be replaced by compacted granular material to compensate for the inadequate strength of the soft or weak subgrade. This can be assessed during construction.
- Fabric filter-encased curb subdrains are required to meet the Town of Caledon requirements.

6.7 Bridge Crossing

A new bridge crossing will be constructed across the natural system in the vicinity of Boreholes BC-105 and 106. At the time of report preparation, design of the bridge crossing is not available for review.

Shallow Foundation

The bridge abutments may be supported on conventional spread footings with restricted bearing capacities, founded onto the stiff to hard silty clay and silty clay till above the wet, loose to compact silt deposit. The recommended bearing pressures at or above an approximate founding depth of El. 255.0 m are restricted as follows:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of footing designing for SLS are estimated at 25 mm and 20 mm, respectively.

Deep Foundation for the Abutments and Piers

Due to the proximity of the Etobicoke Creek and the underlying wet subsoils with limited bearing capacity, construction of shallow foundations may be difficult. Deep foundation, such as driven H-piles, can be considered for bridge abutments and piers extending past the wet silt deposit and into the very dense sandy silt till or hard silty clay till below El. 246.0 m. The piles must not rest in the loose to dense silt unit which is subject to dilation under vibratory driving forces. It is recommended that the piles be extended at least 3 m into the hard or very dense till with ‘N’ values greater than 50 blows. In view that there is insufficient subsoil data to support this design on the west side of the creek valley (BC-105D), deeper borehole(s) should be carried out in the vicinity of the west abutment once the bridge crossing location and details are confirmed to further elaborate on the subsoil condition below El. 245.0 m.

For preliminary design with typical driven pile sizes of HP310x110 and HP360x174, the recommended geotechnical resistances at SLS and ULS are provided in Table 4.

Table 4 - Pile Capacities for H-Piles

Borehole	Abutment	Pile Size	Pile Capacity (kN)		Depth (m)	El. (m)
			SLS	**ULS**		
BC-105D	West	HP310x110	600	720	Below 14.1	Below 246.0
		HP360x174	790	950		
BC-106	East	HP310x110	780	940	Below 10.6	Below 246.0
		HP360x174	1100	1300		

Other specific sizes and associated resistance capacities can be provided upon request. The actual refusal criteria of pile driving should be established once the chosen pile size and the design loads are known. Cast steel drive shoes, as per OPSD 3000.100, will be required in order to protect the driven pile toe into the till deposit. Full time monitoring of the pile driving operation by a geotechnical technician is necessary in order to assess the pile capacity at refusal. In order to verify the design pile capacity, static load test or Pile Driving Analyzer (PDA) must be performed on selected piles at each abutment and pier. Integral abutments can also be supported on H-piles, with a minimum pile embedment of 0.6 m into the concrete cap.

The settlement of piles designed for the load resistance at SLS are estimated to be less than 25 mm.

Lateral Resistance

Lateral loading can be resisted fully or partially by the use of battered steel H-piles. For vertical piles, the resistance to lateral loading will have to be derived from the soil in front of the pile support. The geotechnical lateral resistance may be calculated using the coefficient of horizontal subgrade reaction (k_s) and the ultimate lateral resistance (p_{ult}):

Cohesive Soil: $k_s = 67\ S_u/D$ and $p_{ult} = 9\ S_u$
Cohesionless Soil: $k_s = n_h\ z/D$ and $p_{ulkt} = 3\ \gamma z\ K_p$

where S_u = undrained shear strength (kPa)
z = depth of pile embedment (m)
n_h = coefficient related to soil relative density (MN/m^3)
D = pile width/diameter (m)

γ = bulk unit weight of soil in overburden [or γ' in submerged condition] (kN/m^3)
K_p = coefficient of passive earth pressure

The soil parameters for the calculation of k_s are summarized in Table 5.

Table 5 - Soil Parameters for Lateral Resistance of Pile

Soil Type	γ (kN/m^3)	n_h (MN/m^3)	S_u (kPa)	K_p
Silty Clay	20.5	-	85	-
Silty Clay Till	22.0	-	175	-
Silt	11.0 (submerged)	1.3	-	2.77
Sandy Silt Till	22.5	11	-	3.39

The computed lateral resistance should be multiplied by a geotechnical resistance factor of 0.5. The design of piles and load capacities should be reviewed by the geotechnical engineer before finalization.

Group Pile Efficiency

Where multiple piles are required to support the structure, it is recommended that the spacing between piles must be at least 3 times the diameter or width of the pile. Pile group action for axial resistance should be considered, and can be evaluated by applying a reduction factor as listed below:

Pile Spacing:	8B	6B	4B	3B
Reduction Factor:	1.0	0.9	0.75	0.7

Pile group action for lateral resistance can also be evaluated as listed below:

Pile Spacing:	8B	6B	4B	3B
Reduction Factor:	1.0	0.7	0.4	0.25

Wing Wall Foundation

Wing walls, constructed with cast-in-place concrete, can be supported on strip footings founded below the frost penetration depth of at least 1.2 m below the proposed grade, onto the sound native soil or engineered fill with the following recommended soil bearing pressures:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of wall footings, designing for the bearing pressure at SLS, are estimated to be 25 mm and 20 mm, respectively.

Alternatively, Reinforced Soil Slope (RSS) wall can be used for the wing wall. The RSS wall should be designed in accordance with the MTO Guideline. A 300 mm thick granular bedding, consisting of Granular 'A' compacted to 100% SPDD, will be required beneath the wall facing units after the subgrade is inspected.

The footing subgrade must be inspected prior to the construction of the wing walls. Stepped down footings may be specified with a maximum step height of 0.6 m and a minimum step length of 1.2 m, founded on the sound native soil or engineered fill.

Frost and Scour Protection

All pile caps and/or conventional spread and strip footings should be founded below the frost penetration depth, with a soil cover not less than 1.2 m. Where the abutments are constructed in close proximity of the watercourse/tributary, the foundation should extend either below the scouring depth or the frost depth, whichever is greater.

Scouring protection schemes, such as using R10 Rip-Rap, at least 300 mm in thickness, should be provided along the watercourse.

Seismic Consideration

Based on the Canadian Highway Bridge Design Code, the bridge abutments on piles driven into the very dense tills can be designed to resist an earthquake force using Site Classification 'C'. Conventional shallow bridge foundation and wing wall foundations can be designed using Site Classification 'D' (stiff soil).

General Construction

A construction platform and access driveway will be required for the access of machinery and construction equipment near the crossing. Temporary erosion and sediment control plan must be implemented during construction to prevent unnecessary disturbance to the valley system of the Etobicoke Creek. The erosion and sediment control plan should be reviewed and approved by the Toronto and Regional Conservation Authority (TRCA). Where necessary and/or upon request by the conservation, temporary bank protection may also be required to prevent erosion along the creek bank.

For construction of the bridge abutments and piers, the tributary may be temporarily diverted, where necessary. Where excavation extends into the wet silt unit, dewatering will be required to draw down the groundwater to approximately 1 m below the intended bottom of excavation. Dewatering details such as the method, rate and volumes should be verified with the hydrogeologist and the dewatering contractor. Sheeting enclosures may also be required to limit the extent of excavation and disturbance into the natural system. One should be noted that sheeting installed using vibratory method into the wet silt may result in soil dilation and the shear strength of the wet silt will be reduced. It is recommended that the sheeting enclosures be completed using a non-vibratory method unless such disturbance is accounted for when designing the sheeting enclosure, and also in the design of the abutments and footings for the crossing.

Embankment and Wing Wall Backfill

Should embankment heights be raised significantly higher than the original grade, consolidation settlement of the subsoils will occur. Primary consolidation settlement in the fine-grained subsoil can be expected. This should be further assessed once detailed embankment design is available for review.

Prior to the construction of embankment, the ground must be free of compressible topsoil and deleterious material. The subgrade must be proof-rolled and inspected before earth filling. Any soft/weak material as identified must be subexcavated and replaced with properly compacted inorganic earth fill.

The wing walls should be backfilled with free draining, non-frost susceptible granular fill to at least 1.2 m behind the wall structure. This is to prevent the build up of hydrostatic pressure and the development of any frost action against the wall structure. Weep holes and/or subdrains should be specified to dissipate any water collected behind the walls.

The road embankment towards the bridge crossing should be graded with a slope gradient of 1V:3H or gentler. Where steeper gradient is considered, the stability of the embankment slope should be reviewed. Where applicable, flood protection should be considered for any portions of the embankment that will extend below the flood line.

The sloping ground of embankment should be covered with 300-mm thick topsoil layer, sodded or vegetated to prevent surficial erosion. Prior to sodding and growth of vegetation, an erosion control blanket may be utilized.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 6.

Table 6 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silty Clay Till	22.0	12.0	1.33	1.03
Silty Clay	20.5	10.5	1.30	1.00
Sandy Silt Till/Silty Sand Till	22.5	12.5	1.33	1.05
Silt	21.0	11.0	1.20	1.00
Lateral Earth Pressure Coefficients		**Active K_a**	**At Rest K_o**	**Passive K_p**
Compacted Earth Fill and Silty Clay		0.40	0.55	2.50
Silty Clay Till		0.33	0.50	3.00
Sandy Silt Till/Silty Sand Till		0.29	0.46	3.39
Silt		0.36	0.53	2.77
Estimated Coefficient of Permeability (K) and Percolation Time (T)			**K (cm/sec)**	**T (min/cm)**
Silty Clay Till and Silty Clay			10^{-7}	80+
Sandy Silt Till/Silty Sand Till			10^{-4}	12
Silt			10^{-4} to 10^{-5}	12 to 20
Estimated Electrical Resistivity				**(ohm·cm)**
Silty Clay Till				4000
Silty Clay				3500
Sandy Silt Till/Silty Sand Till				5000
Silt				5500
Coefficients of Friction				
Between Concrete and Granular Base				0.50
Between Concrete and Native Soils or Compacted Earth Fill				0.35

6.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils to be excavated are classified in Table 7.

Table 7 - Classification of Soils for Excavation

Material	Type
Sound Tills and Silty Clay	2
Weathered Soils and Silt (above groundwater)	3
Saturated Soils	4

In excavation, the groundwater seepage from the tills and clay will likely be limited in quantity and can be removed by conventional pumping from sumps. However, excavation extending into the wet silt in around the Etobicoke Creek valley may require more extensive construction dewatering. In order to provide a stable subgrade for the services or foundation construction, the groundwater should be depressed to at least 1.0 m below the intended bottom of excavation. Detailed groundwater profile and dewatering needs should be referred to the hydrogeological report by PEGG.

Excavation into the very stiff to hard and dense to very dense tills containing cobbles and boulders will require extra effort and the use of a heavy-duty, properly equipped backhoe.

Prospective contractors should assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the intended bottom of excavation prior to excavating. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Brookvalley Developments (Hwy 10) Ltd. and for review by its designated consultants, contractors and government agencies. The material in the report reflects the judgement of Hui Wing Yang, P.Eng. and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

Hui Wing Yang, P.Eng.

Kin Fung Li, P.Eng.
HWY/KFL

LICENSED PROFESSIONAL ENGINEER
Jan 31, 2024
H. W. YANG
100126690
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Jan 31, 2024
K. F. LI
100169280
PROVINCE OF ONTARIO

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or ‘N’ Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as ‘○’

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as ‘—●—’

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

‘N’ (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	‘N’ (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-101

FIGURE NO.: 1

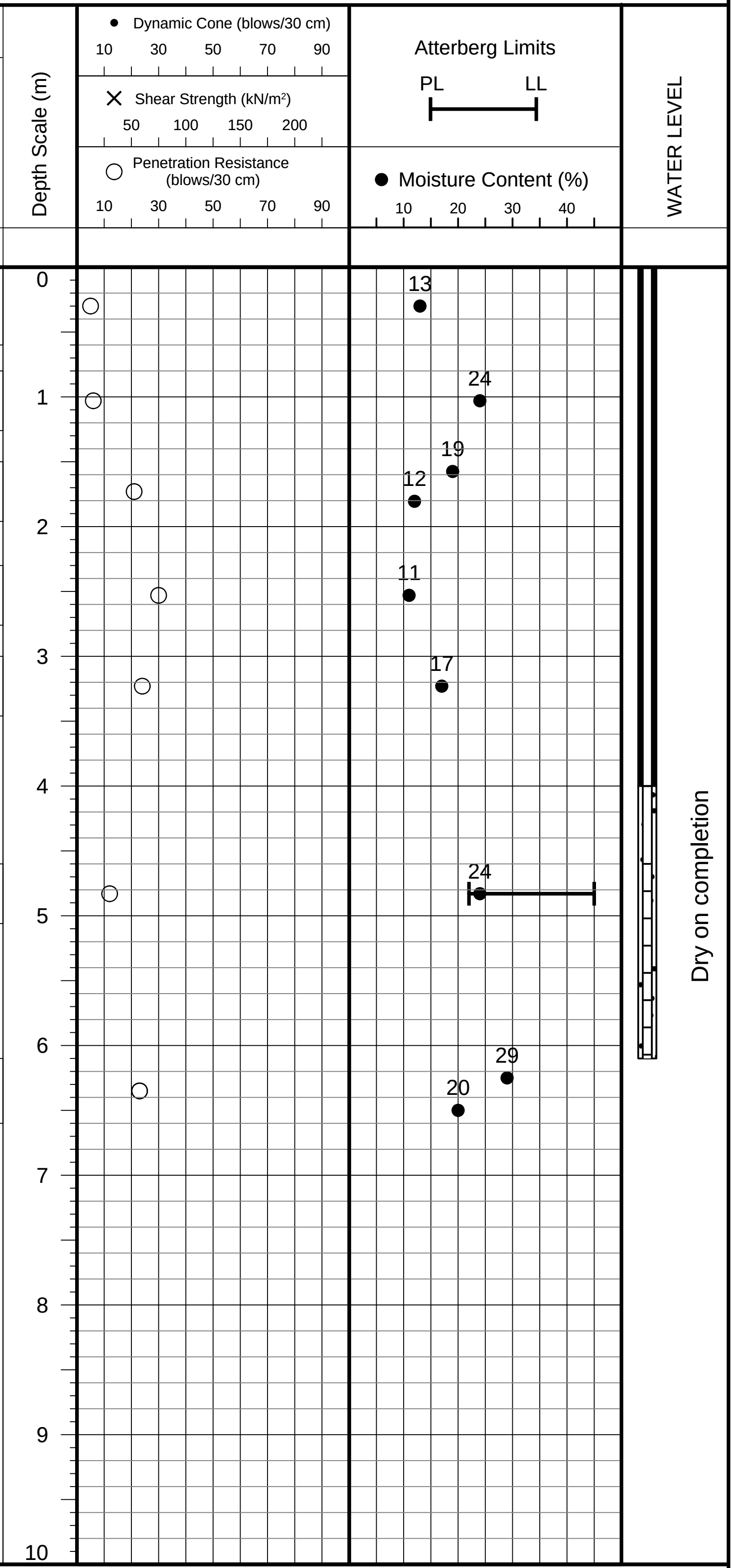
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 13, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
262.4 0.0	Ground Surface **41 cm TOPSOIL**	1	DO	5
	Brown, loose **SANDY SILT** occ. sand seams and layers — weathered	2	DO	6
260.8 1.6	Brown, very stiff **SILTY CLAY TILL** some sand to sandy a trace of gravel occ. sand and silt seams and layers	3A 3B	DO	21
		4	DO	30
		5	DO	24
258.4 4.0	Grey, stiff to very stiff **SILTY CLAY** a trace of sand occ. silt seams and layers	6	DO	12
	— — — silt	7A 7B	DO	23
255.8 6.6	**END OF BOREHOLE**			



Installed 50-mm Ø PVC monitoring well to
6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-102

FIGURE NO.: 2

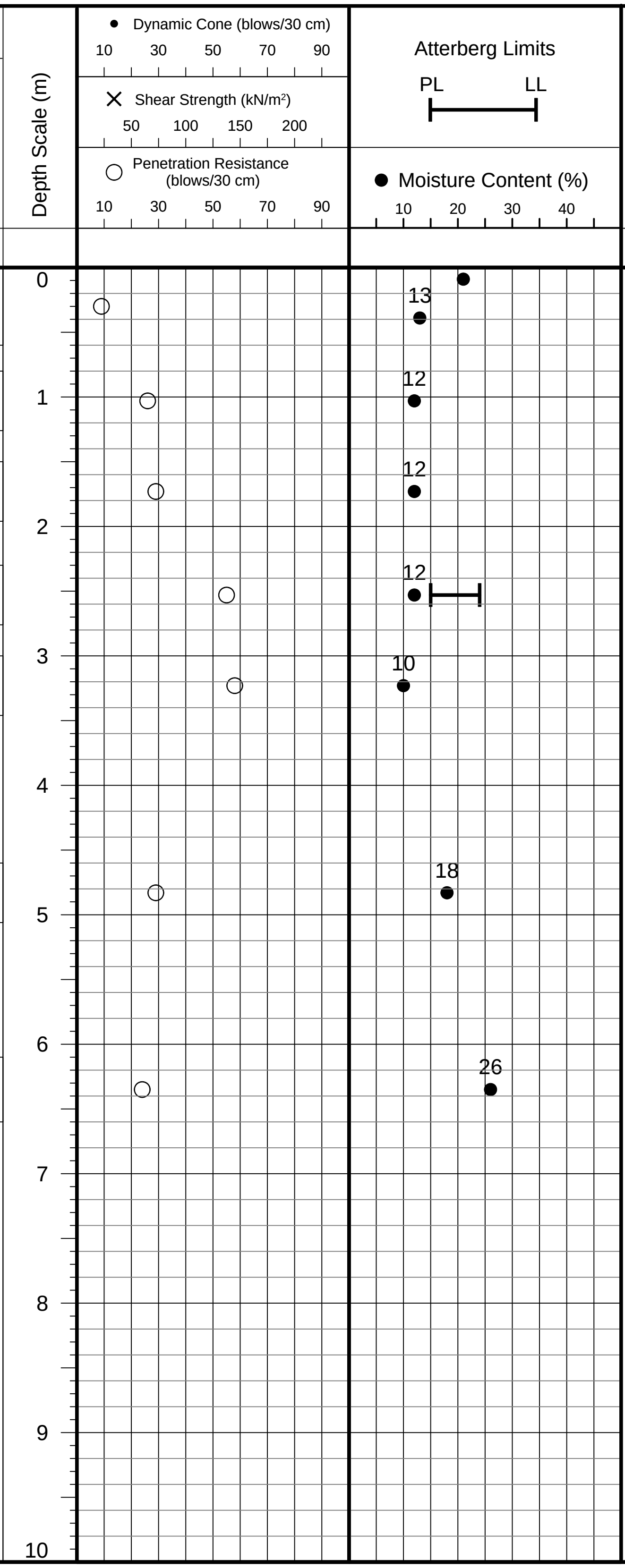
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 16, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
261.3	Ground Surface			
0.0	**18 cm TOPSOIL**	1A	DO	9
	Brown, loose, weathered **SANDY SILT** occ. sand seams and layers	1B		
260.5 0.8	Very stiff to hard **SILTY CLAY TILL** some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles	2	DO	26
		3	DO	29
		4	DO	55
		5	DO	58
	brown grey			
		6	DO	29
255.7 5.6	Grey, very stiff **SILTY CLAY** a trace of sand	7	DO	24
254.7 6.6	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-103

FIGURE NO.: 3

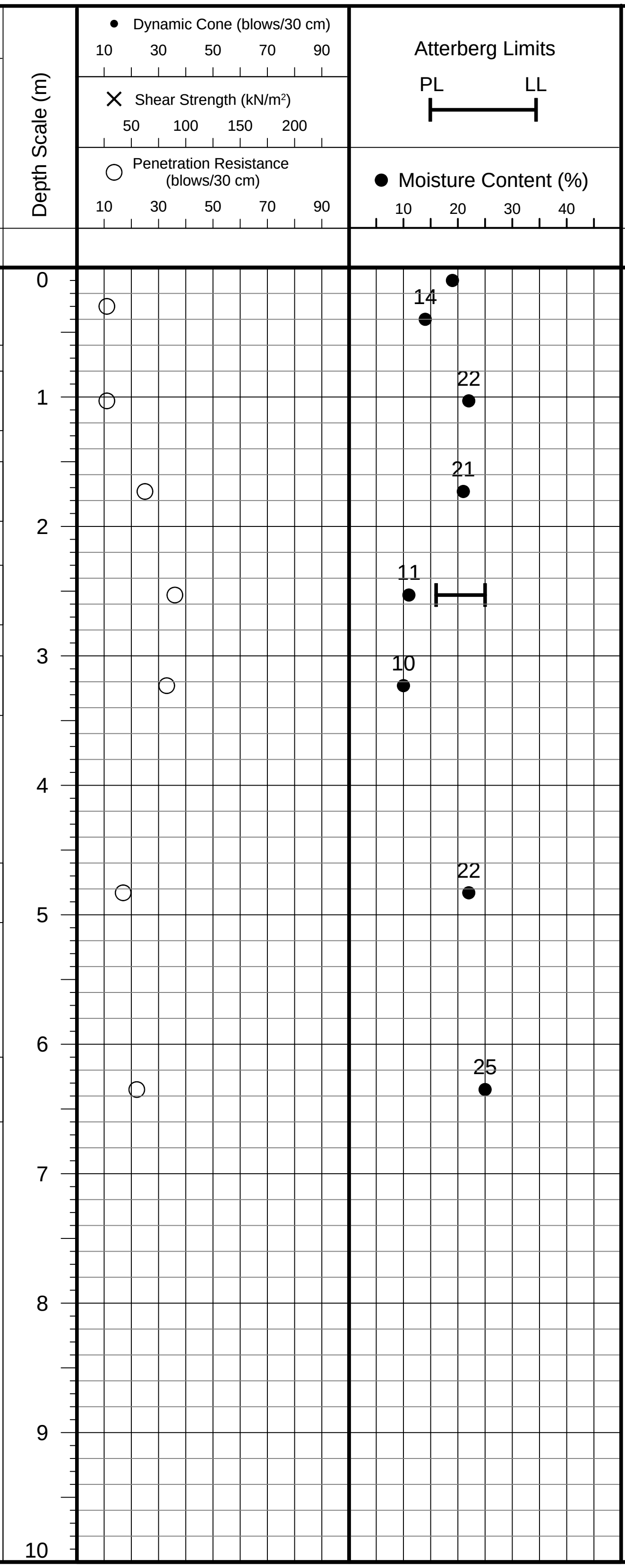
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 16, 2023

		SAMPLES		
El. (m) Depth (m)	SOIL DESCRIPTION	Number	Type	N-Value
261.3 0.0	Ground Surface **20 cm TOPSOIL**	1A 1B	DO	11
	Brown, compact, weathered **SANDY SILT** with organics, occ. silt seams and layers	2	DO	11
259.9 1.4	Very stiff to hard **SILTY CLAY TILL**	3	DO	25
	some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles	4	DO	36
	brown grey	5	DO	33
256.7 4.6	Grey, very stiff **SILTY CLAY** a trace of sand, occ. gravel with dilating silt layers	6	DO	17
		7	DO	22
254.7 6.6	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-104

FIGURE NO.: 4

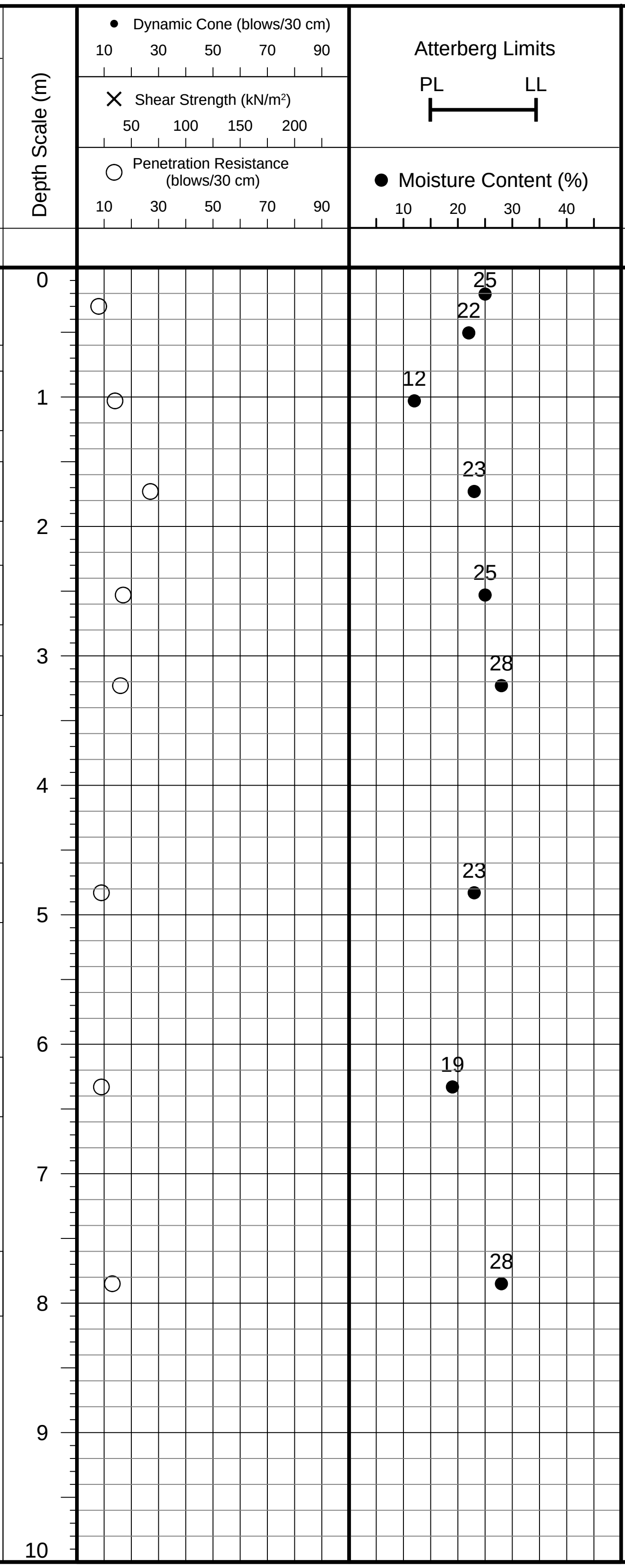
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 16, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
259.5	Ground Surface			
0.0	**41 cm TOPSOIL**	1A	DO	8
	Brown, loose, weathered **SANDY SILT/SILTY FINE SAND**	1B		
258.7 0.8	Brown, stiff to very stiff **SILTY CLAY TILL** some sand, a trace of gravel occ. sand and clay layers	2	DO	14
		3	DO	27
257.2 2.3	Brown, very stiff **SILTY CLAY** a trace of sand, occ. gravel	4	DO	17
		5	DO	16
255.5 4.0	Grey, loose, wet **SILT** some fine sand a trace of clay	6	DO	9
		7	DO	9
252.3 7.2	Grey, stiff **SILTY CLAY** a trace of sand, with varved (silt) layering	8	DO	13
251.4 8.1	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 253.6 m on completion

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-105D

FIGURE NO.: 5

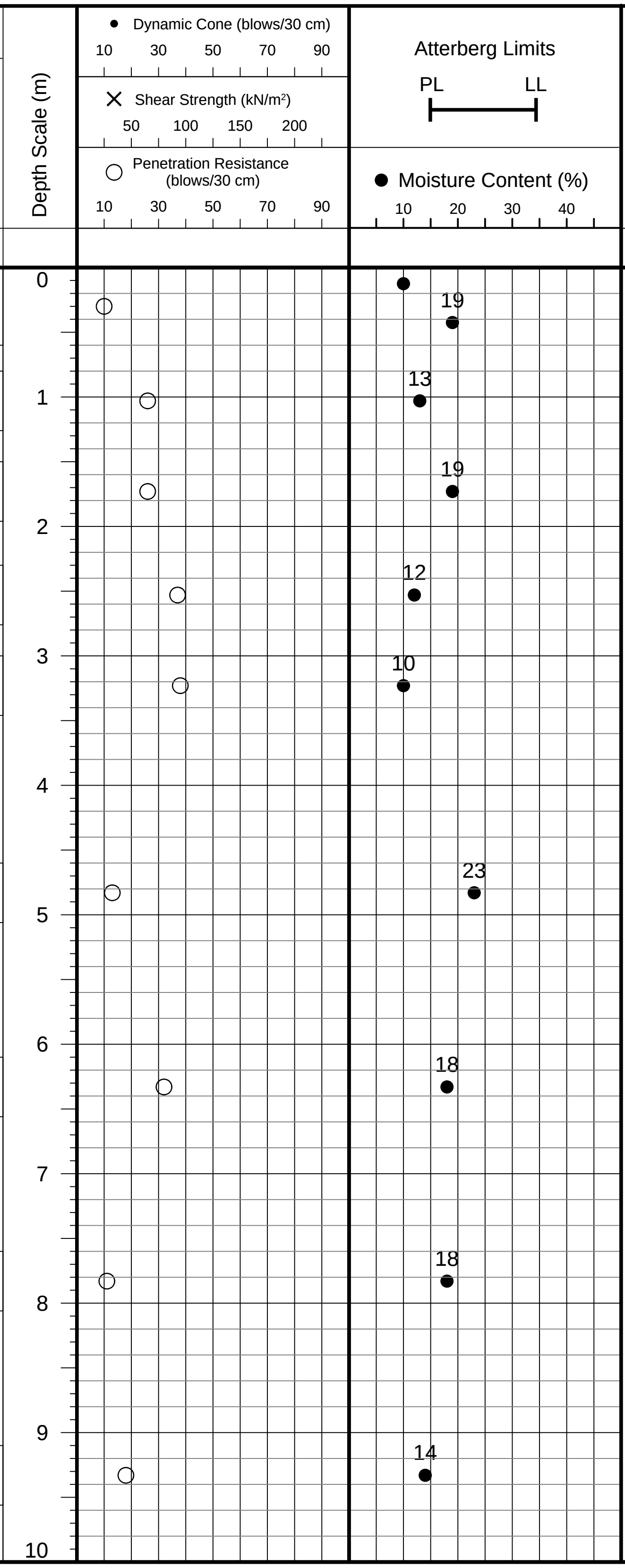
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Augers and Tricone

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
260.1	Ground Surface			
0.0	**25 cm TOPSOIL**	1A	DO	10
	Brown, stiff to hard **SILTY CLAY TILL** some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles — weathered	1B		
		2	DO	26
		3	DO	26
		4	DO	37
		5	DO	38
256.1 4.0	Stiff **SILTY CLAY** a trace of sand, occ. gravel — — brown / grey	6	DO	13
254.5 5.6	Grey, compact to dense, wet **SILT** some fine sand a trace of clay	7	DO	32
		8	DO	11
251.4 8.7	Grey, very stiff to hard **SILTY CLAY TILL** sandy, a trace of gravel occ. sand and silt seams and layers	9	DO	18
250.1				



WATER LEVEL

Water was used during drilling

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-105D

FIGURE NO.: 5

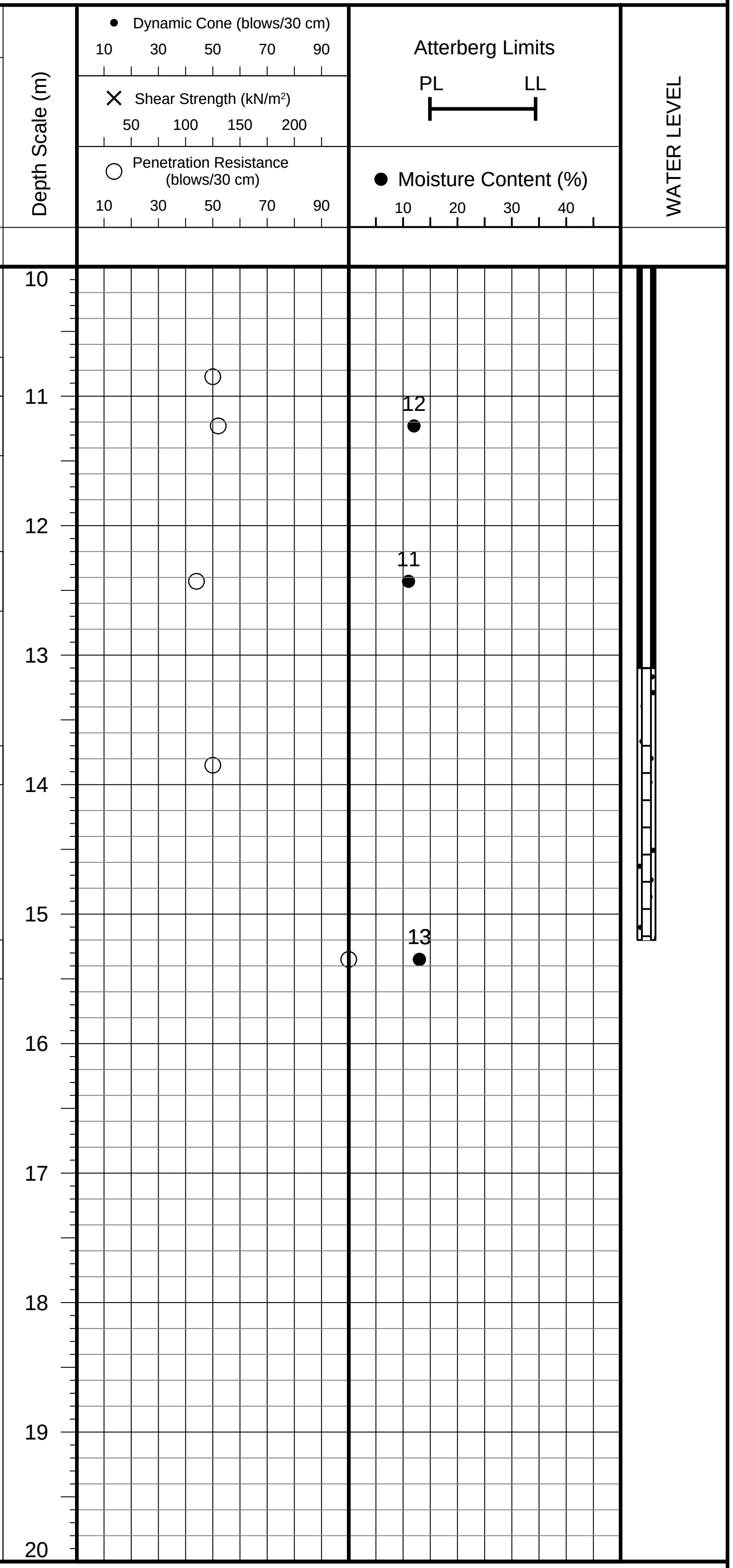
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Hollow Stem Augers and Tricone

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
10.0	Grey, very stiff to hard **SILTY CLAY TILL** sandy, a trace of gravel occ. sand and silt seams and layers	10A	DO	50
		10B	DO	52
248.2 11.9	Grey, dense to very dense **SANDY SILT TILL** traces of clay and gravel occ. cobbles	11	DO	44
		12	DO	50
245.5 14.6	Grey, hard **SILTY CLAY TILL** some sand, with silt layers	13	DO	50/13
244.6 15.5	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 15.2 m, completed with 1.5 m screen Sand backfill from 13.1 to 15.2 m Bentonite seal from 0.0 to 13.1 m Provided with a steel monument casing			



Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-105S

FIGURE NO.: 6

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES			Depth Scale (m)	● Dynamic Cone (blows/30 cm) 10 30 50 70 90 × Shear Strength (kN/m²) 50 100 150 200 ○ Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL LL ● Moisture Content (%) 10 20 30 40	WATER LEVEL
		Number	Type	N-Value				
260.1	Ground Surface							
0.0	**NO SAMPLING** **DIRECT AUGER AND INSTALLED NESTED SHALLOW WELL TO 7.6 m**				0 1 2 3 4 5 6 7			Dry on completion
252.5 7.6	**END OF BOREHOLE** Installed 50-mm Ø PVC monitoring well to 7.6 m, completed with 1.5 m screen Sand backfill from 5.5 to 7.6 m Bentonite seal from 0.0 to 5.5 m Provided with a steel monument casing				8 9 10			

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-106

FIGURE NO.: 7

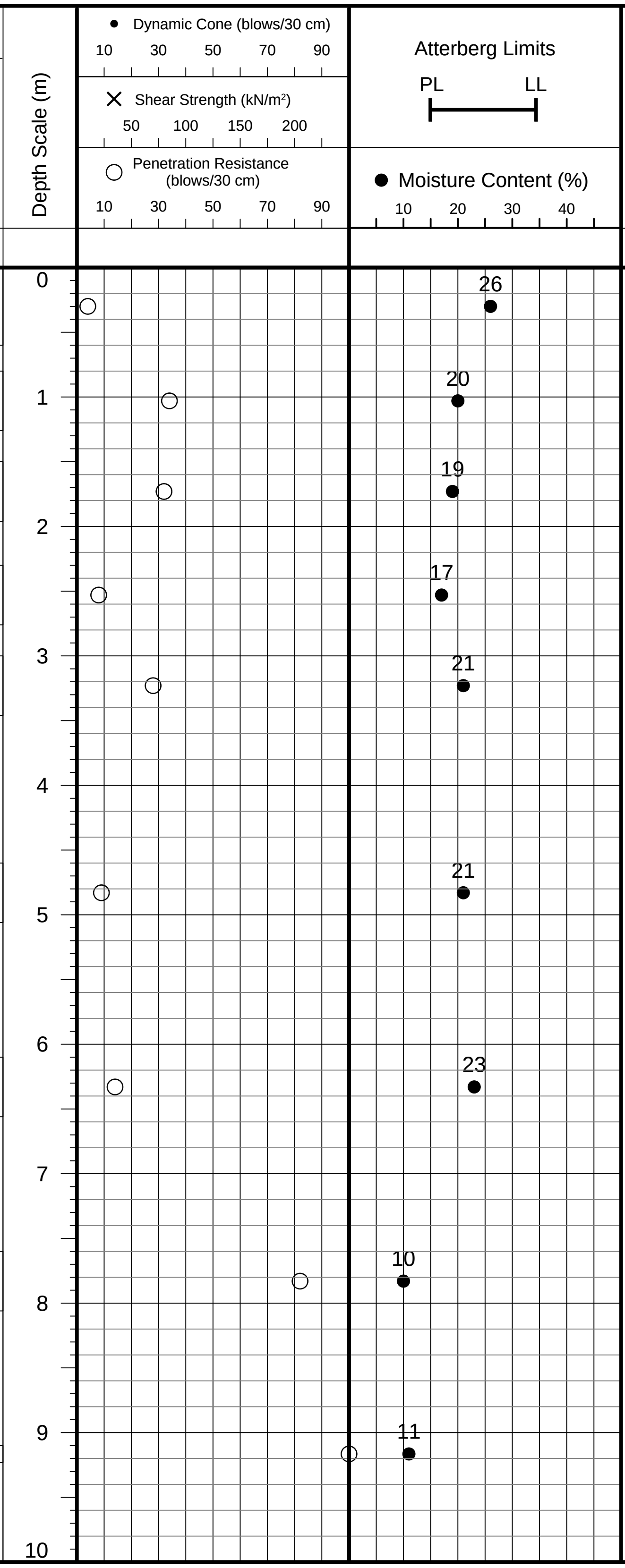
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
256.6	Ground Surface			
0.0	**61 cm TOPSOIL**	1	DO	4
	Brown, hard **SILTY CLAY TILL** some sand, a trace of gravel — weathered	2	DO	34
255.2 1.4	Brown, hard **SILTY CLAY** a trace of sand, occ. gravel	3	DO	32
254.5 2.1	Loose to compact **SILT** some sand, a trace of clay occ. sand seams and clay layers moist, becoming wet below 3.0 m	4	DO	8
		5	DO	28
	— — brown grey	6	DO	9
		7	DO	14
249.4 7.2	Grey, very dense **SANDY SILT TILL/SILTY SAND TILL** a trace of clay a trace to some gravel occ. silt seams and layers, cobbles and boulders	8	DO	82
		9	DO	50/13
246.6				



WATER LEVEL

W.L. @ El. 249.9 m on completion ∇

Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-106

FIGURE NO.: 7

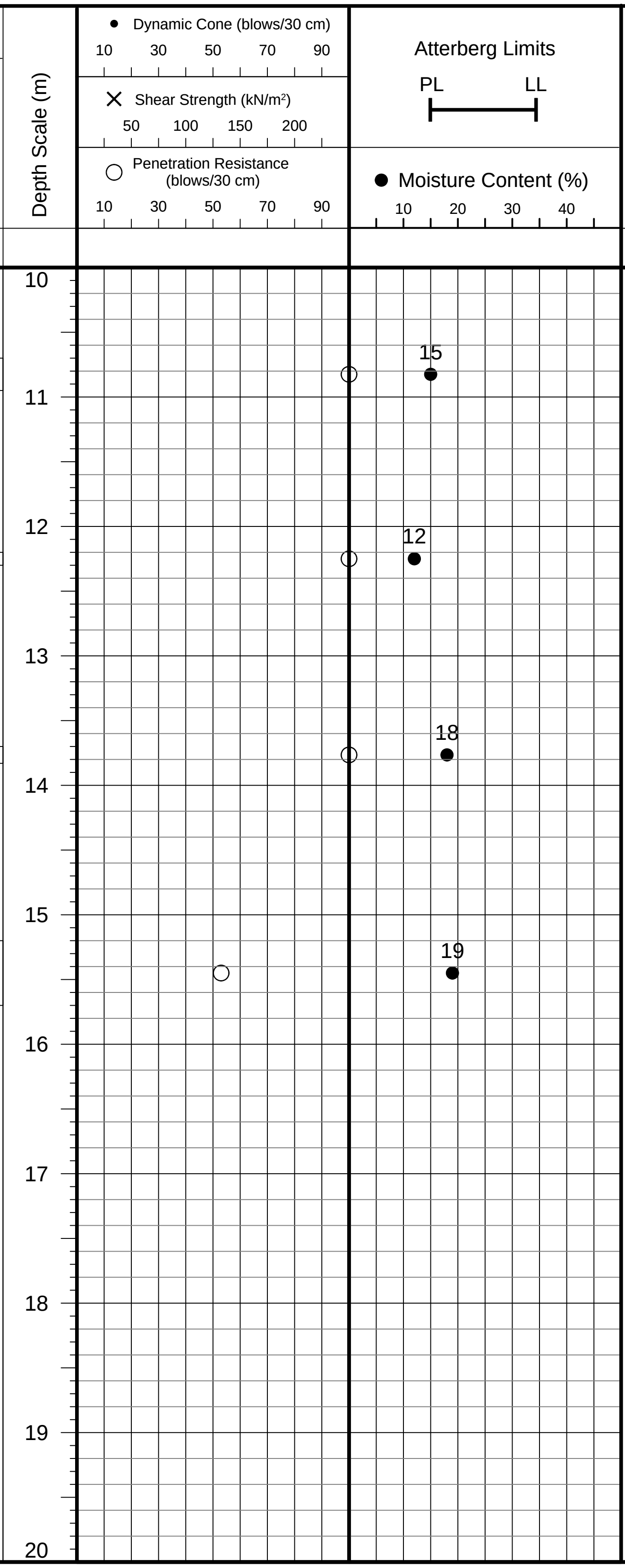
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
10.0	Grey, very dense **SANDY SILT TILL/SILTY SAND TILL** — — — silt a trace of clay a trace to some gravel occ. silt seams and layers, cobbles and boulders	10	DO	50/10	
		11	DO	50/10	
243.3 13.3	Grey, very dense, moist **SILT** some sand and clay occ. clay layers	12	DO	50/13	
		13	DO	53	
240.9 15.7	**END OF BOREHOLE**				



Soil Engineers Ltd.

JOB NO.: 2310-S042

LOG OF BOREHOLE: BC-107

FIGURE NO.: 8

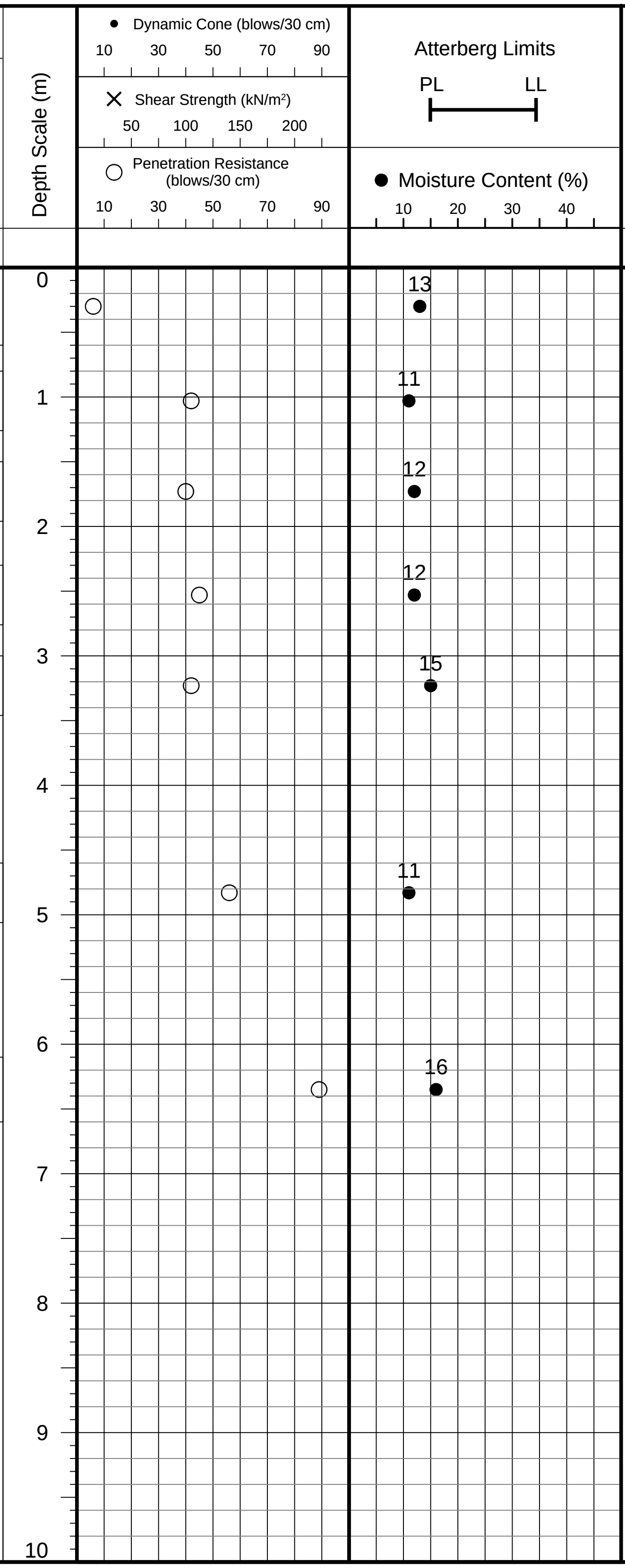
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

DRILLING DATE: October 17, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
260.6	Ground Surface				
0.0	**25 cm TOPSOIL**				
	Brown, firm to hard **SILTY CLAY TILL** some sand to sandy a trace of gravel occ. sand and silt seams and layers weathered	1	DO	6	
		2	DO	42	
		3	DO	40	
		4	DO	45	
		5	DO	42	
256.6 4.0	Brown, very dense, moist **SANDY SILT** a trace of clay occ. silt lenses	6	DO	56	Dry on completion
255.0 5.6	Brown, very dense **SANDY SILT TILL** traces of clay and gravel occ. sand and silt seams and layers	7	DO	89	
254.0 6.6	**END OF BOREHOLE**				



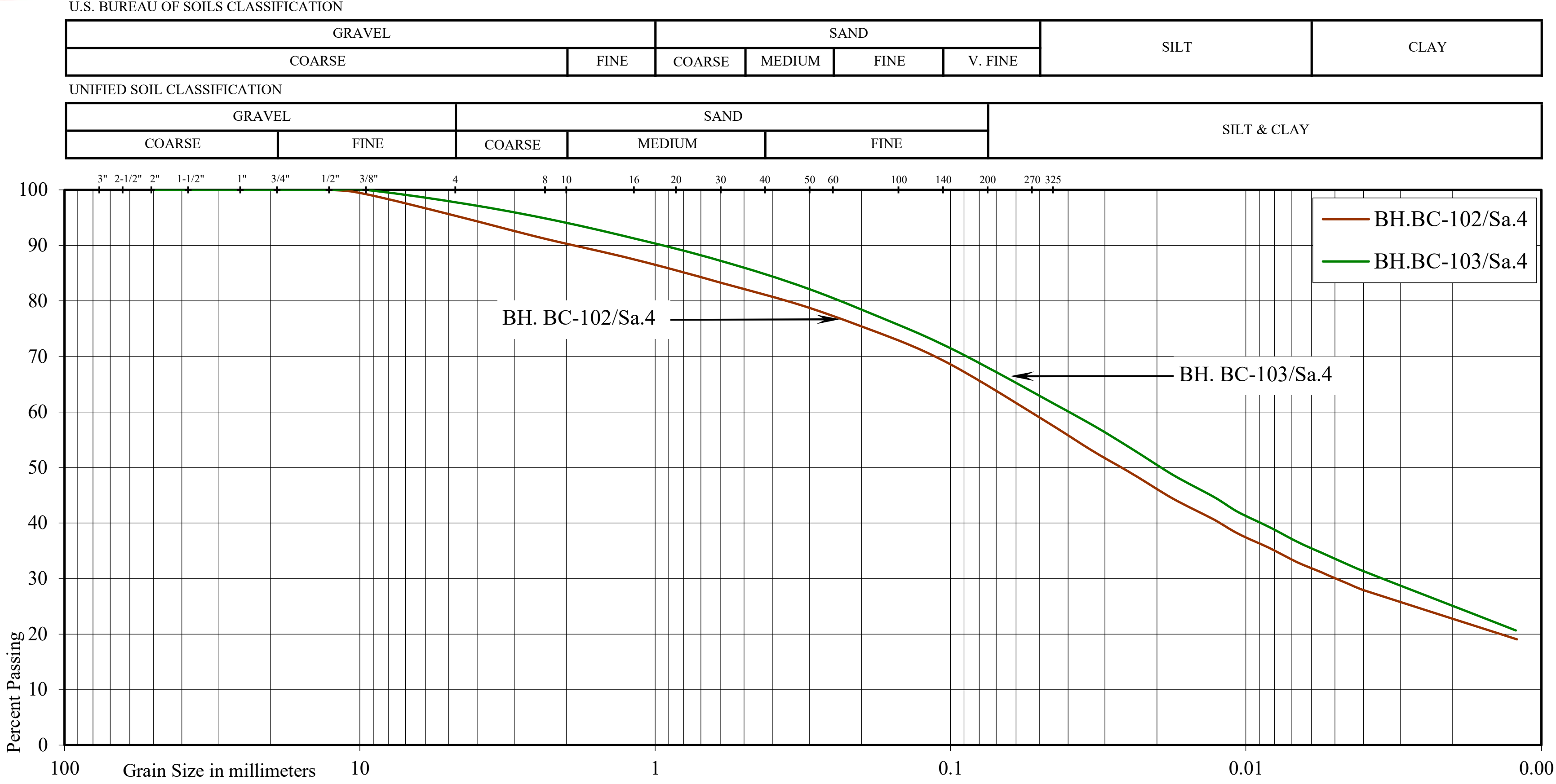
Soil Engineers Ltd.

Page: 1 of 1

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S042



Project: Proposed Residential Development

Location: 12760 Hurontario Street, Town of Caledon

Borehole No: BC-102 BC-103

Sample No: 4 4

Depth (m): 2.5 2.5

Elevation (m): 258.8 258.8

	BC-	BC-
BH./Sa.	102/4	103/4
Liquid Limit (%) =	24	25
Plastic Limit (%) =	15	16
Plasticity Index (%) =	9	9
Moisture Content (%) =	12	11
Estimated Permeability (cm./sec.) =	10^{-7}	10^{-7}

Classification of Sample [& Group Symbol]: SILTY CLAY TILL

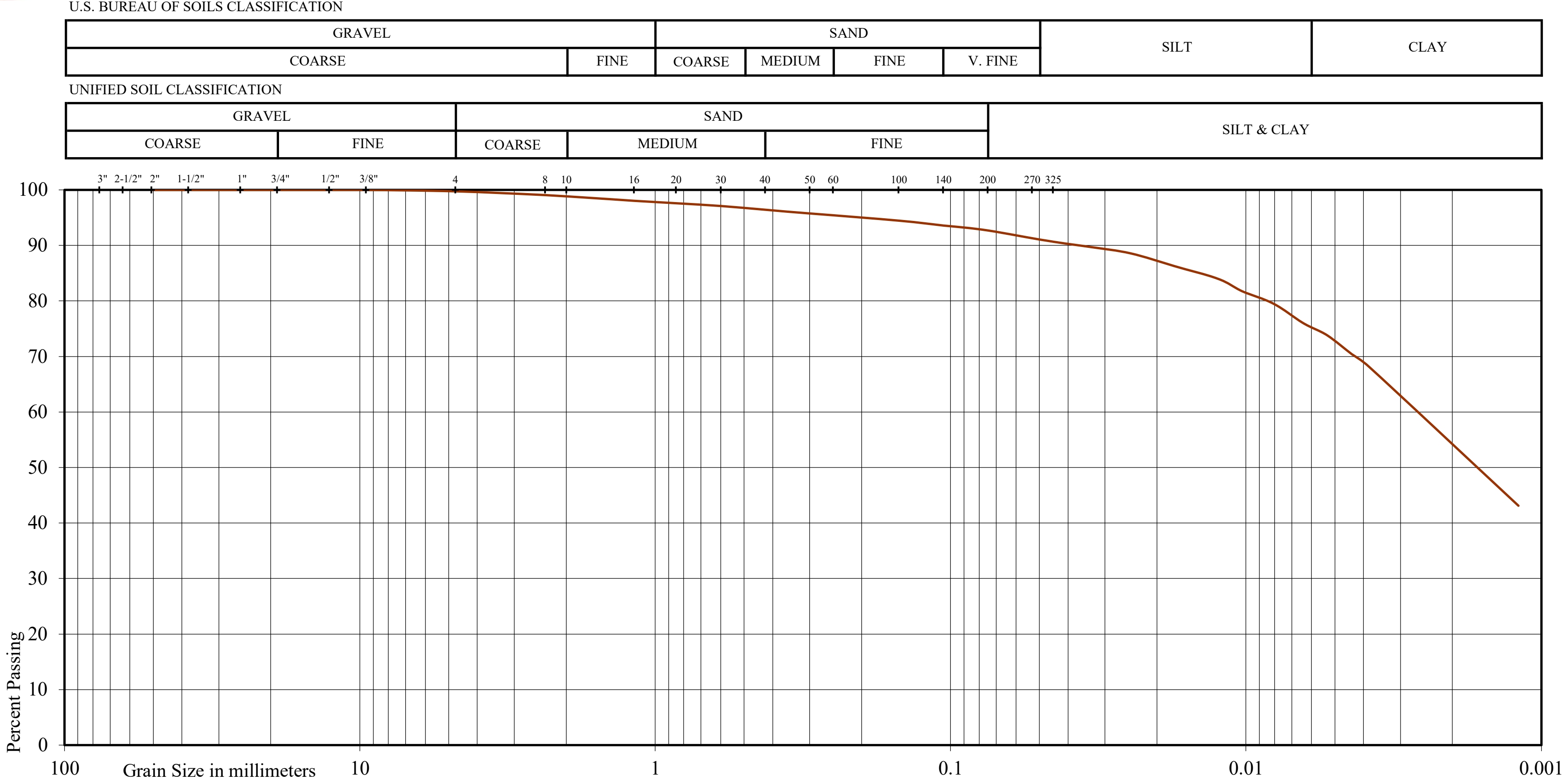
sandy, a trace of gravel

Figure: 9

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S042



Project: Proposed Residential Development

BC-

Location: 12760 Hurontario Street, Town of Caledon

BH./Sa. 101/6

Liquid Limit (%) = 45

Borehole No: BC-101

Plastic Limit (%) = 22

Sample No: 6

Plasticity Index (%) = 23

Depth (m): 4.8

Moisture Content (%) = 24

Elevation (m): 257.6

Estimated Permeability (cm./sec.) = 10^{-7}

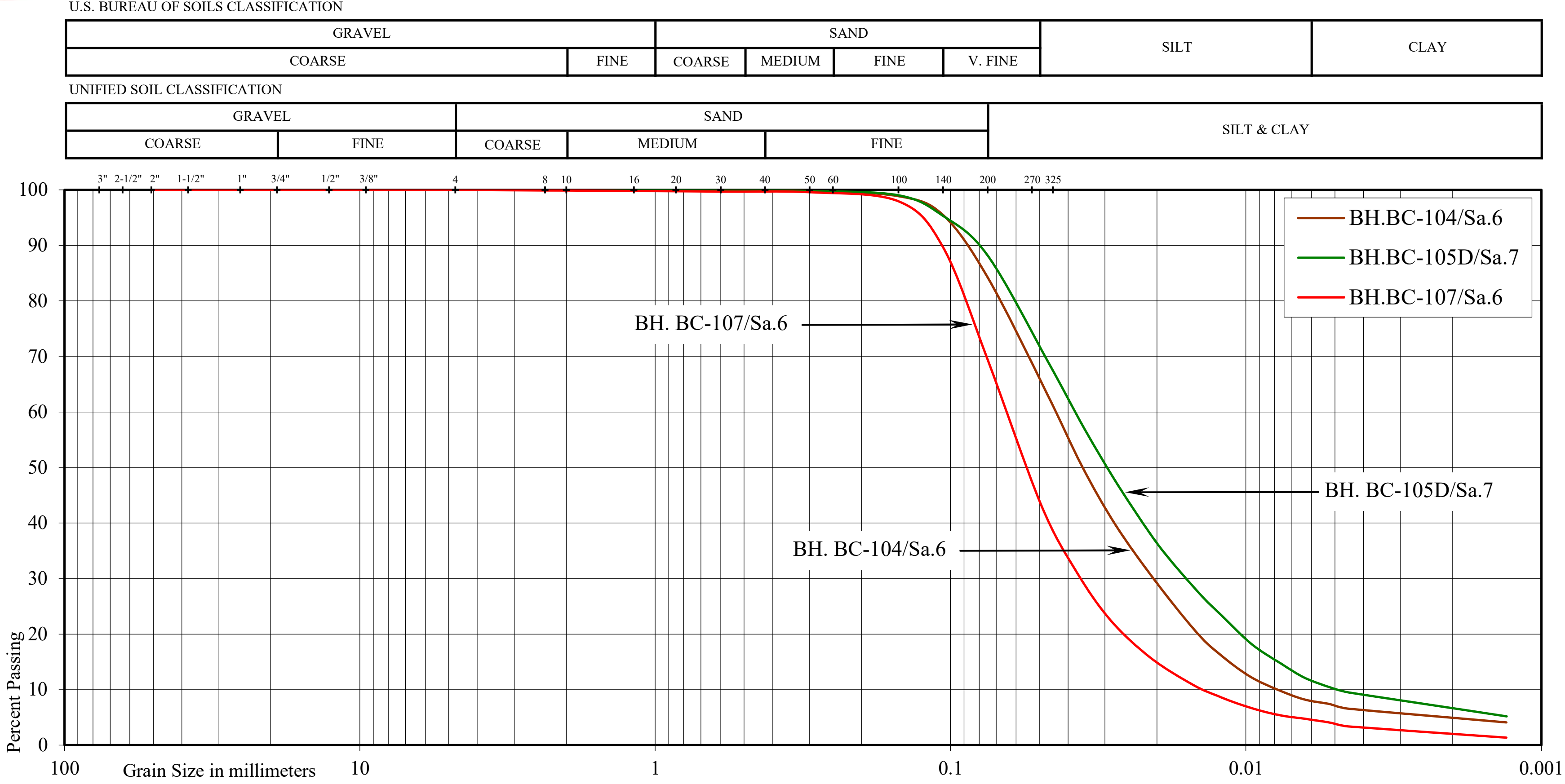
Classification of Sample [& Group Symbol]: SILTY CLAY
a trace of sand

Figure: 10

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S042



Project: Proposed Residential Development

Location: 12760 Hurontario Street, Town of Caledon

Borehole No:	BC-104	BC-105D	BC-107
Sample No:	6	7	6
Depth (m):	4.8	6.3	4.8
Elevation (m):	254.7	253.8	255.8

	BC-	BC-	BC-
BH./Sa.	104/6	105/7	107/6
Liquid Limit (%) =	-	-	-
Plastic Limit (%) =	-	-	-
Plasticity Index (%) =	-	-	-
Moisture Content (%) =	23	18	11
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-5}	10^{-4}

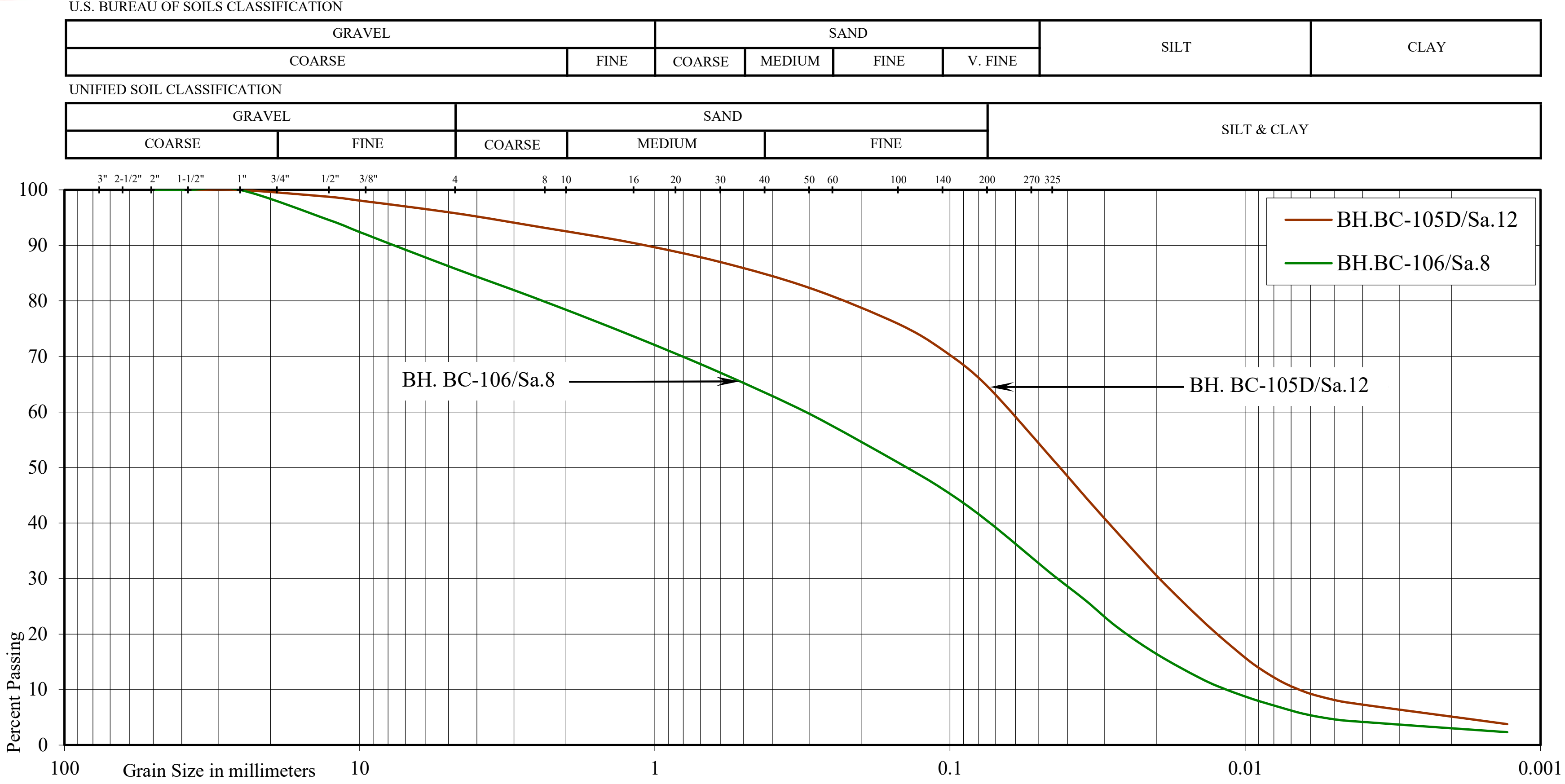
Classification of Sample [& Group Symbol]: SILT, some sand to sandy
a trace of clay

Figure: 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S042



Project: Proposed Residential Development

Location: 12760 Hurontario Street, Town of Caledon

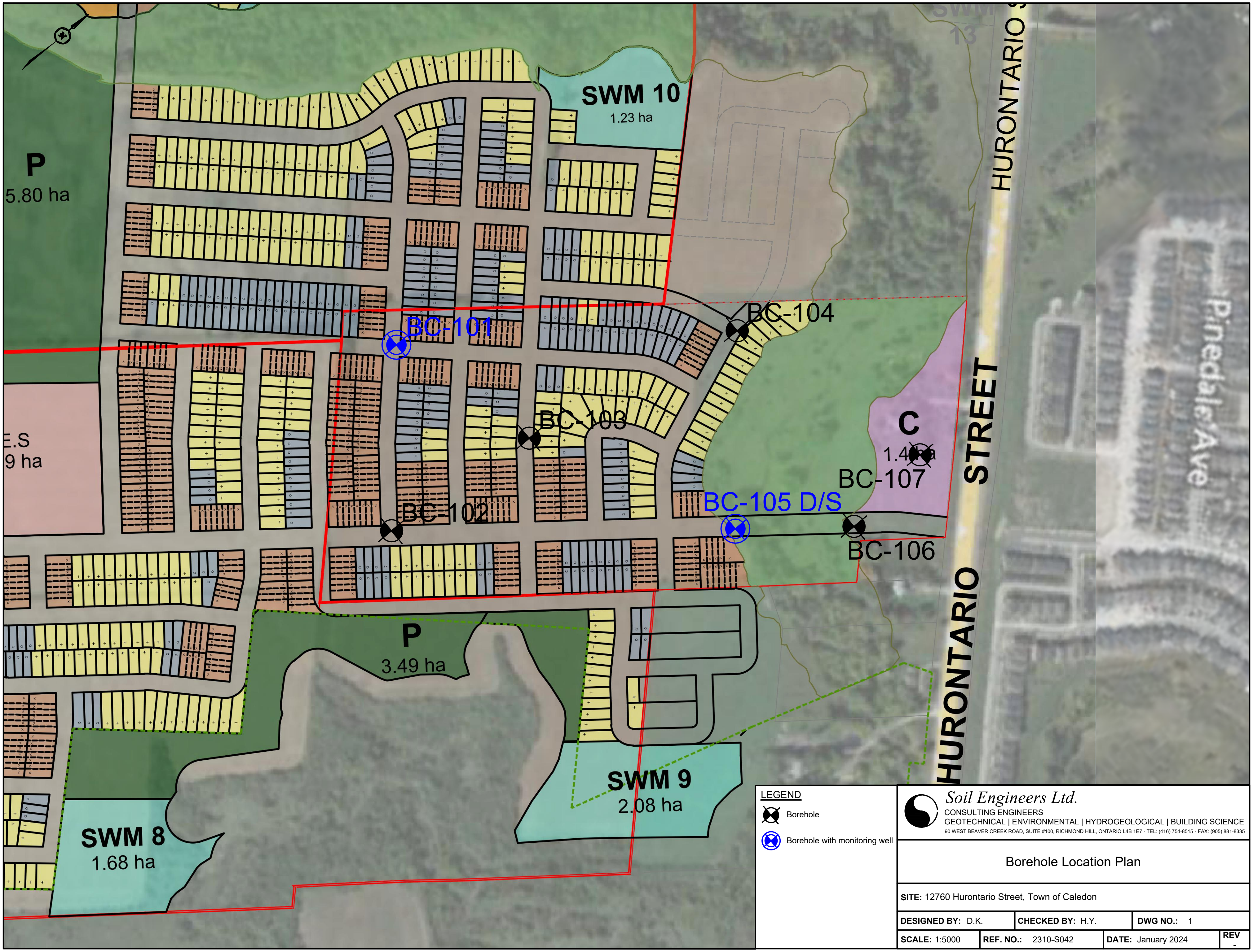
Borehole No:	BC-105D	BC-106
Sample No:	12	8
Depth (m):	13.8	7.8
Elevation (m):	246.3	248.8

	BC-	BC-
BH./Sa.	105/12	106/8
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	-	10
Estimated Permeability (cm./sec.) =	10^{-4}	10^{-4}

Classification of Sample [& Group Symbol]: BC-105D/Sa 12 : SANDY SILT TILL BC-106/Sa 8: SILTY SAND TILL

traces of clay and gravel

Figure: 12



LEGEND

⊗ Borehole

⊗ Borehole with monitoring well

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole Location Plan

SITE: 12760 Hurontario Street, Town of Caledon

DESIGNED BY: D.K.
CHECKED BY: H.Y.
DWG NO.: 1

SCALE: 1:5000
REF. NO.: 2310-S042
DATE: January 2024
REV -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

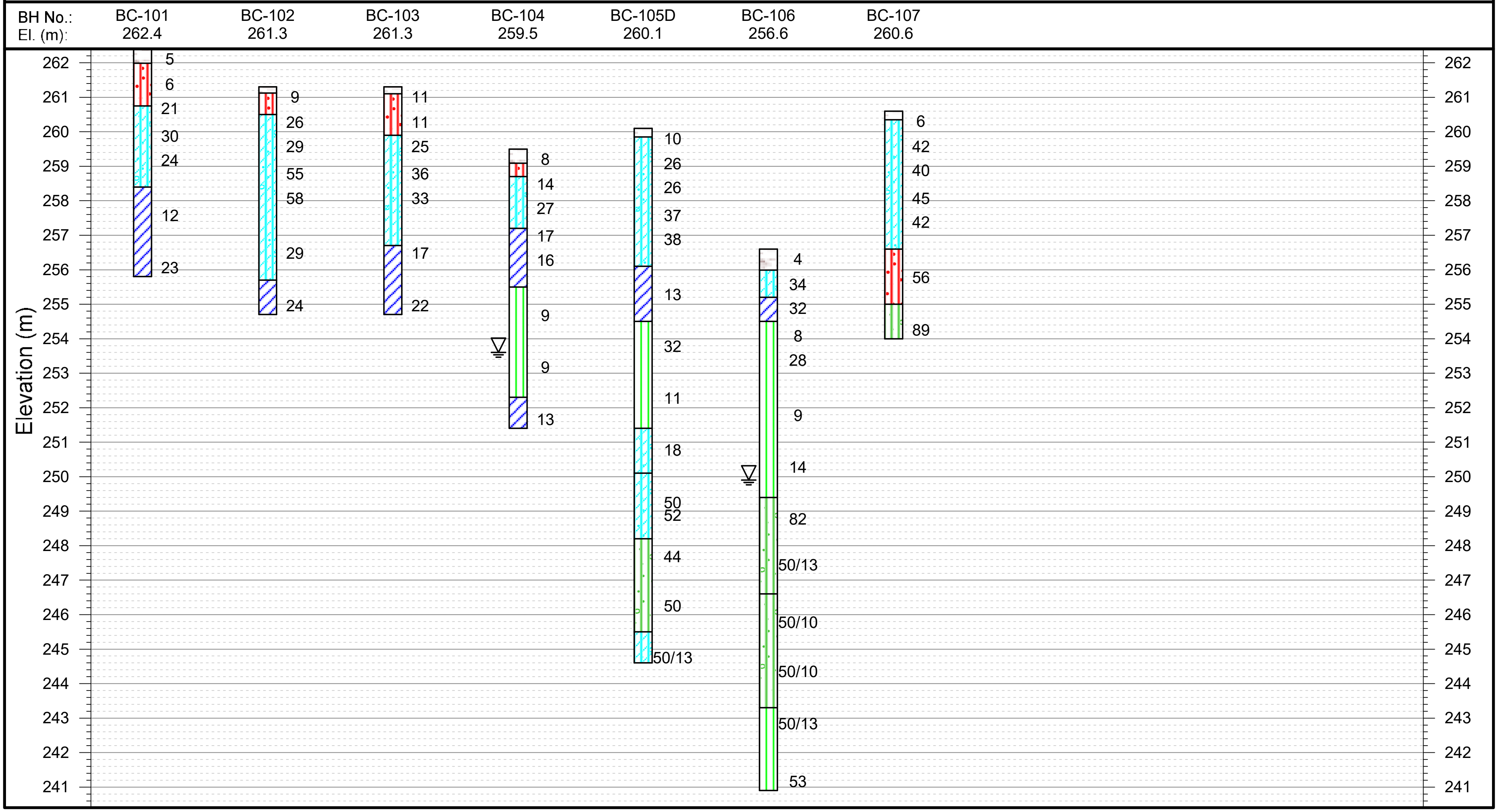
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

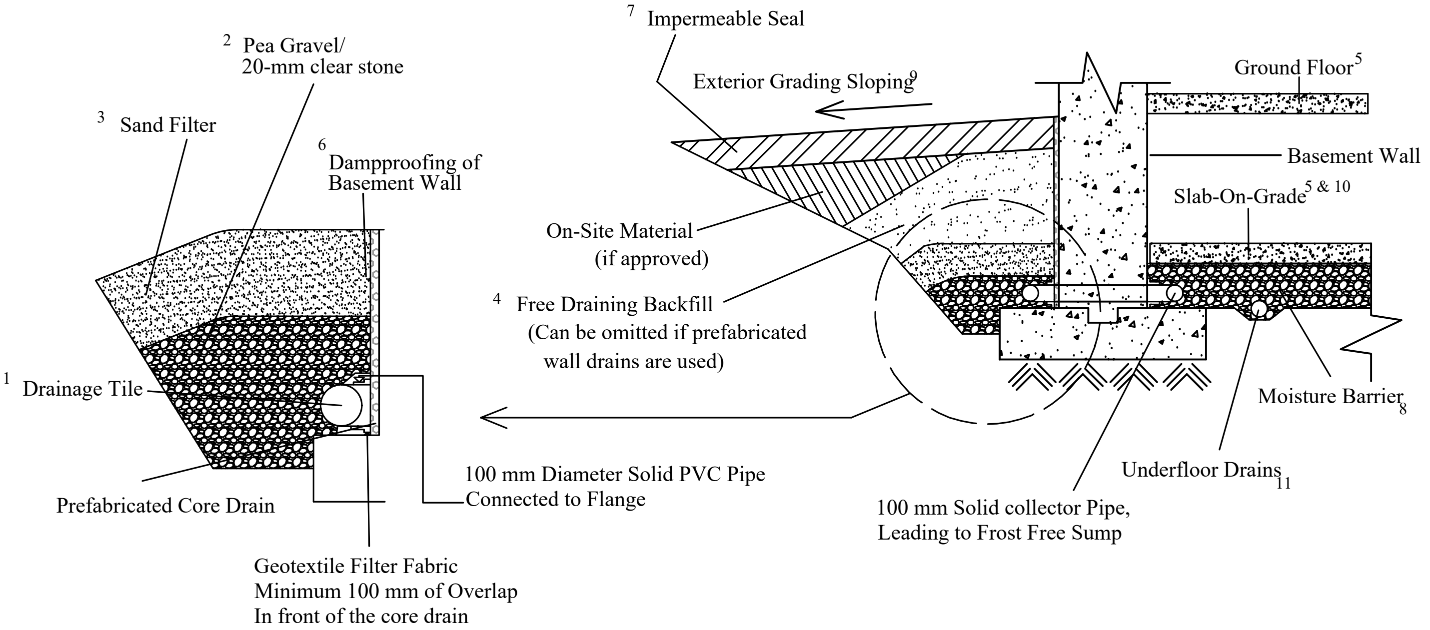
JOB NO.: 2310-S042
REPORT DATE: January 2024
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: 12760 Hurontario Street, Town of Caledon

LEGEND

░	TOPSOIL	▥	SANDY SILT TILL	▨	SILTY CLAY	▨	SILTY CLAY TILL
▥	SANDY SILT	▥	SILT				

▽ WATER LEVEL (END OF DRILLING)





NOTES:

1. **Drainage tile**: consists of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be at minimum of 150 mm (6") below underside of basement floor slab.

2. **Pea gravel**: at 150 mm (6") on the top and sides of drain. If drain is not placed on concrete footing, provide 100 mm (4") of pea gravel below drain. The pea gravel may be replaced by 19-mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270R or equivalent.

3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300 mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.

4. **Free-draining backfill**: OPSS Granular 'B' or equivalent, compacted to 95% to 98% (maximum) Standard Proctor dry density. Do not compact closer than 1.8 m (6') from wall with heavy equipment. This may be replaced by on-site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.

5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.

6. **Dampproofing** of the basement wall is required before backfilling

7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free-draining sand, the seal may be omitted.

8. **Moisture barrier**: 19-mm CRL or compacted OPSS Granular 'A', or equivalent. The thickness of this layer should be 150 mm (6") minimum.

9. **Exterior Grade**: slope away from basement wall on all the sides of the building.

10. **Slab-On-Grade** should not be structurally connected to walls or foundations.

11. **Underfloor drains*** should be placed in parallel rows at 6 to 8 m (20'-25') centre, on 100 mm (4") of pea gravel with 150 mm (6") of pea gravel on top and sides. The spacing should be at least 300 mm (12") between the underside of the floor slab and the top of the pipe. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

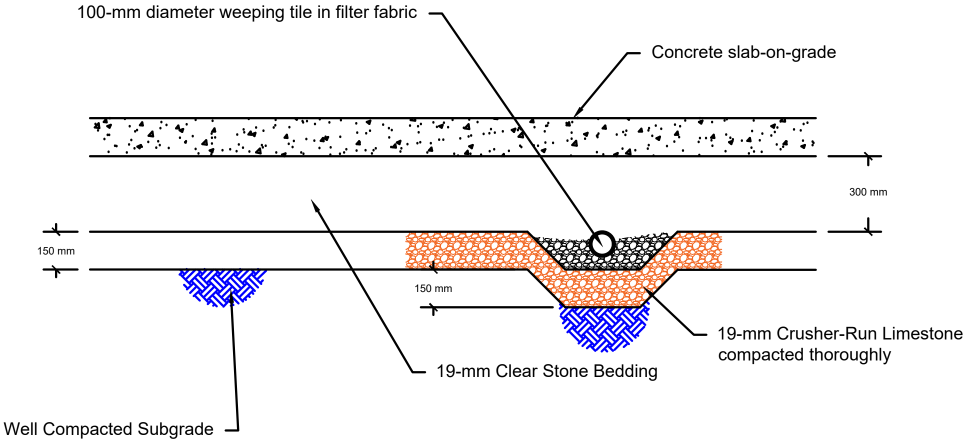
*Underfloor drains can be deleted where not required.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

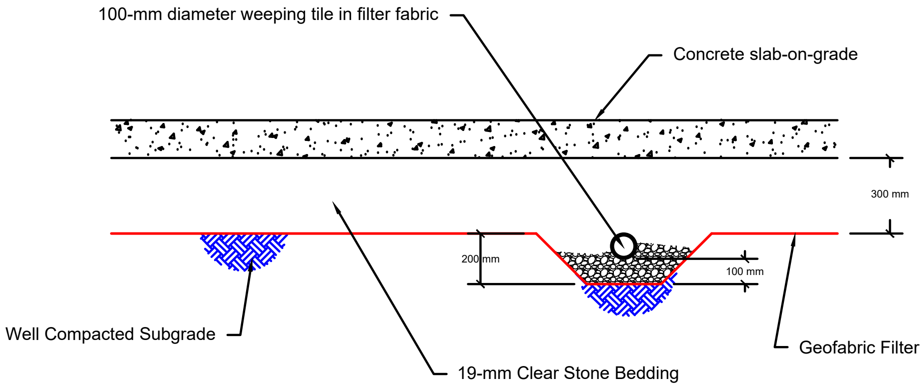
PERMANENT PERIMETER DRAINAGE SYSTEM
(FOR OPEN EXCAVATION)

SITE: 12760 HURONTARIO STREET, TOWN OF CALEDON

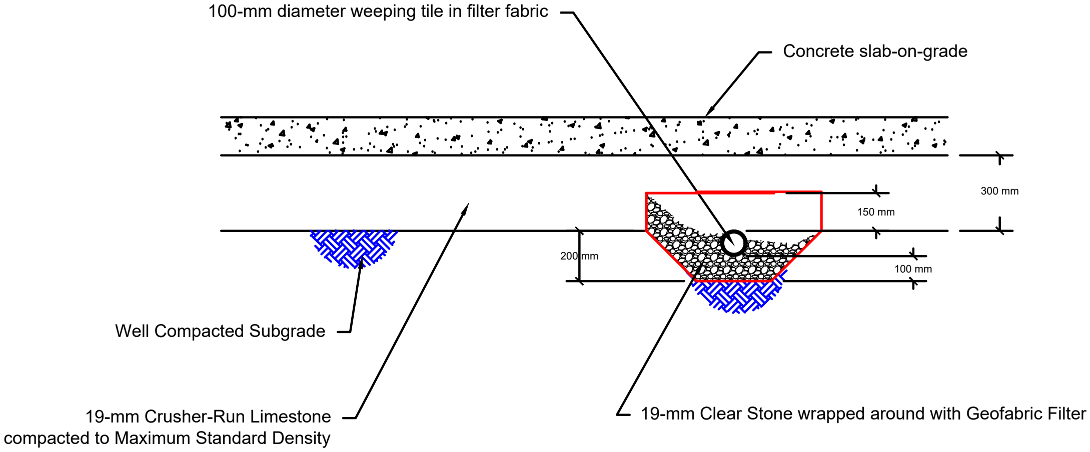
DESIGNED BY: K.L.	**CHECKED BY:** B.S.	**DWG NO.:** 3	
SCALE: N.T.S.	**REF. NO.:** 2310-S042	**DATE:** JANUARY 2024	**REV** -



Option 'A'



Option 'B'



Option 'C'

Note:

1. Weepers should be placed in 6 m grids, draining in a positive gradient towards an outlet or a sputter pit for removal by pumping.
2. A 10-mil polyethylene sheet should be specified between the gravel bedding and concrete slab.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

DETAILS OF UNDERFLOOR WEEPERS

SITE: 12760 HURONTARIO STREET, TOWN OF CALEDON

DESIGNED BY: K.L. **CHECKED BY:** B.S. **DWG NO.:** 4

SCALE: N.T.S. **REF. NO.:** 2310-S042 **DATE:** JANUARY 2024 **REV** -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

A REPORT TO
SCHOOL WEST INVESTMENT INC.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

SOUTHEAST OF OLD SCHOOL ROAD AND
CHINGUACOUSY ROAD

TOWN OF CALEDON

REFERENCE NO. 2310-S043

FEBRUARY 2024

DISTRIBUTION

Digital Copy - School West Investment Inc.

TABLE OF CONTENTS

TABLES

ENCLOSURES

1.0 INTRODUCTION

In accordance with the email authorization dated October 2, 2023, from Mr. Frank Filippo of School West Investment Inc., a geotechnical investigation was carried out for a property located southeast of Old School Road and Chinguacousy Road in the Town of Caledon.

The purpose of the investigation was to reveal the subsurface conditions and to determine the engineering properties of the disclosed soils for the design and construction of a proposed residential development.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located in the southeast quadrant of the Old School Road and Chinguacousy Road intersection, in the Town of Caledon. The property is situated within the physiographic region of South Slope with glaciolacustrine-derived silty to clayey till and a modern alluvial deposit along the Etobicoke Creek tributary corridors. The subsoil profile at the site is characterized by sand and silt deposits layered in between the upper Halton Till and the lower Newmarket Till.

At the time of investigation, the property consists of farm fields. The agricultural fields are separated by a Y-shaped Etobicoke Creek tributary system connecting to a wood lot in the southeast corner of the site. The existing site grading generally descends towards the south.

Based on the conceptual site plan, the site will be developed as a low- to medium-density residential subdivision, with park and stormwater management (SWM) pond blocks.

3.0 FIELD WORK

The field work, consisting of 10 boreholes extending to a depth ranging from 6.2 to 6.6 m, was carried out between October 19 and 23, 2023. To facilitate the hydrogeological study by Palmer Environmental Consulting Group (PECG), 50-mm diameter monitoring wells were installed at 4 selected borehole locations. The depth and details of the monitoring wells are shown on the corresponding Borehole Logs. The locations of the boreholes and monitoring wells are shown on Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted machine equipped with solid stem augers for soil sampling. Split-spoon samples were recovered for soil classification and laboratory testing. Standard Penetration Tests using the procedures described on the enclosed “List of Abbreviations and Terms” were performed at the sampling depths. The relative density of the non-cohesive strata and the consistency of the cohesive strata are inferred from the ‘N’ values. The field work was supervised and the findings were recorded by a geotechnical technician.

The ground elevation at each borehole location was determined using a handheld equipment of the Global Navigation Satellite System.

4.0 SUBSURFACE CONDITIONS

Beneath the topsoil veneer, the subsoil profile generally consists of silty clay till overlying a silt and silty fine sand deposit and in places, bedding onto a sandy silt till stratum. Silty clay was also found beneath the tills at various depths and locations.

Detailed descriptions of the encountered subsurface conditions are presented on the Logs of Borehole, comprising of Figures 1 to 10, inclusive. The soil stratigraphy is illustrated on the Subsurface Profile, Drawing No. 2.

Previous borehole investigations and monitoring well installations were carried out in 2017 by PECG as part of their hydrogeological study. Relevant borehole logs are enclosed in the Appendix for reference and the borehole data is summarized in this report.

The engineering properties of the disclosed soils are discussed herein.

4.1 Topsoil

The revealed topsoil thickness ranges from 18 to 33 cm. Thicker topsoil may be encountered in areas beyond the borehole locations, especially in local low-lying areas.

4.2 Silty Clay Till and Silty Clay

Silty clay till was encountered in the upper stratigraphy across the site, except in Boreholes W-109 and W-110. The till consists of a mixture of particle sizes ranging from clay to gravel, with silt and clay being the dominant fraction. Silty clay, containing a trace to some sand and embedded silt layers, was encountered beneath the silty clay till in Borehole W-101 and beneath the sandy silt till/silty sand till in Borehole W-109. Grain size analyses were performed on representative samples of the silty clay till and silty clay, and the results are plotted on Figures 11 and 12, respectively.

The Atterberg Limits of a clay till and clay sample and the natural water content values of all the samples were determined; the results are plotted on the Borehole Logs and summarized below:

	Silty Clay Till	**Silty Clay**
Liquid Limit	27%	40%
Plastic Limit	17%	20%
Natural Water Content	9% to 19% (median 13%)	12% to 21% (median 15%)

The results indicate that the clay till is low in plasticity and clay is medium in plasticity. Both the clay and clay till are in moist conditions with natural water content values generally below their plastic limits.

The recorded 'N' values of the silty clay till range from 6 to 62, with a median of 25 blows per 30 cm of penetration. This indicates that the clay till is firm to hard, generally being very stiff in consistency. The low 'N' values are generally restricted to the surficial weathered zone, which extends to depths of 0.8 to 1.4 m below grade. Intermittent hard resistance to augering was encountered in places, indicating the presence of cobbles in the till mantle.

The obtained 'N' values of the clay range from 11 to 89, with a median of 50 blows per 30 cm of penetration, showing that the clay is stiff to hard, generally being hard in consistency.

The engineering properties of the silty clay till and clay are listed below:

- High frost susceptibility and low water erodibility.
- In excavation, the clay till and clay will be stable in relatively steep cuts; however, prolonged exposure may lead to localized sloughing.

4.3 Silt and Silty Fine Sand

The silt, containing traces of sand and clay, was generally contacted beneath the silty clay till and silty clay. Boreholes W-101, W-103, W-104 and W-105 were terminated in the silt deposit. At Boreholes W-106 and W-108, a silty fine sand layer was encountered beneath the silt, overlying the sandy silt till. Grain size analyses were performed on 2 representative samples each of the silt and silty fine sand, and the results are plotted on Figures 13 and 14, respectively.

The obtained natural water content values of the silt and silty fine sand range from 13% to 23%, with a median of 20%, indicating that the deposit is moist to wet, generally in a wet condition.

The recorded ‘N’ values range from 5 to 70, with a median of 31 blows per 30 cm penetration, indicating relative densities of loose to very dense, generally being dense. The loose soil was encountered near the ground surface within the weathered zone.

The engineering properties of the silt and silty fine sand are listed below:

- High capillarity and water retention capability.
- Highly frost susceptible, with high soil-adfreezing potential.
- High water erodibility, the fine particles will migrate through small openings under seepage pressure.
- The shear strength is mainly derived from internal friction. The wet silt and silty sand are susceptible to dynamic disturbance, which will induce a build-up of pore water pressure, resulting in soil dilation and a reduction in shear strength.
- In excavation, the silt and silty sand will remain stable for a short period of time but may slough readily. The wet silt/silty sand will run with seepage, and boil under an approximate piezometric head of 0.4 m.

4.4 Sandy Silt Till

Sandy silt till was generally encountered in the northern half of the site, in the lower stratigraphy of Boreholes W-102, W-106 to W-110. In Borehole W-109, sandy silt till/silty sand till was also contacted beneath the topsoil veneer. The till is cemented with a trace of clay, and is laminated with sand and silt seams and layers. Hard resistance to augering was encountered in places, indicating the presence of cobbles. A grain size analysis was performed on a sample of the till; the result is plotted on Figure 15.

The natural water content values of the till range from 7% to 17%, with a median of 10%, indicating that the till is generally in a moist condition.

The obtained ‘N’ values range from 6 to over 50, with a median of over 50 blows per 30 cm penetration, indicating that the relative density of the till is loose to very dense, generally being very dense.

The engineering properties of the sandy silt till are listed below:

- Highly frost susceptible and moderately low water erodibility.
- The till will be relatively stable in relatively steep excavation; however, if remained open for an extended period of time, localized sloughing may occur, especially under seepage conditions.

4.5 Review of Borehole Records by PECG

In 2017, boreholes were carried out and monitoring wells were installed by PECG at 3 select locations within the property as part of the hydrogeological study for the Mayfield West Phase 2 Stage 3 Lands block. The Borehole Records of MW-1, MW-2D/S and MW-3 are enclosed in the Appendix for reference and their locations are shown on Drawing No. 1.

A review of the borehole logs revealed a topsoil layer at the surface, extending to depths of 0.84 and 1.45 m. In MW-1, a medium sand and silt unit is sandwiched between the upper clayey silt till and a lower silty clay till, indicating a makeup similar to the nearby Borehole W-105. In MW-2D/S and MW-3, the fine to medium sand and silt deposit is underlain by a clay layer and silty sand/clayey silt to silty clay till.

The obtained 'N' values indicate that the sand and silt deposit is compact to very dense, and the tills are either very stiff to hard in consistency or dense to very dense in relative density. The sand and silt unit is generally wet.

4.6 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied. As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	**Determined Natural Water Content (%)**	**Water Content (%) for Standard Proctor Compaction**	
		100% (optimum)	**Range for 95% or +**
Silty Clay Till	9 to 19 (median 13)	18	15 to 22
Silty Clay	12 to 21 (median 15)	20	16 to 24
Silt/Silty Fine Sand	13 to 23 (median 20)	12	8 to 16
Sandy Silt Till	7 to 17 (median 10)	10	6 to 15

The on-site soils are suitable for structural backfill. The addition of water will be required for the silty clay till and clay prior to structural compaction, especially in the dry and warm seasons and in areas where compaction is best performed on the wet side of the optimum. The silt and silty fine sand are too wet and must be aerated prior to structural backfill. This can be achieved by either stockpiling or spreading the soils thinly on the ground for aeration in the dry warm weather.

The lifts for compaction should be limited to 20 cm, or to a suitable thickness assessed by test strips performed by the compaction equipment. Boulders larger than 15cm in size must be sorted and removed from the backfill.

5.0 GROUNDWATER CONDITION

Groundwater levels were detected in 4 of the 10 boreholes upon completion of drilling in October 2023. Seepage was also detected in Boreholes W-106 and W-108 from the wet silt and silty fine sand at depths of 2.4 and 3.0 m below grade, respectively. In December 2023, stabilized groundwater levels were recorded from the installed monitoring wells in by PECG; these levels are tabulated in Table 2.

Table 2 - Groundwater Levels

			Measured Groundwater Levels					
			On Completion		**Dec. 6, 2023**		**Dec. 12-13, 2023**	
Borehole/ Monitoring Well No.	**Ground El. (m)**	**Well Depth (m)**	**Depth (m)**	**El. (m)**	**Depth (m)**	**El. (m)**	**Depth (m)**	**El. (m)**
W-101	266.0	-	Dry	-	No Well			
W-102	264.7	-	2.7	262.0	No Well			
W-103	264.9	6.1	Dry	-	1.94	262.96	1.90	263.00
W-104	263.4	-	1.6	261.8	No Well			
W-105	267.6	-	2.4	265.2	No Well			
W-106	265.5	6.1	N/A	-	2.04	263.46	2.09	263.41
W-107	268.7	-	Dry	-	No Well			
W-108	267.5	6.1	N/A	-	2.56	264.94	-	-
W-109	267.7	-	Dry	-	No Well			

Borehole/ Monitoring Well No.	Ground El. (m)	Well Depth (m)	Measured Groundwater Levels					
			On Completion		Dec. 6, 2023		Dec. 12-13, 2023	
			Depth (m)	El. (m)	Depth (m)	El. (m)	Depth (m)	El. (m)
W-110	265.4	-	2.7	262.7	No Well			
MW-1	268.0	6.09	2.28[a]	265.72	Well Not Found			
MW-2D	268.0	8.84	7.60[a]	260.40	1.71	266.29	-	-
MW-2S	268.0	4.88	4.48[a]	263.52	1.46	266.54	-	-
MW-3	263.0	7.62	5.05[a]	257.95	-	-	-	-

[a] Water level measured on completion on November 13, 2017.

Stabilized water levels were recorded at depths ranging from 1.46 to 2.56 metres below ground surface (mbgs), or from El. 266.54 to 262.96 m. The groundwater records are generally consistent with or near the observed wet silt and sand deposit at the boreholes. The groundwater regime is subject to seasonal fluctuations. Detailed groundwater profile and monitoring records should be referred to the hydrogeological study by PECG.

6.0 <u>DISCUSSION AND RECOMMENDATIONS</u>

Beneath the topsoil veneer, the site is underlain by a stratum of generally very stiff silty clay till and/or hard silty clay, overlying a dense silt and sand unit, and in places, bedding onto a very dense sandy silt till deposit. The surficial weathered zone extends to depths of 0.8 to 1.4 m below grade.

Stabilized water levels were recorded at the monitoring wells at depths ranging from 1.46 to 2.56 mbgs, or from El. 266.54 to 262.96 m. The groundwater records are generally consistent with or near the observed wet silt and sand deposit at the boreholes. The groundwater regime is subject to seasonal fluctuations.

Based on the conceptual site plan, the site will be developed as a low- to medium-density residential subdivision, with park and SWM pond blocks. The development will be provided with municipal services and paved roadways meeting municipal standards. The following geotechnical considerations warrant special attention:

1. The topsoil must be stripped for development; it can be reused for general landscaping purposes only.
2. The weathered soil should be inspected prior to any placement of earth fill for site grading purpose. Where required, the badly weathered soil should be subexcavated, sorted free of any organic, topsoil, and/or other deleterious material, before reusing for structural backfill.
3. Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction.
4. The sound native soils are suitable for supporting structures founded on conventional spread and strip footings.
5. In view of the underlying wet silt and sand deposit and the observed groundwater levels, it is recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level. Otherwise, underfloor subdrain systems and/or waterproofing of basements should be implemented to relieve any groundwater upfiltration due to seasonal fluctuation of the groundwater.
6. A Class 'B' bedding, consisting of compacted 19-mm Crusher-Run Limestone (CRL), is recommended for the construction of underground services. Where services installation extends into the saturated silt and sand, or where dewatering is required, a Class 'A' concrete bedding should be considered for pipe support.
7. Groundwater seepage from the tills and clay will likely be removable by conventional pumping from sumps during construction. Excavation extending into the saturated soils will require construction dewatering.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes, and the assessment given herein is general in nature based on the borehole findings. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Site Preparation

The topsoil and vegetation at the ground surface must be removed for development. The topsoil can only be reused for landscaping purposes.

Where additional fill is required for site grading, the earth fill can be placed in an engineered manner for conventional footing construction, site services support and road construction. The engineering requirements for a certifiable fill are presented below:

1. The subgrade must be inspected and proof-rolled prior to any fill placement. Badly weathered soils should also be subexcavated, sorted free of topsoil inclusions and deleterious materials, if any, aerated and properly compacted in layers.
2. Inorganic soils must be used for the fill, and they must be uniformly compacted in lifts of 20 cm thick to at least 98% Standard Proctor Dry Density (SPDD) up to the proposed finished grade. The soil moisture must be properly controlled near the optimum. If the foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% SPDD.
3. If the engineered fill is compacted with the moisture content on the wet side of the optimum, the underground services and pavement construction should not begin until the pore pressure within the fill mantle has completely dissipated. This must be further assessed at the time of the engineered fill construction.
4. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue or contamination. Any potential imported earth fill from off-site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before being hauled to the site.
5. The fill operation must be inspected on a full-time basis by a technician under direction of a geotechnical engineer.
6. The engineered fill should not be placed during period when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.
7. The engineered fill must extend over the entire graded area; the engineered fill envelope and finished elevations must be clearly and accurately defined in the field, and they must be precisely documented by qualified surveyors.
8. The foundations and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
9. Despite stringent control in the placement of the engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the foundations must be properly reinforced, or be designed by the structural engineer for the project. The total and differential settlements of 25 mm and 20 mm, respectively, should be considered in the design of the foundation founded on engineered fill.
10. Any excavation carried out in certified engineered fill must be reported to the geotechnical consultant who supervised the fill placement in order to document the

locations of the excavation and/or to supervise reinstatement of the excavated areas to engineered fill status. If construction on the engineered fill does not commence within a period of 2 years from the date of certification, the condition of the engineered fill must be assessed for re-certification.

6.2 Foundation

Based on the conceptual site plan, the development consists of low- to medium-density residential blocks. The following bearing pressures are recommended for houses supported on conventional strip and spread footings founded onto engineered fill or sound native soils below the topsoil and weathered soils:

- Maximum Bearing Pressure at Serviceability Limit State (SLS) = 150 kPa
- Factored Ultimate Bearing Pressure at Ultimate Limit State (ULS) = 250 kPa

The total and differential settlements of footing designed for the recommended bearing pressure at SLS are estimated at 25 mm and 20 mm, respectively.

The footing subgrade must be inspected by a geotechnical engineer, or a senior geotechnical technician, under the supervision of a geotechnical engineer, to ensure that the revealed conditions are compatible with the design of the foundation.

Footings exposed to weathering, or in unheated areas, should have at least 1.2 m of earth cover for protection against frost action.

Where the footing excavation consists of wet silt and/or sand, or the footing subgrade is saturated, a concrete mud-slab of lean mix concrete, 8 to 10 cm in thickness, should be poured immediately after subgrade preparation and inspection to protect the approved subgrade against disturbance by the construction traffic.

The foundation should meet the requirements specified by the latest Ontario Building Code, and the structures can be designed to resist a minimum earthquake force using Site Classification ‘D’ (stiff soil).

Higher bearing pressures may be provided depending on location and foundation design depth. This can be confirmed once the design and grading specifications are available for review.

6.3 **Basement Structure**

Where house basements are proposed, they should be designed for the lateral earth pressure using the soil parameters provided in Table 4.

With the recorded groundwater levels and a wet silt and sand unit observed throughout the site at various depths, It is recommended that the basement floor be founded at least 1.0 m above the seasonal high groundwater level.

In conventional basement design, perimeter walls of the basement structure should be damp-proofed and provided with perimeter subdrains at the wall base. Backfill of the open excavation should consist of free-draining granular material (Drawing No. 3) unless prefabricated drainage board is installed over the entire wall below grade.

Should the basement floor be founded less than 1.0 m above the groundwater table, underfloor subdrains (Drawing No. 4) should be provided to supplement the perimeter subdrain system to relieve any groundwater upfiltration due to seasonal fluctuation. If the basement floor is to be founded less than 0.5 m above the groundwater table, the basement structure should be waterproofed and designed for hydrostatic uplift pressure. The subdrains, connected to a positive outlet, should be encased in a fabric filter to protect them against blockage by silting.

The subgrade of the basement slab must consist of sound native soil or well compacted inorganic earth fill or engineered fill. The subgrade should be inspected prior to slab-on-grade construction. Where loose or soft subgrade is detected, it should be subexcavated and replaced with inorganic material, compacted to at least 98% SPDD.

The concrete slab should be constructed on a minimum 15 cm thick granular base, consisting of 19-mm CRL, or equivalent, compacted to its maximum SPDD. Where underfloor weepers are required, the bedding should be increased to 30 cm in thickness. In addition, a vapor barrier should be placed between the granular bedding and the concrete slab to prevent upfiltration of water vapour.

The external grading must be designed to drain surface runoff away from the structures to minimize the frost heave phenomenon generally associated with the disclosed soils.

6.4 Underground Services

A Class ‘B’ bedding is recommended for construction of the underground services. The bedding material should consist of compacted 19-mm CRL, or equivalent, compacted to at least 98% SPDD. In the saturated silt and sand, a Class ‘A’ bedding should be considered for proper pipe support.

The subgrade for underground services should consist of sound native soils or properly compacted earth fill. Where soft or loose soil is encountered at the invert level, it must be subexcavated and replaced with properly compacted bedding material.

The pipe joints connecting into manholes and catch basins should be leak-proof or wrapped with an appropriate waterproof membrane to prevent migration of fines due to leakage, leading to a loss of subgrade support and subsequent pipe collapse.

Openings to subdrains and catch basins should be shielded by a fabric filter to prevent silting. In order to prevent pipe floatation when the service trench is deluged with water derived from precipitation, a soil cover with a thickness of at least the diameter of the pipe should be in place at all times after completion of the pipe installation.

The service pipes and metal fittings should be protected against corrosion. For estimation of anode weight requirements, the electrical resistivities of the disclosed soils presented in Table 4 can be used. The proposed anode weight must meet the minimum requirements as specified by the Town of Caledon.

6.5 Backfilling Trenches and Excavated Areas

The on-site inorganic soils are suitable for trench backfill. The addition of water will be required for the clay till and clay prior to structural compaction during dry and warm weather and in areas where compaction is best performed on the wet side of the optimum. Wet silt and sand will require aeration prior to their use as structural backfill. The tills should be sorted free of large cobbles and boulders (over 15 cm in size).

The backfill material should be compacted to at least 95% SPDD. In areas below the slab-on-grade and in the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% SPDD with a moisture content 2% to 3% drier than the optimum. This is to provide the required stiffness for floor or pavement construction. The lift of each backfill layer should be limited to a thickness of 20 cm, or the thickness should be determined by test strips at the time of compaction.

In normal construction practice, the problem areas of pavement settlement largely occur adjacent to foundation walls, columns, manholes, catch basins and services crossings. In areas which are inaccessible to a heavy compactor, sand backfill which can be appropriately compacted using a smaller vibratory compactor should be used.

One must be aware of possible consequences during trench backfilling and exercise caution as described below:

- To backfill a deep trench, one must be aware that the future settlement is to be expected, unless the sides is flattened to 1V:2H, and the lifts of the fill and its moisture content are stringently controlled; i.e. lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 98% SPDD, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand and the compaction must be carried out diligently, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section.
- In areas where the underground services construction is carried out during the winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to the final surfacing of the new pavement and slab-on-grade construction.
- When construction is carried out in the winter, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in-situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement that may become evident within several years after construction.
- In areas where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.6 **Pavement Design**

The recommended pavement design for residential local roads, satisfying the minimum requirement from the Town of Caledon, is provided in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL3
Asphalt Binder	65	HL8
Granular Base	150	Granular 'A' or equivalent
Granular Sub-base	300	Granular 'B' or equivalent

In preparation of the pavement subgrade, all topsoil and compressible material should be removed. The subgrade should be proof-rolled and inspected. Any soft spots identified must be subexcavated and replaced with inorganic earth fill. The subgrade within 1.0 m below the underside of the granular sub-base must be compacted to at least 98% SPDD, with a water content at 2% to 3% drier than the optimum. All the granular bases should be compacted to 100% SPDD.

The pavement subgrade will suffer a strength regression if water is allowed to infiltrate the mantle. The following measures should be incorporated in the construction procedures and pavement design:

- The pavement subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.
- Lots areas adjacent to the road should be properly graded to prevent ponding of large amounts of water. Otherwise, the water will seep into the subgrade mantle and induce a regression of the subgrade strength, with costly consequences for the pavement construction.
- In extreme cases during the wet seasons, if soft or weak subgrade is identified, it can be replaced by compacted granular material to compensate for the inadequate strength of the soft or weak subgrade. This can be assessed during construction.
- Fabric filter-encased curb subdrains are required to meet the Town of Caledon requirements.

6.7 Stormwater Management Ponds

Two SWM ponds (SWM 3 and 4) are proposed in the northern half of the subdivision, adjacent to the creek tributary system. Detailed designs of the ponds were not available for review at the time of report preparation.

Pond Liner

Based on the borehole information from Boreholes W-106 and W-110, the pond areas are underlain by a silt/silty fine sand deposit overlying sandy silt till at approximate depths of 3 to 4 m below grade. It is anticipated that pond excavation will extend into the permeable deposits. An earthen clay liner (with an estimated permeability of 10^{-7} cm/sec or less) or a geosynthetic clay liner (GCL) with soil ballast will therefore be required to minimize water infiltration through the native soils which will affect the designed capacity of the ponds.

Water levels were recorded at depths ranging from 1.46 to 2.09 mbgs at the nearby monitoring wells, or at approximately El. 263.4 m and El. 266.5 m at SWM 3 and 4, respectively, and may be higher during wet seasons. The appropriate thickness of the clay liner or ballast to counteract the hydrostatic uplift pressures and the extent of the liner can be established once the pond elevations are available for review.

Pond Berm Construction

The side slopes of the ponds should be graded at 1V:3H or flatter for stability above the wet perimeter, and 1V:4H or flatter below the wet perimeter. All exposed side slopes must be vegetated and/or sodded to prevent surface erosion.

Any proposed earth embankments should be constructed using inorganic clay or clay till material, compacted to at least 98% SPDD in lifts of no more than 20 cm in thickness. The subgrade must be inspected and proof-rolled prior to any fill placement. The construction of the berms must be supervised and certified by the site geotechnical engineer. The pond side slopes should be surface compacted.

Control Structures

The following bearing pressures can be used for the design of control structures supported on conventional footings founded on engineered fill or on sound native soils below the topsoil and weathered soils:

- Soil Bearing Pressure at SLS: 100 kPa
- Factored Ultimate Soil Bearing Pressure at ULS: 120 kPa

The footings must be placed below the scouring depth and be provided with a minimum earth cover of 1.2 m to protect them from frost damage. The inlets and outlets of the ponds must be lined with gabion mats, rip rap or equivalent measures for protection against scouring.

The foundation for the control structures should meet the requirements specified by the latest Ontario Building Code, and the structures should be designed to resist a minimum earthquake force using Site Classification ‘D’ (stiff soil).

General Considerations

One should be aware that minor maintenance may be required after rapid drawdown as the water recedes from a flood level to normal level. Routine visual inspection and maintenance will be required to rectify any observed deficiency.

6.8 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor	**Unit Weight (kN/m^3)**		**Estimated Bulk Factor**	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silty Clay Till	22.0	12.0	1.33	1.03
Silty Clay	20.5	10.5	1.30	1.00
Sandy Silt Till	22.5	12.5	1.33	1.05
Silt/Silty Sand	20.5	10.5	1.25	1.00

Lateral Earth Pressure Coefficients	**Active K_a**	**At Rest K_o**	**Passive K_p**
Compacted Earth Fill and Silty Clay	0.40	0.55	2.50
Silty Clay Till/Silt/Silty Sand	0.33	0.50	3.00
Sandy Silt Till	0.29	0.46	3.39

Estimated Coefficients of Permeability (K) and Percolation Time (T)	**K (cm/sec)**	**T (min/cm)**
Silty Clay Till and Silty Clay	10^{-7}	80+
Sandy Silt Till/Silt	10^{-5}	20
Silty Sand	10^{-3}	8

Table 4 - Soil Parameters (cont'd)

Estimated Electrical Resistivities	**(ohm·cm)**
Silty Clay Till	4000
Silty Clay	3500
Sandy Silt Till	4500
Silt/Silty Sand	5500
Coefficients of Friction	
Between Concrete and Granular Base	0.50
Between Concrete and Native Soils or Compacted Earth Fill	0.35

6.9 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. The types of soils to be excavated are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Sound Tills and Silty Clay	2
Weathered Soils, Silt and Sand (above groundwater)	3
Saturated Soils	4

In excavation, the groundwater seepage from the tills and clay will likely be limited in quantity and can be removed by conventional pumping from sumps. However, excavation extending into the saturated soils will require more extensive construction dewatering. The wet silt/silty sand will slump readily, leading to sloughing and migrate/run with seepage and boil under an approximate piezometric head of 0.4 m.

In order to provide a stable subgrade for the SWM ponds, underground services and foundation construction, the groundwater should be depressed to at least 1.0 m below the intended bottom of excavation. Detailed groundwater profile and dewatering needs should be referred to the hydrogeological report by PEGG.

Excavation into the very stiff to hard and dense to very dense tills containing cobbles and boulders will require extra effort and the use of a heavy-duty, properly equipped backhoe.

Prospective contractors should assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the intended bottom of excavation prior to excavating. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of School West Investment Inc. and for review by its designated consultants, contractors and government agencies. The material in the report reflects the judgement of Hui Wing Yang, P.Eng. and Kin Fung Li, P.Eng., in light of the information available to it at the time of preparation.

Use of the report is subject to the conditions and limitations of the contractual agreement. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

Hui Wing Yang, P.Eng.

Kin Fung Li, P.Eng.
HWY/KFL

LICENSED PROFESSIONAL ENGINEER
Feb. 9, 2024
H W YANG
100126690
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Feb 9, 2024
K. F LI
100169280
PROVINCE OF ONTARIO

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Standard Penetration Resistance or 'N' Value:

The number of blows of a 63.5 kg hammer falling from a height of 76 cm required to advance a 51 mm outer diameter drive open sampler 30 cm into undisturbed soil, after an initial penetration of 15 cm.

Plotted as '○'

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows per each 30 cm of penetration of a 51 mm diameter, 90° point cone driven by a 63.5 kg hammer falling from a height of 76 cm.

Plotted as '—●—'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/30 cm)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
>50	very dense

Cohesive Soils:

Undrained Shear Strength (kPa)	'N' (blows/30 cm)	Consistency
<12	<2	very soft
12 to <25	2 to <4	soft
25 to <50	4 to <8	firm
50 to <100	8 to <15	stiff
100 to 200	15 to 30	very stiff
>200	>30	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test

METRIC CONVERSION FACTORS

1 ft = 0.3048 m
1 inch = 25.4 mm
1 lb = 0.454 kg
1 ksf = 47.88 kPa

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-101

FIGURE NO.: 1

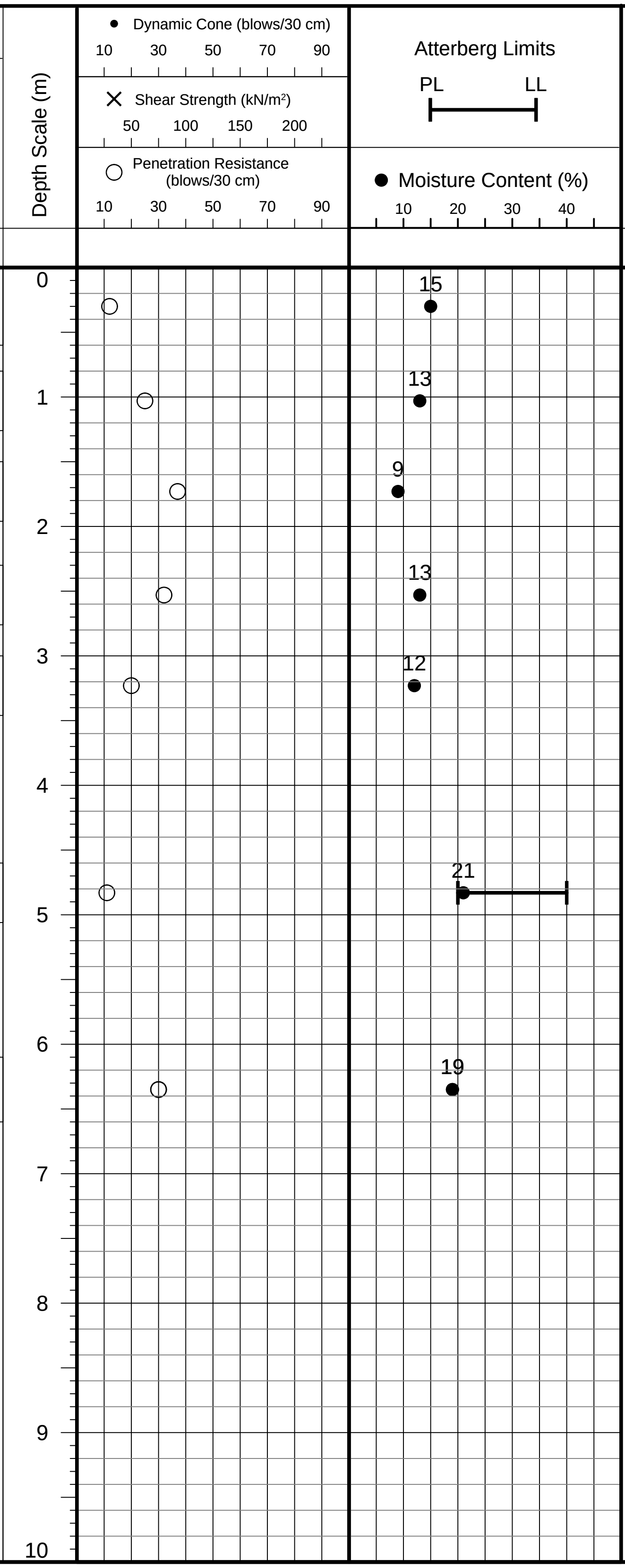
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 23, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
266.0	Ground Surface			
0.0	**25 cm TOPSOIL**			
	Stiff to hard	1	DO	12
	SILTY CLAY TILL — weathered	2	DO	25
	sandy, a trace of gravel occ. sand and silt seams and layers	3	DO	37
		4	DO	32
	— — brown grey	5	DO	20
262.0 4.0	Grey, stiff **SILTY CLAY** a trace of sand occ. silt seams and layers	6	DO	11
260.4 5.6	Grey, compact, very moist to wet **SILT** traces of fine sand and clay	7	DO	30
259.4 6.6	**END OF BOREHOLE**			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-102

FIGURE NO.: 2

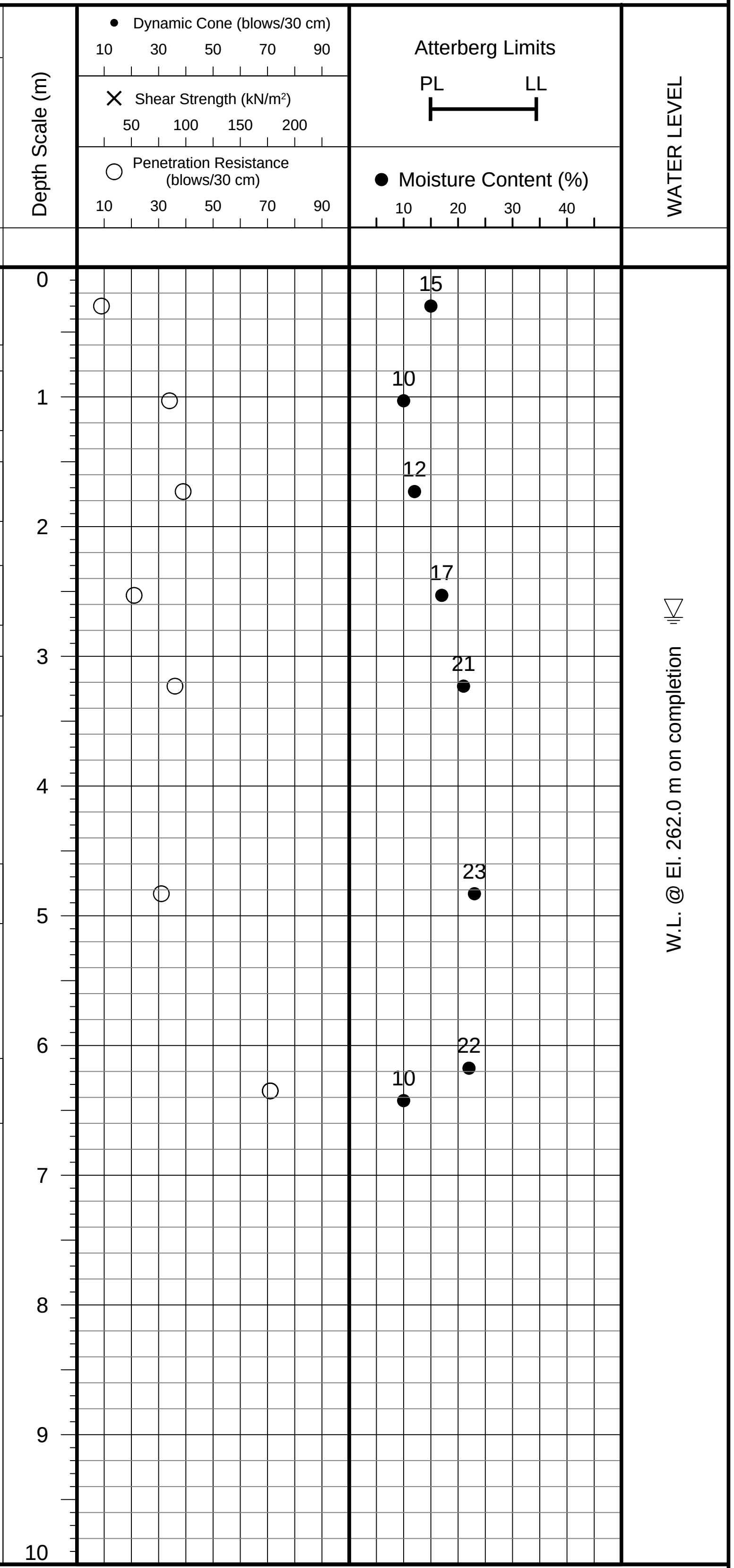
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 23, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
264.7	Ground Surface			
0.0	**33 cm TOPSOIL**			
	Brown, stiff to hard	1	DO	9
	weathered			
	SILTY CLAY TILL	2	DO	34
	sandy, a trace of gravel occ. sand and silt seams and layers	3	DO	39
262.6 2.1	Grey, compact to dense, very moist to wet			
	SILT	4	DO	21
	a trace to some sand occ. sand seams and clay layers	5	DO	36
		6	DO	31
258.4 6.3	Reddish-brown, very dense, moist **SANDY SILT TILL**	7A 7B	DO	71
258.1 6.6	traces of clay and gravel			
	END OF BOREHOLE			



Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-103

FIGURE NO.: 3

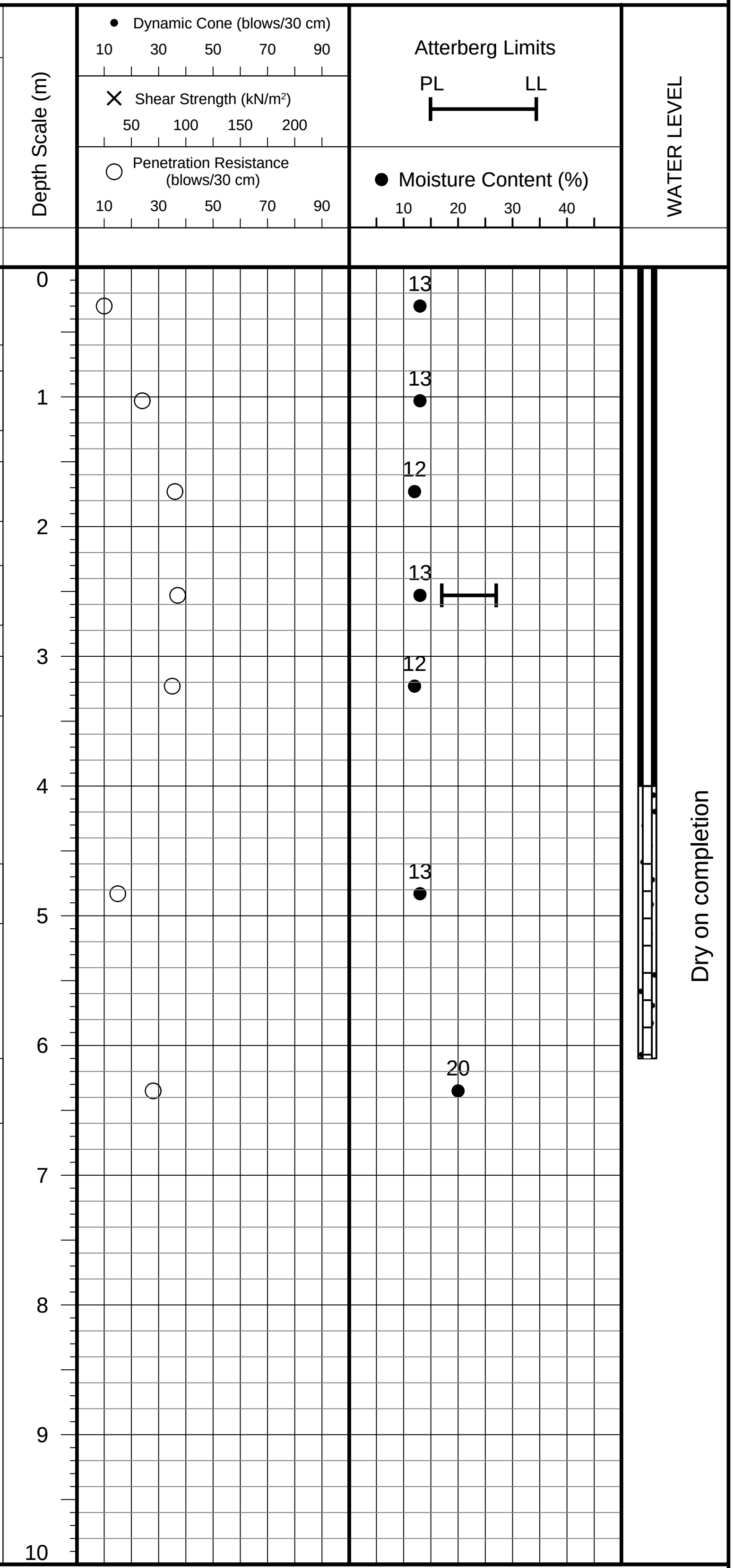
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 19, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
264.9 0.0	Ground Surface **20 cm TOPSOIL**			
	Stiff to hard	1	DO	10
	weathered **SILTY CLAY TILL**			
		2	DO	24
	some sand to sandy a trace of gravel occ. sand and silt seams and layers, cobbles	3	DO	36
		4	DO	37
	brown grey	5	DO	35
		6	DO	15
259.3 5.6	Grey, compact, wet **SILT** traces of fine sand and clay	7	DO	28
258.3 6.6	**END OF BOREHOLE**			



END OF BOREHOLE

Installed 50-mm Ø PVC monitoring well to
6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-104

FIGURE NO.: 4

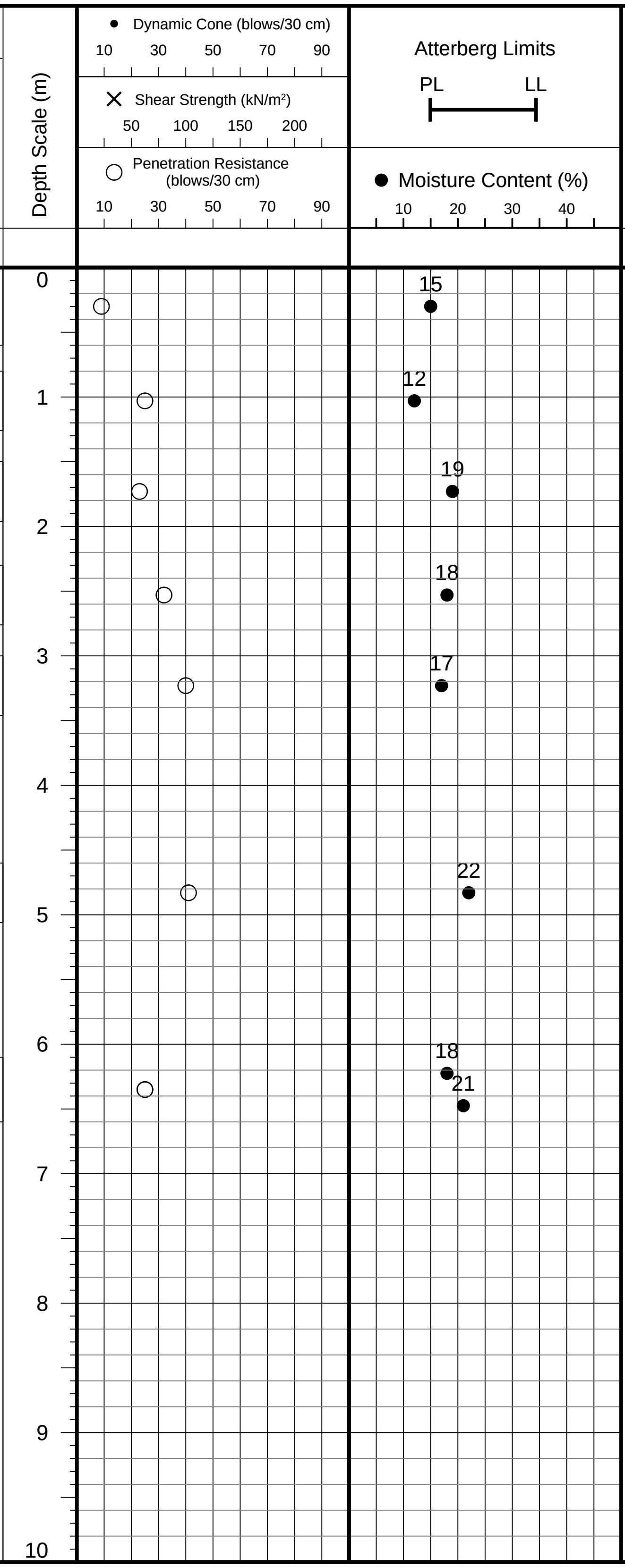
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

DRILLING DATE: October 23, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
263.4	Ground Surface			
0.0	**33 cm TOPSOIL**			
	Brown, stiff to very stiff	1	DO	9
	weathered			
	SILTY CLAY TILL	2	DO	25
	sandy, a trace of gravel occ. sand and silt seams and layers	3	DO	23
261.3 2.1	Grey, compact to dense, very moist to wet			
	SILT	4	DO	32
	some sand to sandy a trace of clay occ. clay layers	5	DO	40
		6	DO	41
	moist,	7A	DO	25
	varved clay	7B		
256.8 6.6	**END OF BOREHOLE**			



WATER LEVEL

▽ W.L. @ El. 261.8 m on completion

Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-105

FIGURE NO.: 5

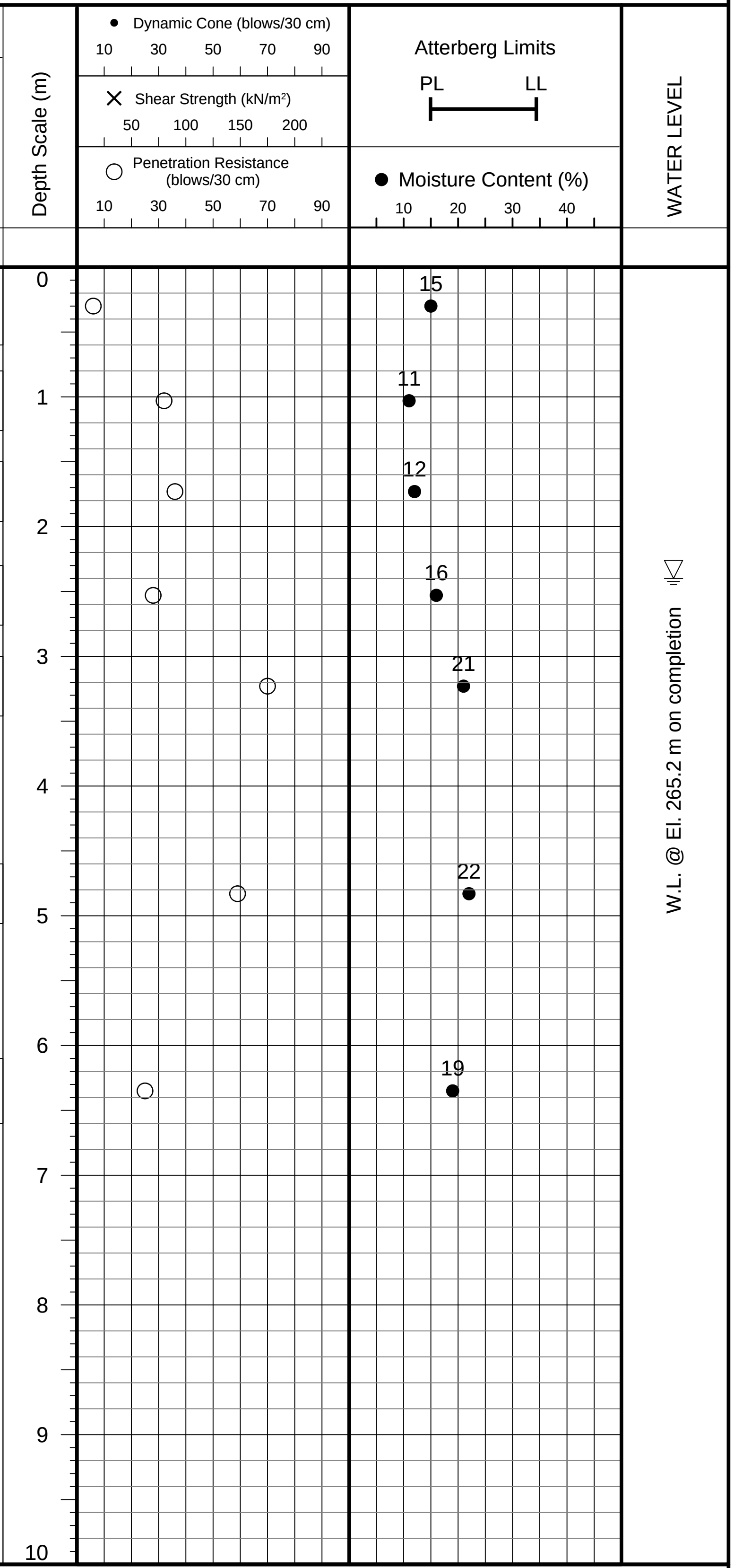
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 20, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
267.6 0.0	Ground Surface **28 cm TOPSOIL** Brown, firm to hard weathered **SILTY CLAY TILL** sandy, a trace of gravel occ. sand and silt seams and layers, cobbles	1	DO	6
		2	DO	32
		3	DO	36
		4	DO	28
264.7 2.9	Compact to very dense, wet **SILT** some sand, a trace of clay occ. silty fine sand layers brown grey	5	DO	70
		6	DO	59
		7	DO	25
261.0 6.6	**END OF BOREHOLE**			



Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-106

FIGURE NO.: 6

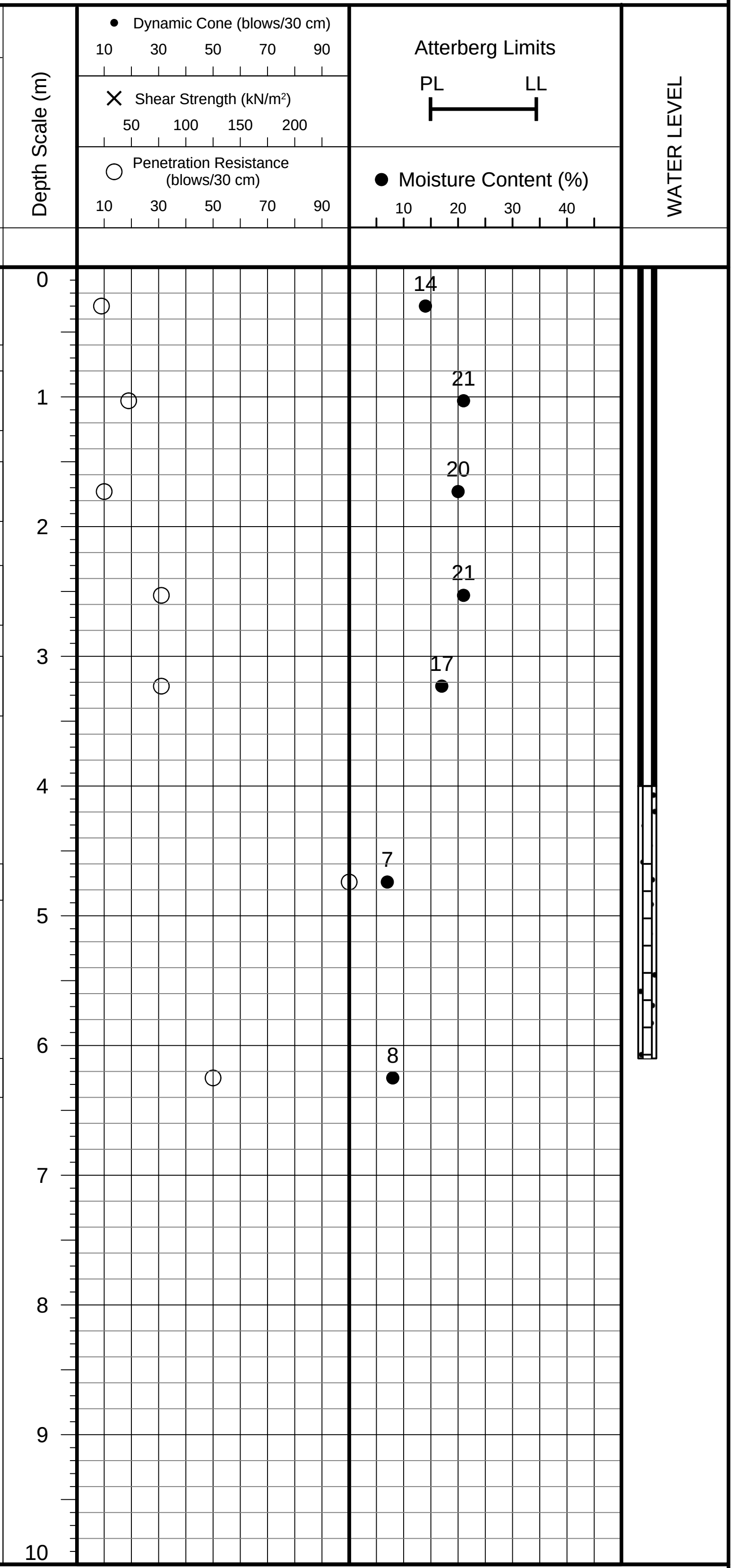
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 19, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
265.5	Ground Surface			
0.0	**20 cm TOPSOIL** Brown, stiff, weathered **SILTY CLAY TILL** sandy, a trace of gravel	1	DO	9
264.7 0.8	Brown, loose to compact, very moist to wet weathered **SILT** some sand, a trace of clay	2	DO	19
		3	DO	10
263.4 2.1	Brown, dense, wet seepage **SILTY FINE SAND** a trace of clay	4	DO	31
262.6 2.9	Reddish-brown/grey, dense to very dense grey, silt and clay layers **SANDY SILT TILL** traces of clay and gravel occ. silt and clay layers, cobbles and boulders	5	DO	31
		6	DO	50/13
		7	DO	50
259.1 6.4	**END OF BOREHOLE**			



Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing

Seepage and cave-in detected at 2.4 m

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-107

FIGURE NO.: 7

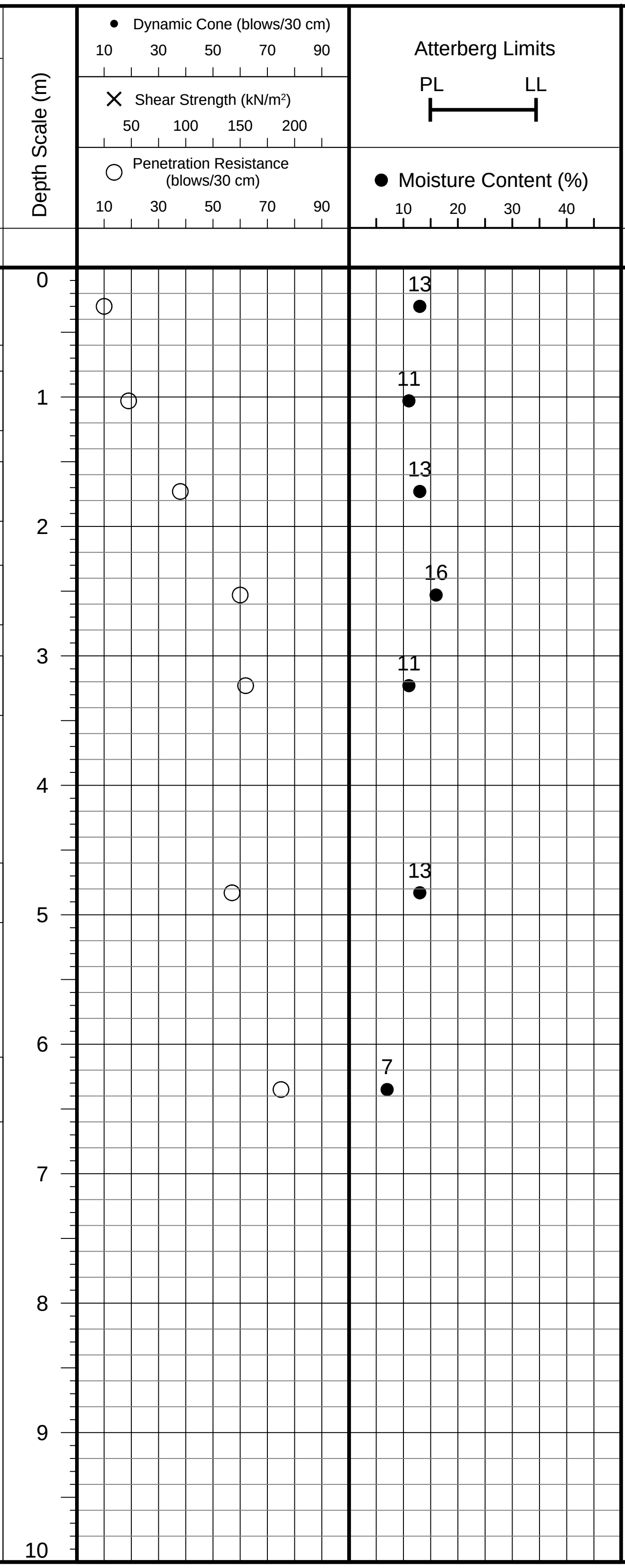
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 20, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value	WATER LEVEL
268.7	Ground Surface				
0.0	**18 cm TOPSOIL**				Dry on completion
	Stiff to hard	1	DO	10	
	weathered				
	SILTY CLAY TILL	2	DO	19	
	sandy, a trace of gravel occ. sand and silt seams and layers, cobbles	3	DO	38	
	silt	4	DO	60	
	brown grey				
		5	DO	62	
264.7 4.0	Grey, very dense **SILT** some clay occ. clay layers	6	DO	57	
263.1 5.6	Reddish-brown, very dense **SANDY SILT TILL** traces of clay and gravel, occ. cobbles	7	DO	75	
262.1 6.6	**END OF BOREHOLE**				



JOB NO.: 2310-S043

LOG OF BOREHOLE: W-108

FIGURE NO.: 8

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

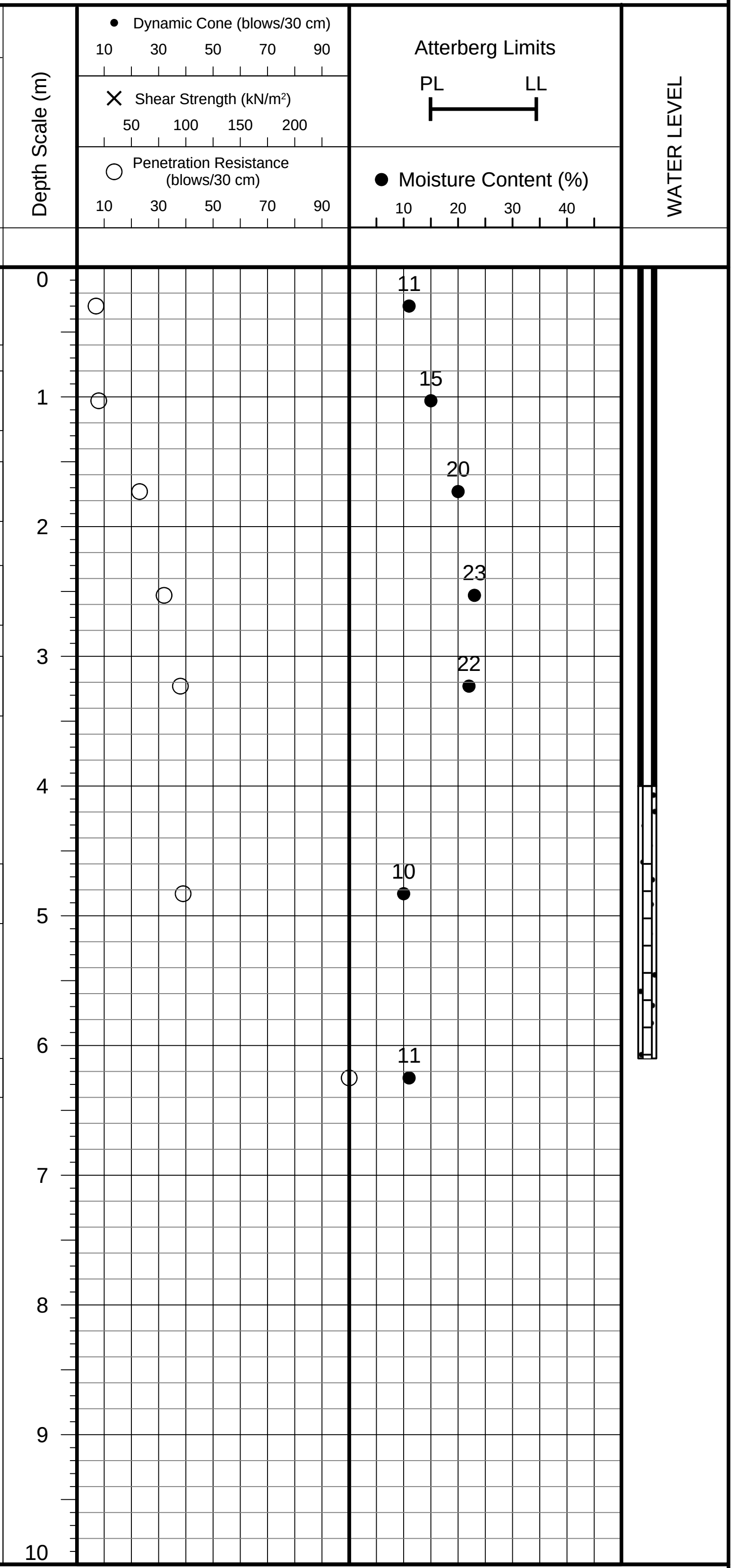
PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

DRILLING DATE: October 19, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
267.5	Ground Surface			
0.0	**18 cm TOPSOIL**			
	Brown, firm to stiff, weathered **SILTY CLAY TILL** sandy, a trace of gravel occ. topsoil inclusions	1	DO	7
		2	DO	8
266.1 1.4	Brown, compact to dense, wet **SILT** some sand, a trace of clay occ. sand layers	3	DO	23
		4	DO	32
264.6 2.9	Brown, dense, wet — seepage **SILTY FINE SAND** a trace of clay occ. silt lenses and layers	5	DO	38
263.5 4.0	Reddish-brown, dense to very dense **SANDY SILT TILL** traces of clay and gravel occ. silt layers	6	DO	39
		7	DO	50/10
261.1 6.4	**END OF BOREHOLE**			

Installed 50-mm Ø PVC monitoring well to 6.1 m, completed with 1.5 m screen
Sand backfill from 4.0 to 6.1 m
Bentonite seal from 0.0 to 4.0 m
Provided with a steel monument casing

Seepage and cave-in detected at 3.0 m



Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-109

FIGURE NO.: 9

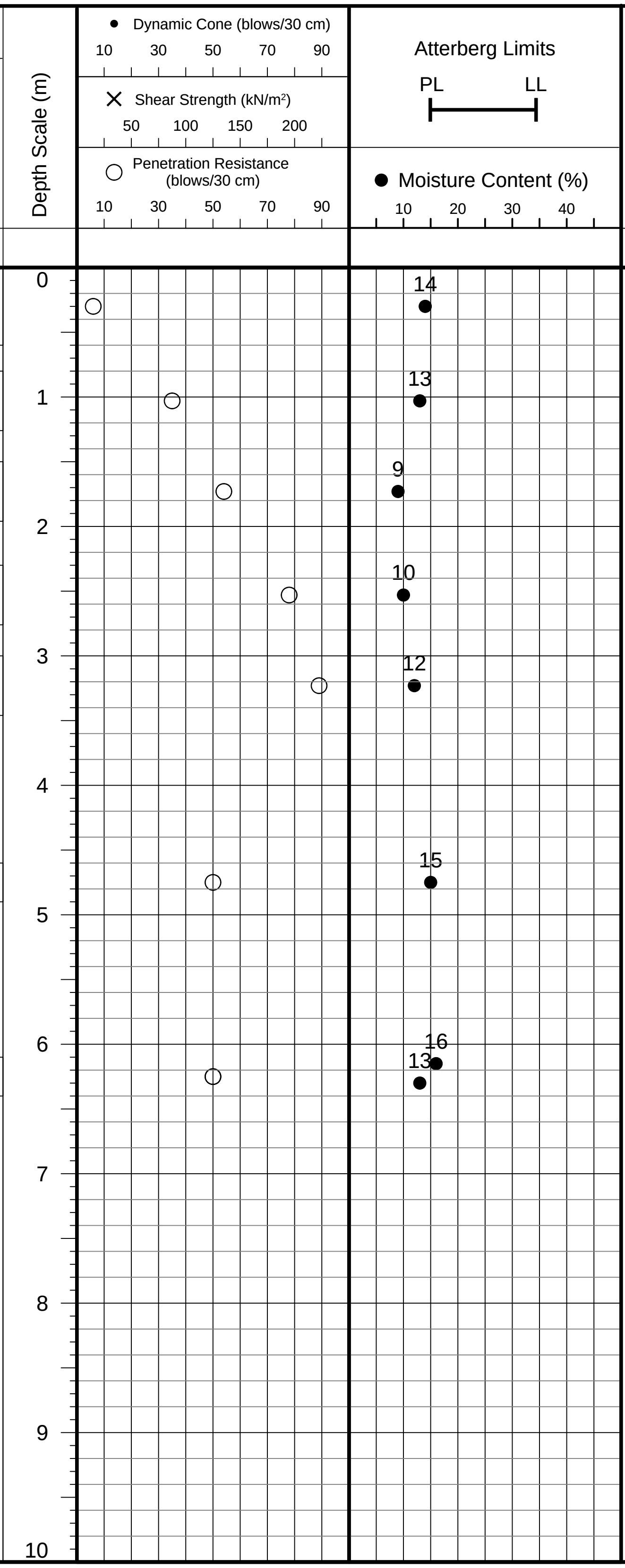
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 20, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
267.7	Ground Surface			
0.0	**23 cm TOPSOIL**			
	Brown, loose to very dense	1	DO	6
	SANDY SILT TILL/SILTY SAND TILL weathered, cobble	2	DO	35
	traces of clay and gravel occ. cobbles and boulders	3	DO	54
		4	DO	78
264.8 2.9	Hard			
	brown grey	5	DO	89
	SILTY CLAY			
	a trace to some sand frequent silt layers occ. gravel and sand seams			
		6	DO	50
261.5 6.2	Reddish-brown, very dense	7A 7B	DO	50
261.3 6.4	**SANDY SILT TILL**			
	END OF BOREHOLE			



WATER LEVEL

Dry on completion

Soil Engineers Ltd.

JOB NO.: 2310-S043

LOG OF BOREHOLE: W-110

FIGURE NO.: 10

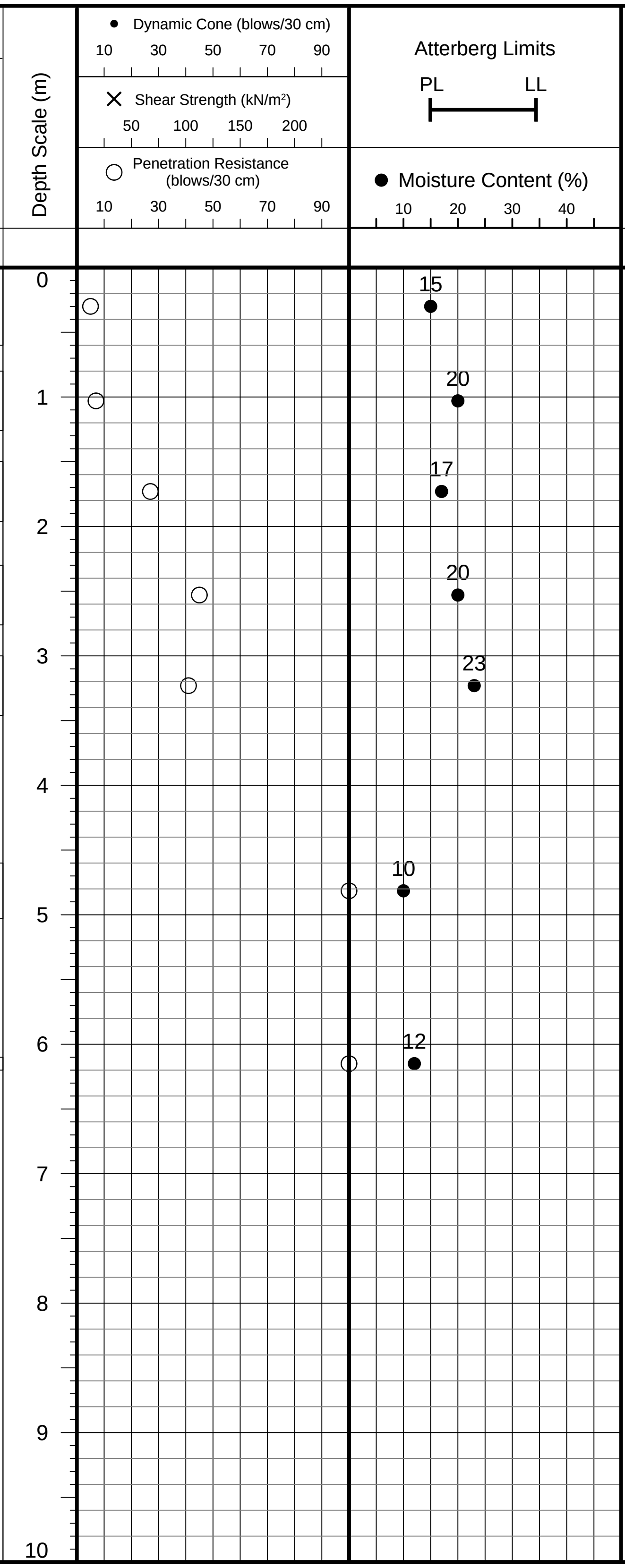
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Solid Stem Augers

PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road,
Town of Caledon

DRILLING DATE: October 20, 2023

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
265.4	Ground Surface			
0.0	**30 cm TOPSOIL**			
	Brown, loose to dense	1	DO	5
	SILT weathered	2	DO	7
	some sand to sandy a trace of clay occ. sand layers becoming wet below 3.0 m	3	DO	27
		4	DO	45
		5	DO	41
261.4 4.0	Reddish-brown/grey, very dense **SANDY SILT TILL** traces of clay and gravel occ. sand and silt seams and layers, cobbles and boulders	6	DO	90/13
259.2 6.2		7	DO	50/10
	END OF BOREHOLE			



WATER LEVEL

W.L. @ El. 262.7 m on completion

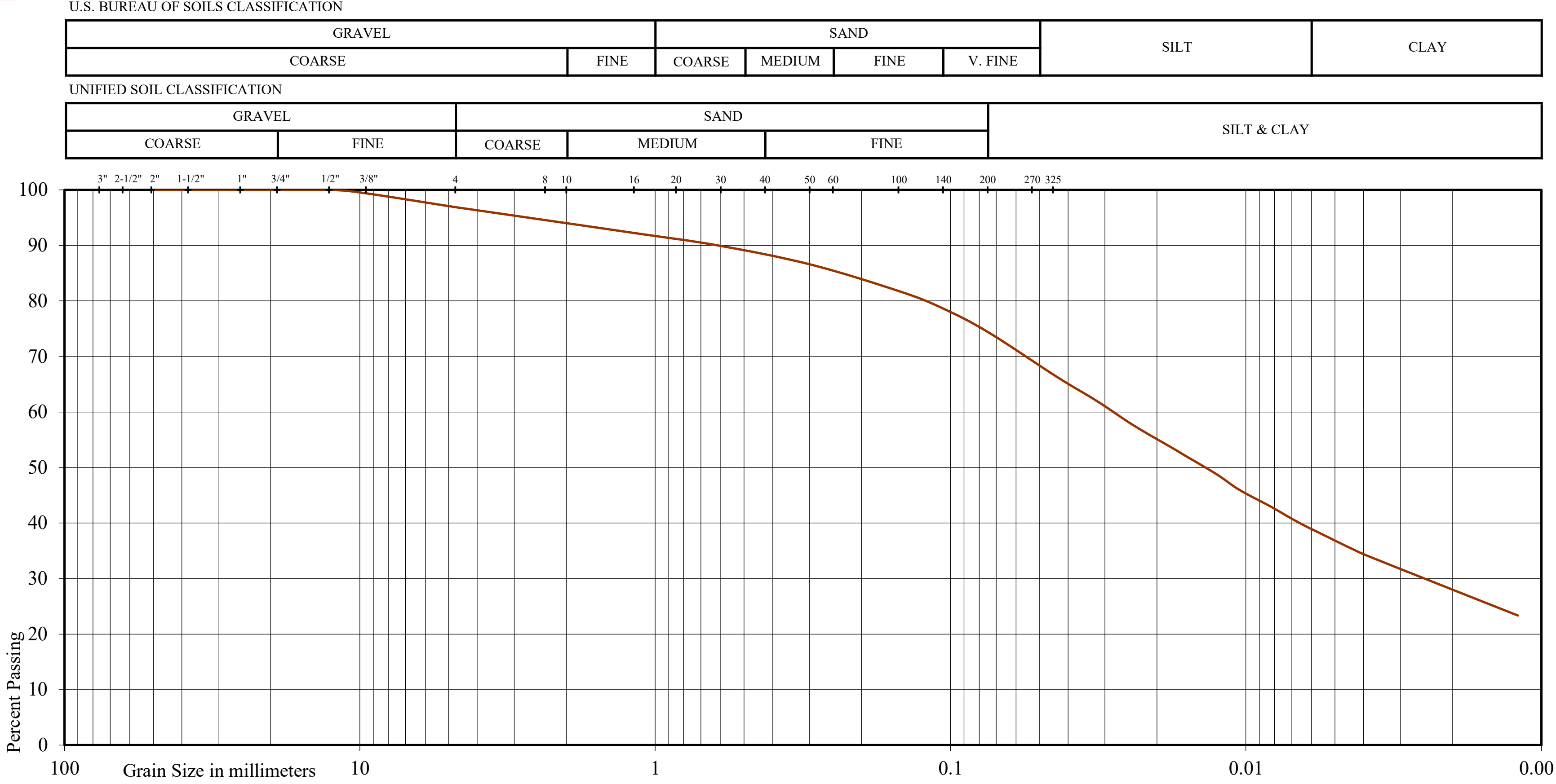
Soil Engineers Ltd.

Page: 1 of 1

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S043



Project: Proposed Residential Development

Location: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

BH./Sa. 103/4

Liquid Limit (%) = 27

Plastic Limit (%) = 17

Plasticity Index (%) = 10

Moisture Content (%) = 13

Estimated Permeability (cm./sec.) = 10^{-7}

Borehole No: W-103

Sample No: 4

Depth (m): 2.5

Elevation (m): 262.4

Classification of Sample [& Group Symbol]: SILTY CLAY TILL

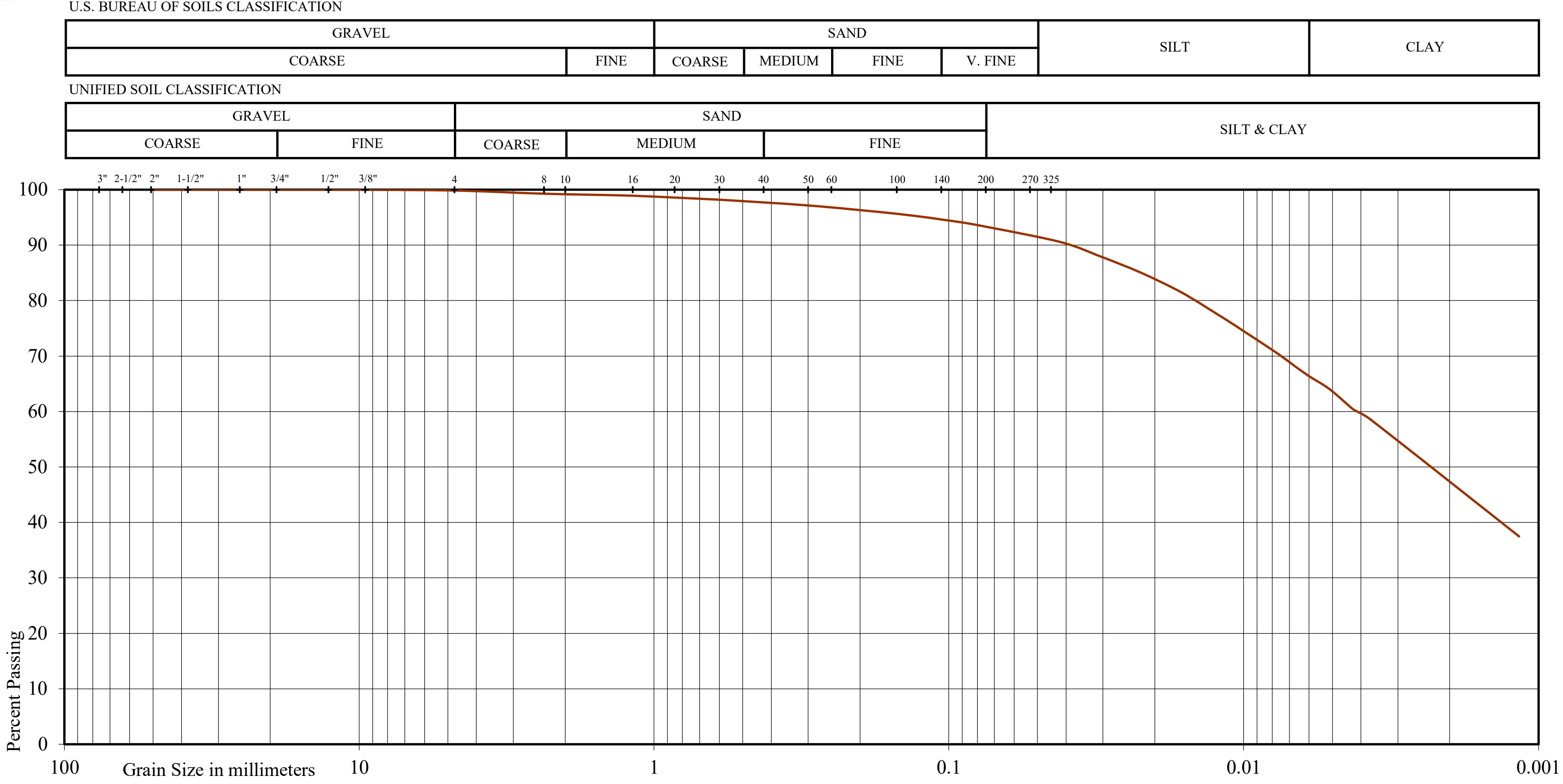
sandy, a trace of gravel

Figure: 11

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S043



Project: Proposed Residential Development

Location: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

BH./Sa. 101/6

Liquid Limit (%) = 40

Borehole No: W-101

Plastic Limit (%) = 20

Sample No: 6

Plasticity Index (%) = 20

Depth (m): 4.8

Moisture Content (%) = 21

Elevation (m): 261.2

Estimated Permeability (cm./sec.) = 10^{-7}

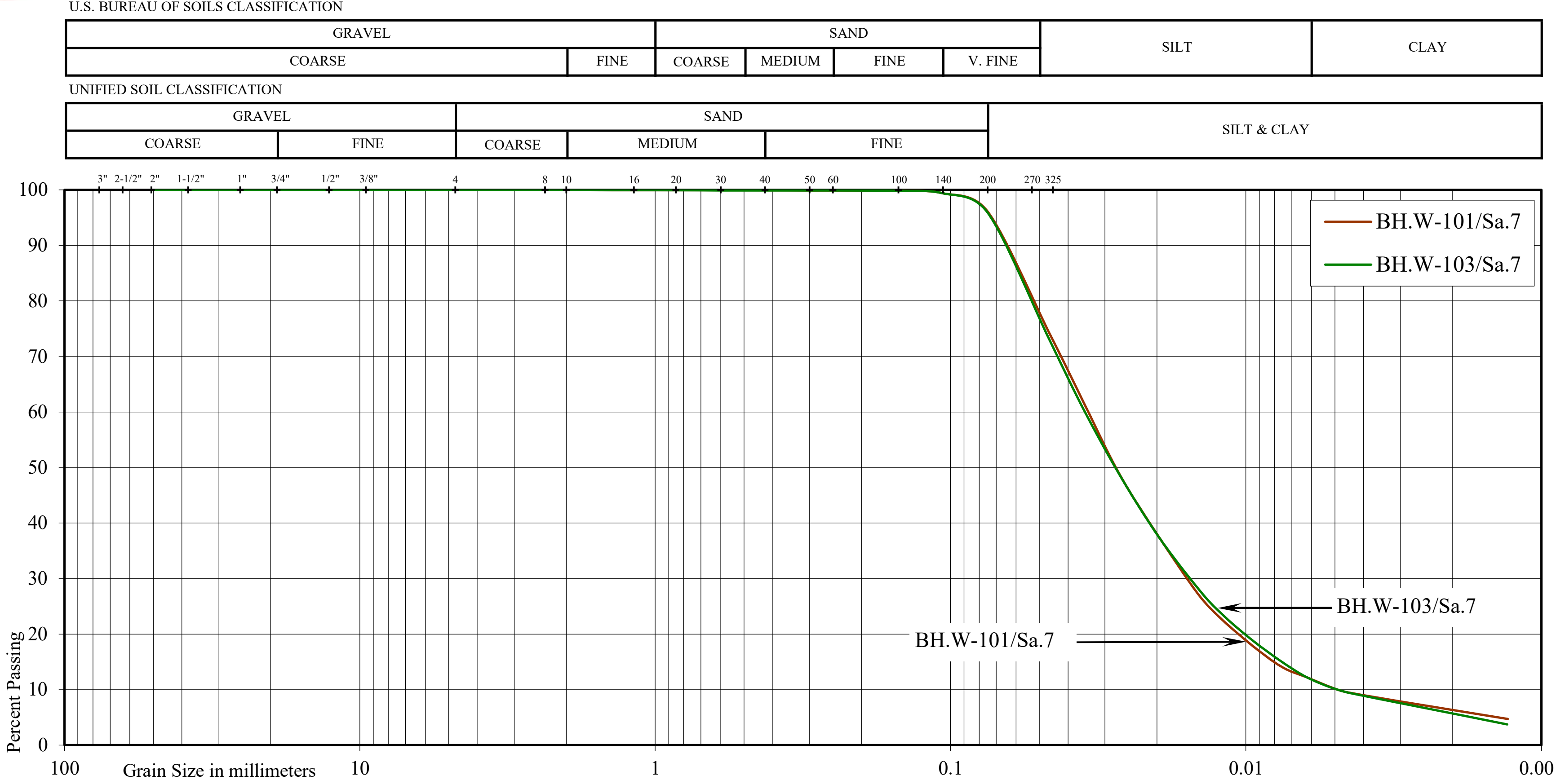
Classification of Sample [& Group Symbol]: SILTY CLAY
a trace of sand

Figure: 12

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S043



Project: Proposed Residential Development

Location: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

Borehole No:	W-101	W-103
Sample No:	7	7
Depth (m):	6.3	6.3
Elevation (m):	259.7	258.6

BH./Sa.	101/7	103/7
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	19	20
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-5}

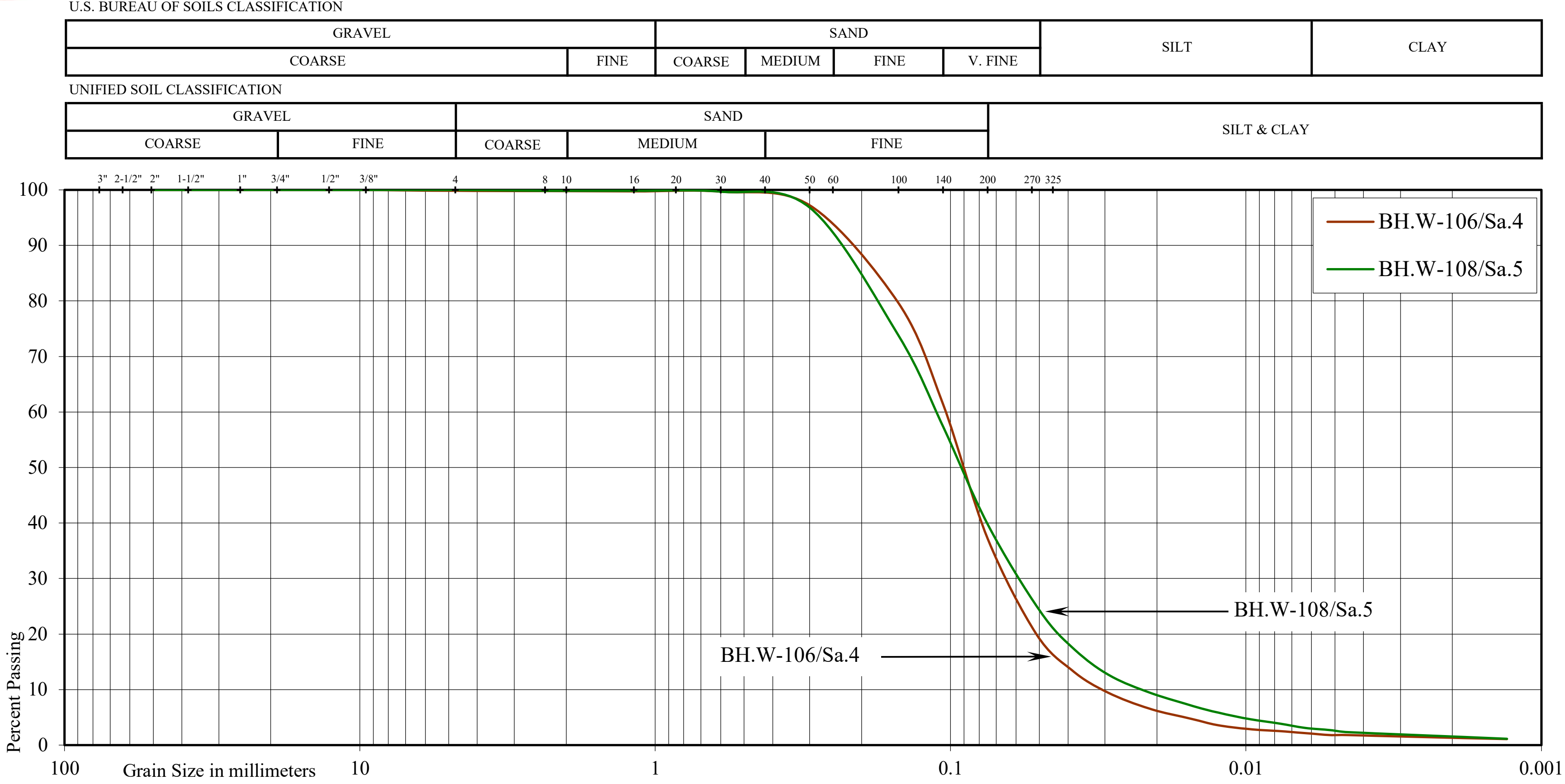
Classification of Sample [& Group Symbol]: SILT

traces of fine sand and clay

Figure: 13

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S043



Project: Proposed Residential Development

Location: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

Borehole No:	W-106	W-108
Sample No:	4	5
Depth (m):	2.5	3.2
Elevation (m):	263.0	264.3

BH./Sa.	106/4	108/5
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	21	22
Estimated Permeability (cm./sec.) =	10^{-3}	10^{-3}

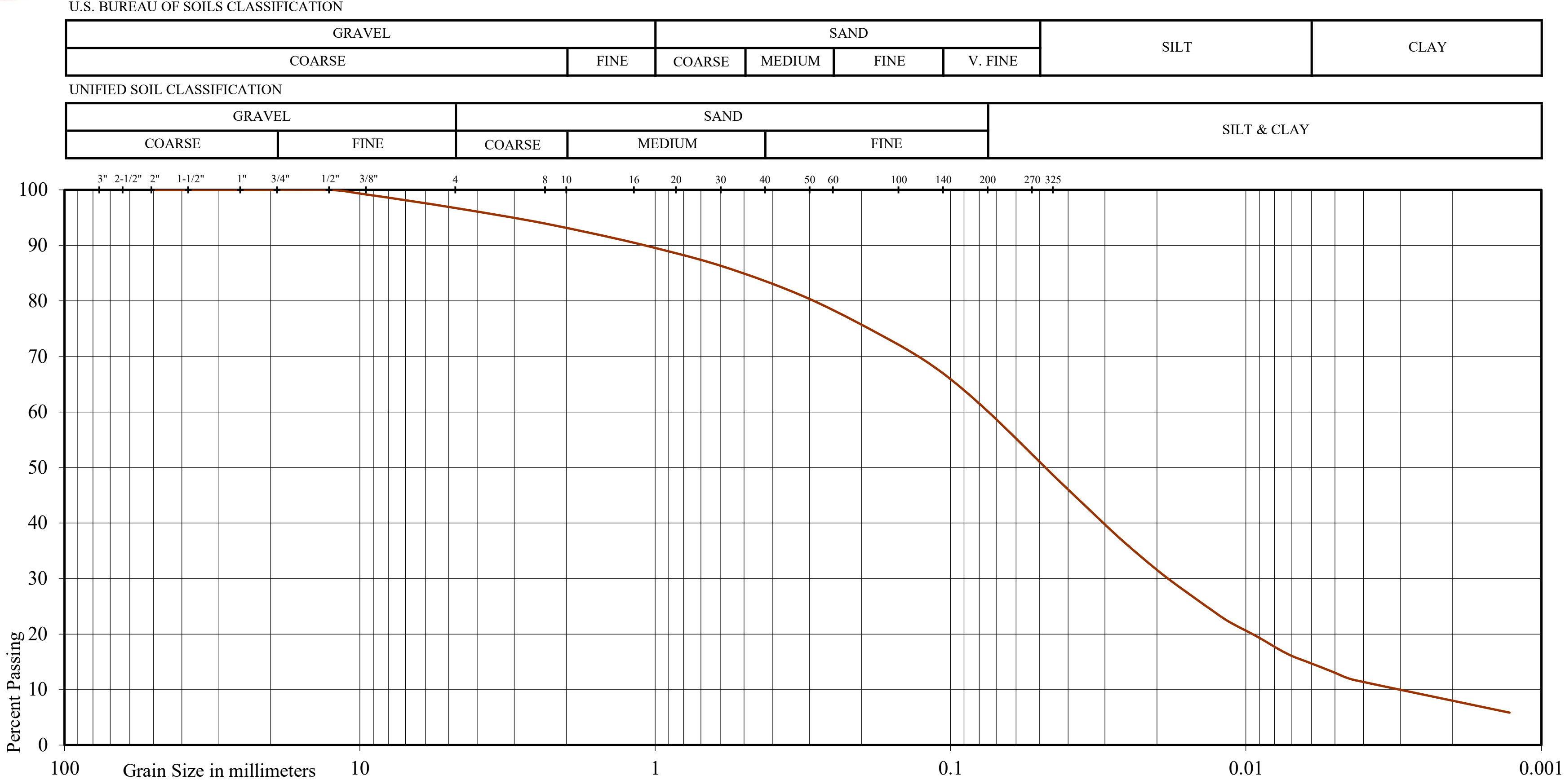
Classification of Sample [& Group Symbol]: SILTY FINE SAND
a trace of clay

Figure: 14

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 2310-S043



Project: Proposed Residential Development

Location: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

BH./Sa. 108/6

Liquid Limit (%) = -

Plastic Limit (%) = -

Plasticity Index (%) = -

Moisture Content (%) = 10

Estimated Permeability (cm./sec.) = 10^{-5}

Borehole No: W-108

Sample No: 6

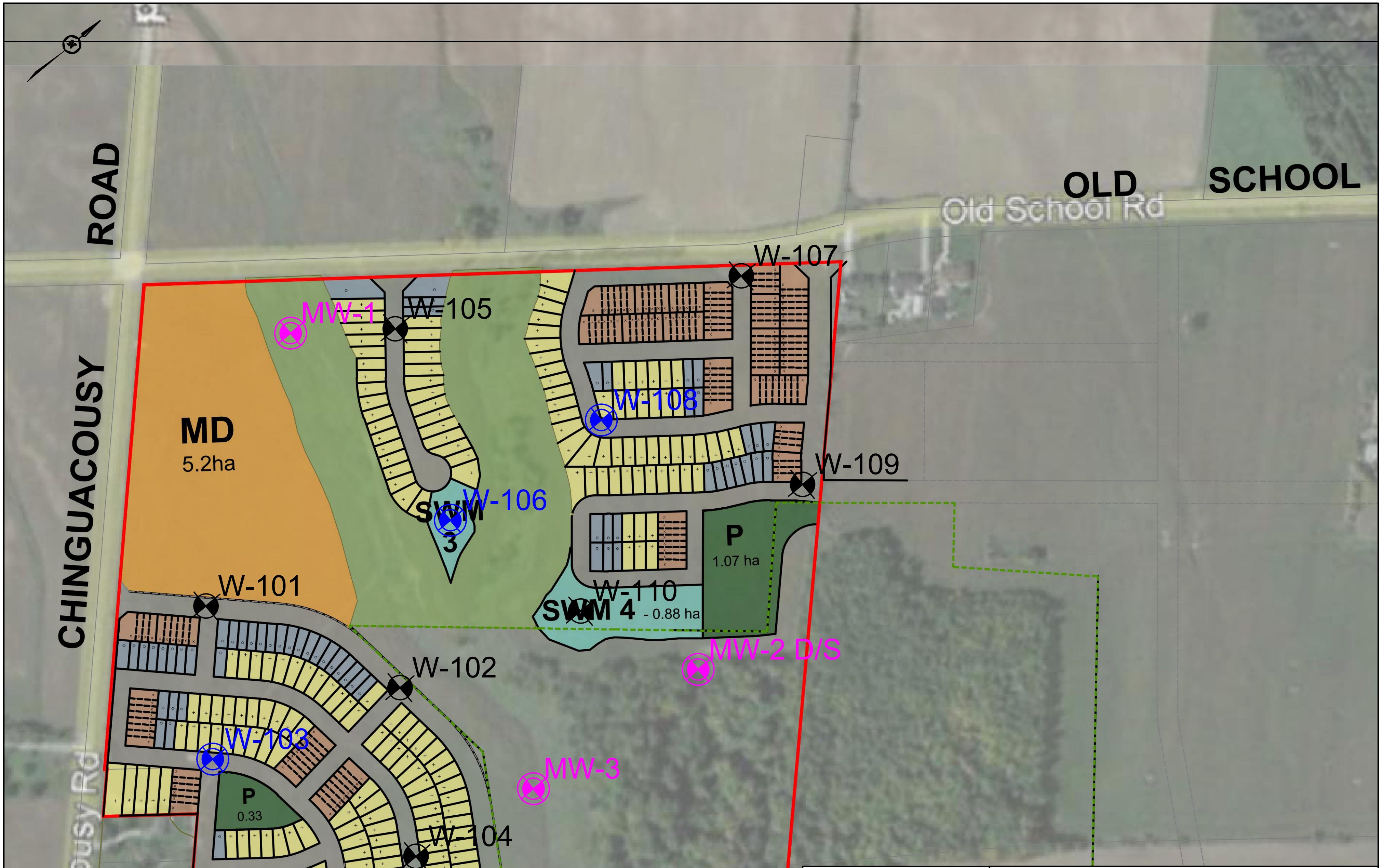
Depth (m): 4.8

Elevation (m): 262.7

Classification of Sample [& Group Symbol]: SANDY SILT TILL

traces of clay and gravel

Figure: 15



LEGEND

- 2023 SEL Borehole
- 2023 SEL Monitoring Well
- 2017 PECG Monitoring Well

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

Borehole Location Plan

SITE: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

DESIGNED BY: D.K. **CHECKED BY:** H.Y. **DWG NO.:** 1

SCALE: 1:5000 **REF. NO.:** 2310-S043 **DATE:** FEBRUARY 2024 **REV** -

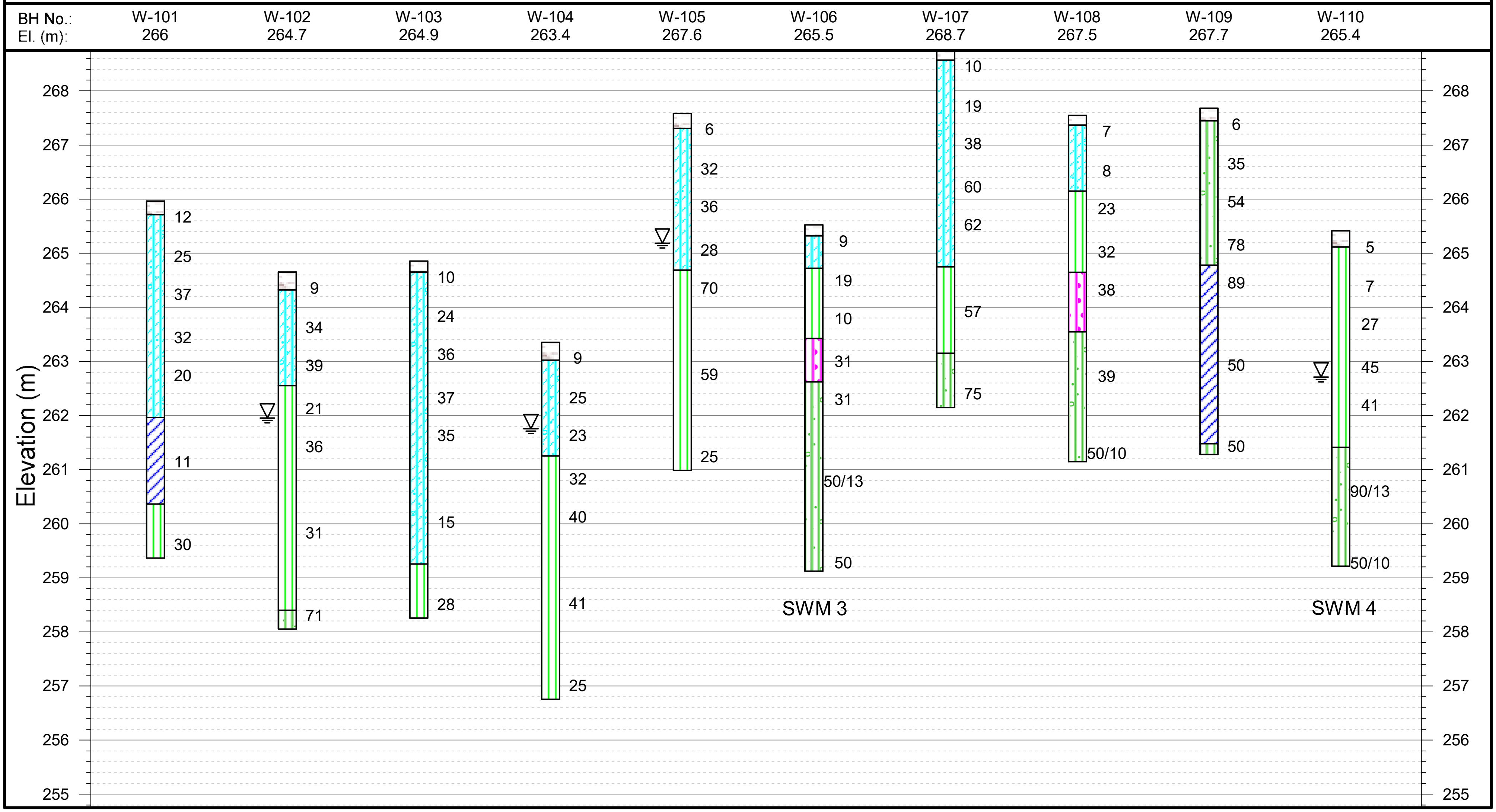
Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

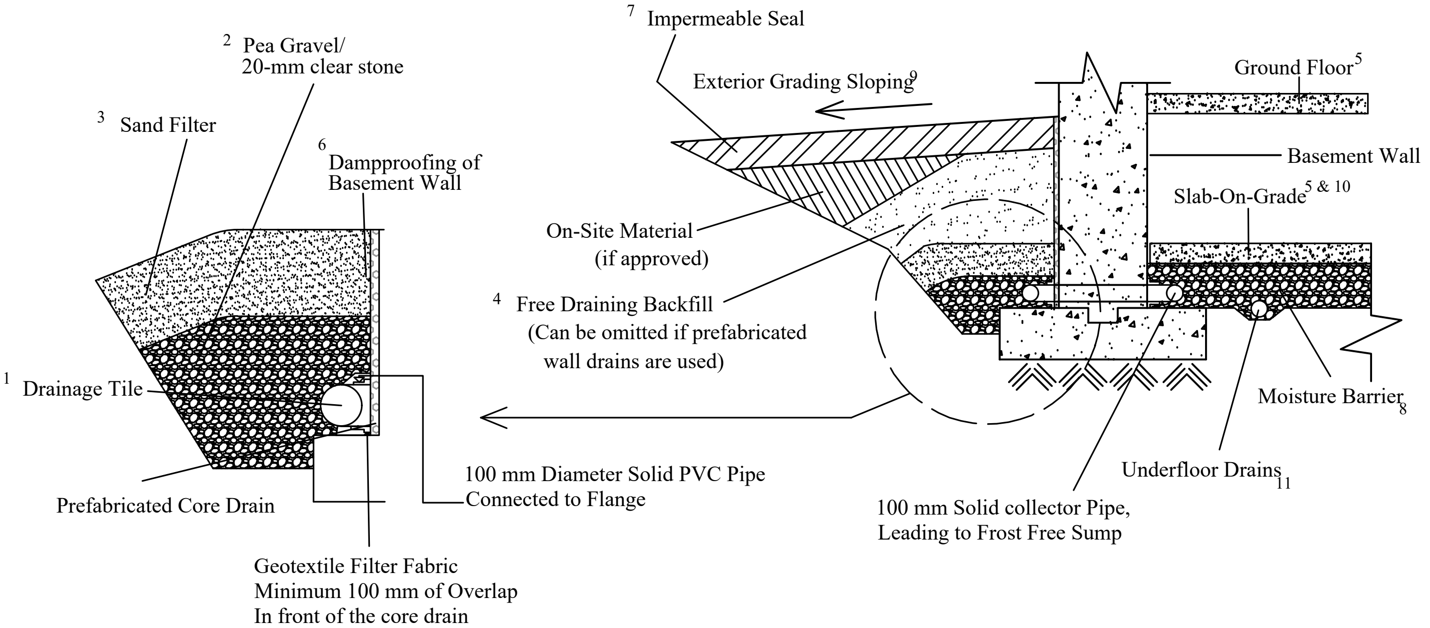
SUBSURFACE PROFILE
DRAWING NO. 2
SCALE: AS SHOWN

JOB NO.: 2310-S043
REPORT DATE: February 2024
PROJECT DESCRIPTION: Proposed Residential Development
PROJECT LOCATION: Southeast of Old School Road and Chinguacousy Road, Town of Caledon

LEGEND

▨ TOPSOIL
▨ SANDY SILT TILL
▨ SILTY CLAY
▨ SILTY CLAY TILL
▨ SILTY FINE SAND
▨ SILT
▽ WATER LEVEL (END OF DRILLING)





NOTES:

1. **Drainage tile**: consists of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet. Invert to be at minimum of 150 mm (6") below underside of basement floor slab.

2. **Pea gravel**: at 150 mm (6") on the top and sides of drain. If drain is not placed on concrete footing, provide 100 mm (4") of pea gravel below drain. The pea gravel may be replaced by 19-mm clear stone provided that the drain is covered by a porous geotextile membrane of Terrafix 270R or equivalent.

3. **Filter material**: consists of C.S.A. fine concrete aggregate. A minimum of 300 mm (12") on the top and sides of gravel. This may be replaced by an approved porous geotextile membrane of Terrafix 270R or equivalent.

4. **Free-draining backfill**: OPSS Granular 'B' or equivalent, compacted to 95% to 98% (maximum) Standard Proctor dry density. Do not compact closer than 1.8 m (6') from wall with heavy equipment. This may be replaced by on-site material if prefabricated wall drains (Miradrain) extending from the finished grade to the bottom of the basement wall are used.

5. **Do not backfill** until the wall is supported by the basement floor slab and ground floor framing, or adequate bracing.

6. **Dampproofing** of the basement wall is required before backfilling

7. **Impermeable backfill seal** of compacted clay, clayey silt or equivalent. If the original soil in the vicinity is a free-draining sand, the seal may be omitted.

8. **Moisture barrier**: 19-mm CRL or compacted OPSS Granular 'A', or equivalent. The thickness of this layer should be 150 mm (6") minimum.

9. **Exterior Grade**: slope away from basement wall on all the sides of the building.

10. **Slab-On-Grade** should not be structurally connected to walls or foundations.

11. **Underfloor drains*** should be placed in parallel rows at 6 to 8 m (20'-25') centre, on 100 mm (4") of pea gravel with 150 mm (6") of pea gravel on top and sides. The spacing should be at least 300 mm (12") between the underside of the floor slab and the top of the pipe. The drains should be connected to positive sumps or outlets. Do not connect the underfloor drains to the perimeter drains.

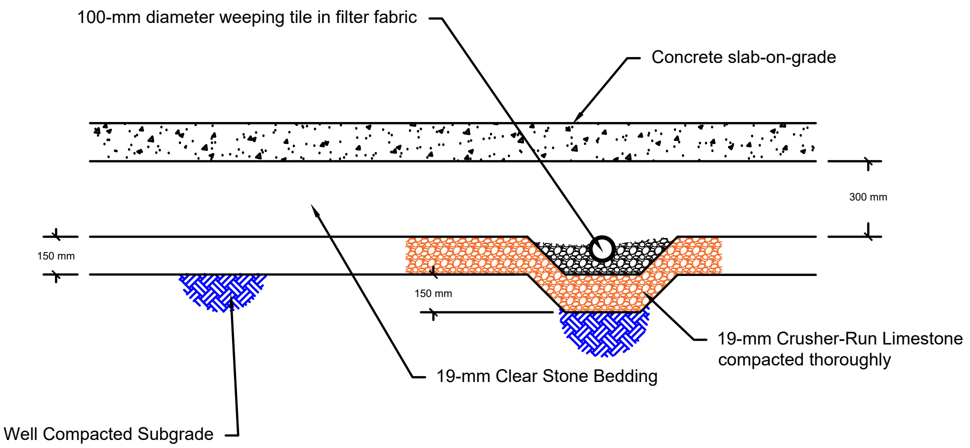
*Underfloor drains can be deleted where not required.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

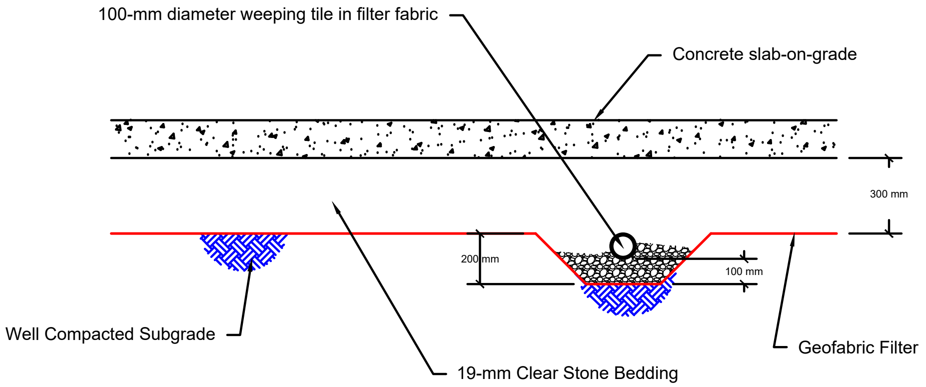
PERMANENT PERIMETER DRAINAGE SYSTEM
(FOR OPEN EXCAVATION)

SITE: SOUTHEAST OF OLD SCHOOL ROAD AND CHINGUACOUSY ROAD
TOWN OF CALEDON

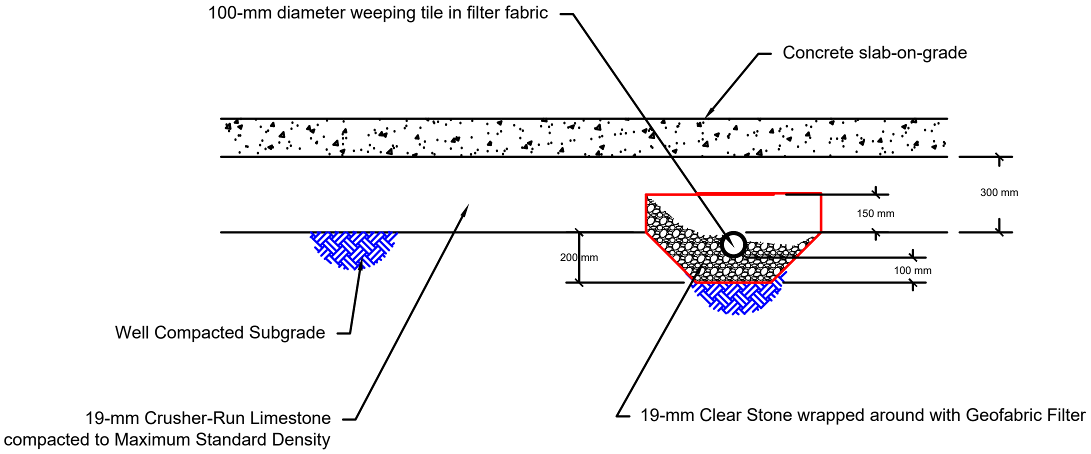
DESIGNED BY: K.L. **CHECKED BY:** B.S. **DWG NO.:** 3
SCALE: N.T.S. **REF. NO.:** 2310-S043 **DATE:** FEBRUARY 2024 **REV** -



Option 'A'



Option 'B'



Option 'C'

Note:

1. Weepers should be placed in 6 m grids, draining in a positive gradient towards an outlet or a sump pit for removal by pumping.
2. A 10-mil polyethylene sheet should be specified between the gravel bedding and concrete slab.

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

DETAILS OF UNDERFLOOR WEEPERS

SITE: SOUTHEAST OF OLD SCHOOL ROAD AND CHINGUACOUSY ROAD
TOWN OF CALEDON

DESIGNED BY: K.L.
CHECKED BY: B.S.
DWG NO.: 4
SCALE: N.T.S.
REF. NO.: 2310-S043
DATE: FEBRUARY 2024
REV -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE 100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL: (416) 754-8515 · FAX: (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	MUSKOKA	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 721-7863	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 721-7864	FAX: (905) 542-2769

APPENDIX

BOREHOLE LOGS BY PECG

REFERENCE NO. 2310-S043

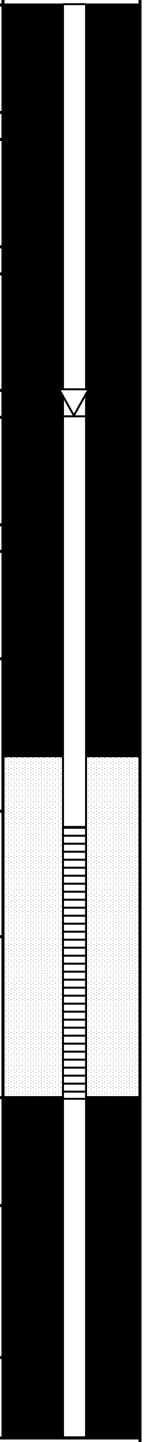
PALMER ENVIRONMENTAL CONSULTING GROUP INC.

BOREHOLE RECORD OF MW-1

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 590926.7 E, 4843008.5 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 13, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 4.57 m - 6.09 m

Depth (mbgs)	Soil Profile Description	Strata	Elevation Depth	Samples Number	Type	Sample Description Recovery (m)	N-Value
0 0.6	Topsoil: clay and silt, some sand, organics, loose, moist, brown	▦		1	SS	0.254 / 0.609	8
0.75 1		▦	267.16 0.84				
1.36	Clayey silt till, some sand, some gravel, very stiff to hard, moist, brown	▩		2	SS	0.432 / 0.609	30
1.52 2 2.13		▩	265.79 2.21	3	SS	0.432 / 0.609	44
2.28 2.89	Medium sand and silt, medium dense to very dense, wet, grey	░		4	SS	0.533 / 0.609	55
3 3.04 3.65		░		5	SS	0.609 / 0.609	26
4 4.57 5 5.18		░		6	SS	0.609 / 0.609	47
6 6.09		░	261.6 6.4	N/A	N/A	N/A	N/A
6.7 7 7.62 8 7.9	Silty clay till, some sand, very dense, moist, red/brown	▩	260.1	7	SS	0.279 / 0.279	83 / 0.28m
	END OF BOREHOLE AT 7.9 m		7.9				

Piezometer Installation



Well Installation Details

Stick Up Height: 0.65 m	**W.L. upon Well Completion (D.):** 2.93 mbtoc, 2.28 mbgs
Ground Elevation: 268 masl	**W.L. upon Well Completion (S.):** N/A

PALMER
ENVIRONMENTAL
CONSULTING
GROUP INC.

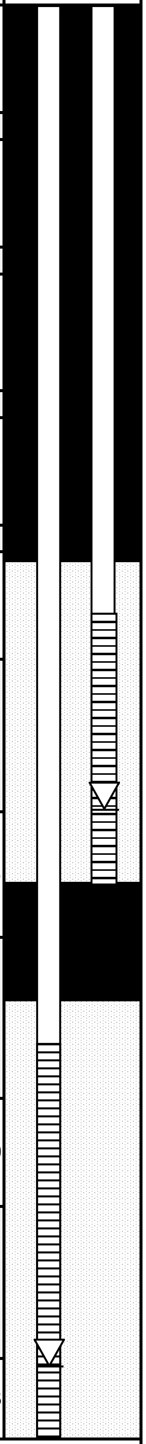
BOREHOLE RECORD OF MW-2 s/d

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 591429.4 E, 4843101.6 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** 3.35 m - 4.88 m
Date: November 13, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 5.79 m - 8.84 m

Soil Profile		
Description	Strata	Elevation Depth
Topsoil: Fine and medium sand and silt, some clay, organics, loose, moist to dry, dark brown	▦	266.55 1.45
Fine to medium sand and silt, medium dense, moist to wet, brown/grey	░	265.76 2.24
Clay, very stiff, cohesive, moist, grey	▤	265.4 2.6
4.11 m - 4.65 m: Gravel with silt matrix, very wet, grey Clayey silt to silty clay till, some sand, gravel and cobbles, very dense, moist, red/brown	▩	

Depth (mbgs)	Samples		Sample Description	
	Number	Type	Recovery (m)	N-Value
0 0.6	1	SS	0.330 / 0.609	7
0.75 1.36	2	SS	0.305 / 0.609	10
1.52 2.13	3	SS	0.609 / 0.609	22
2.28 2.89	4	SS	0.609 / 0.609	28
3.04 3.65	5	SS	0.508 / 0.609	49
4.57 5.18	6	SS	0.356 / 0.381	71 / 0.23
6.09 6.7	7	SS	0.102 / 0.102	50 / 0.10
7.62	8	SS	0.076 / 0.076	50 / 0.08

Piezometer Installation



Depth (mbgs): 1, 2, 3, 4, 5, 6, 7, 8

Well Installation Details

S. Stick Up Height: 0.66 m; **D. Stick Up Height:** 0.75 m	**W.L. upon Well Completion (D.):** 8.35 mbtoc, 7.60 mbgs
Ground Elevation: 268 masl	**W.L. upon Well Completion (S.):** 5.14 mbtoc, 4.48 mbgs

BOREHOLE RECORD OF MW-2 s/d

Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 591429.4 E, 4843101.6 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** 3.35 m - 4.88 m
Date: November 13, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 5.79 m - 8.84 m

Depth (mbgs)	Soil Profile			Samples		Sample Description		Piezometer Installation
	Description	Strata	Elevation Depth	Number	Type	Recovery (m)	N-Value	
8.22	*Continued* Clayey silt to silty clay till, some sand, gravel and cobbles, very dense, moist, red/brown	▨	258.78					
9								
9.14	END OF BOREHOLE AT 9.22 m		9.22	9	SS	0.076 / 0.076	50 / 0.08	
9.75								
10								
10.66								
11								
11.27								
12								
12.19								
12.8								
13								
13.71								
14								
14.32								
15								
15.24								
15.84								
16								

Well Installation Details

S. Stick Up Height: 0.66 m; **D. Stick Up Height**: 0.75 m	**W.L. upon Well Completion (D.):** 8.35 mbtoc, 7.60 mbgs
Ground Elevation: 268 masl	**W.L. upon Well Completion (S.):** 5.14 mbtoc, 4.48 mbgs

BOREHOLE RECORD OF MW-3

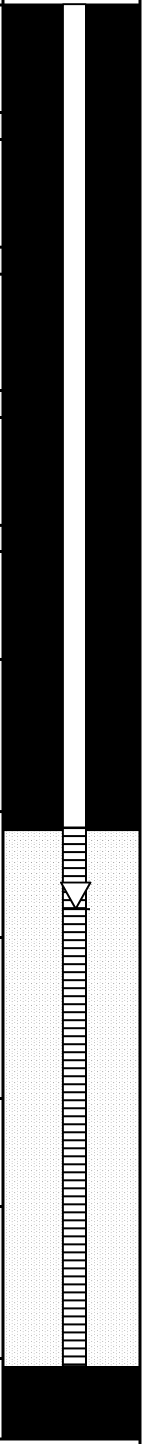
Project: Mayfield West Stage 3	**Drilling Method:** Stolid Stem Augers	**Coordinates:** 591415.3 E, 4842905.2 N
Project #: 170162	**Borehole Diameter:** 0.12 m	**Well Diameter:** 0.0508 m
Location: Caledon, Ontario	**Rig Type:** Marl M-5	**S. Screened Interval:** N/A
Date: November 13, 2017	**Drilling Contractor:** DrillTech	**D. Screened Interval:** 4.57 m - 7.62 m

Soil Profile			
Description	Strata	Elevation	Depth
Topsoil: silt and fine sand, some clay, some organics, loose, moist to wet, brown *1.12 m: soils turn grey*	▦	261.55	1.45
Fine sand and silt, some clay, laminae, medium dense, wet, grey	░	260.64	2.36
Clay, some silt, cohesive, hard, wet, grey	▤	260.38	2.62
Silty sand to silty clay till, gravel and cobbles, dense to very dense, moist, red/brown	▩	255.08	7.92

END OF BOREHOLE AT 7.92 m

Depth (mbgs)	Samples		Sample Description	
	Number	Type	Recovery (m)	N-Value
0 – 0.6	1	SS	0.254 / 0.609	5
0.75 – 1.36	2	SS	0.483 / 0.609	7
1.52 – 2.13	3	SS	0.584 / 0.609	22
2.28 – 2.89	4	SS	0.533 / 0.609	27
3.04 – 3.65	5	SS	0.609 / 0.609	47
4.57 – 5.18	6	SS	0.381 / 0.609	37
6.09 – 6.7	7	SS	0.279 / 0.279	73 / 0.28
7.62 – 7.92	8	SS	0.305 / 0.305	59

Piezometer Installation



Well Installation Details

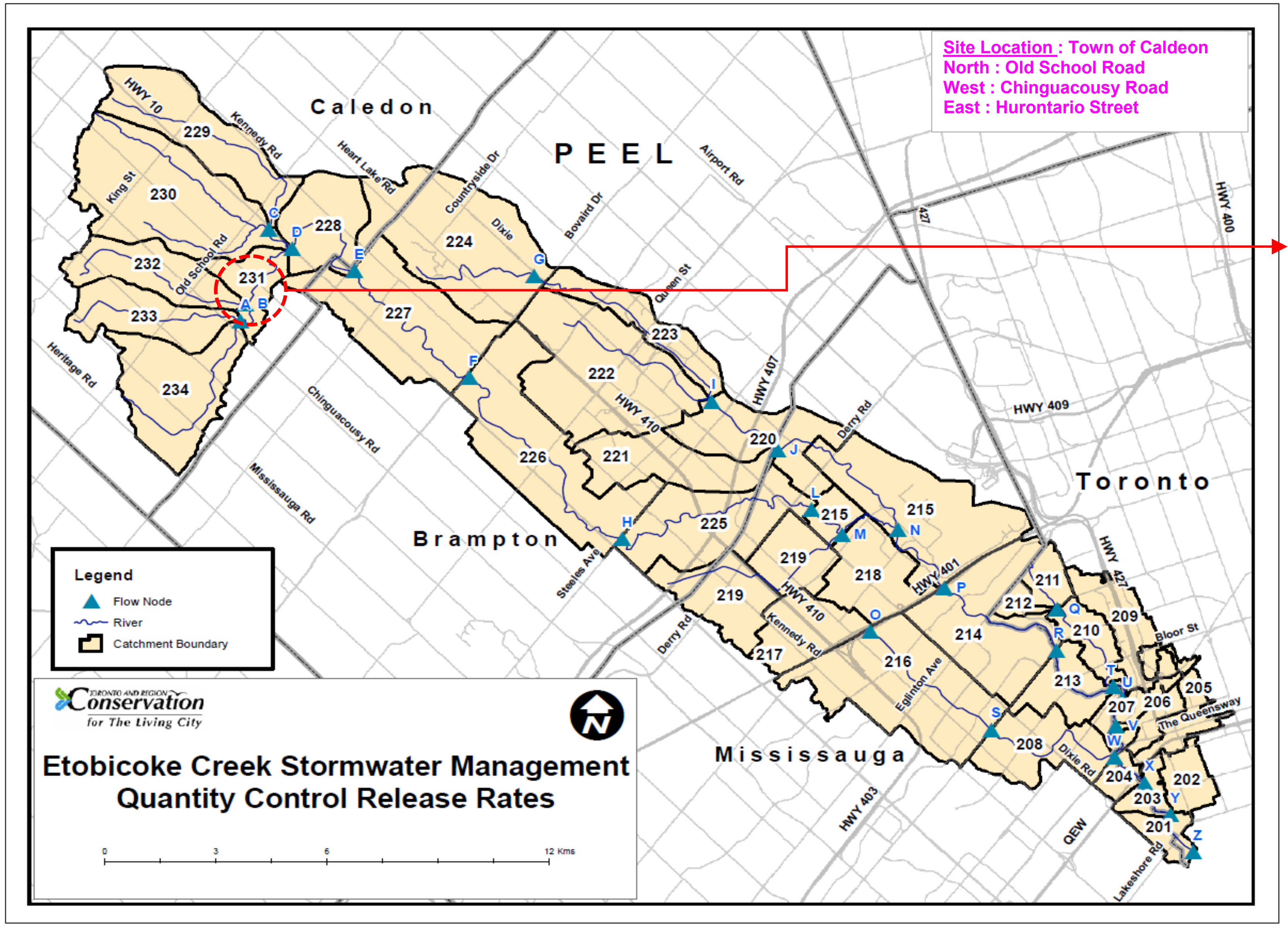
Stick Up Height: 0.75 m	**W.L. upon Well Completion (D.):** 5.80 mbtoc, 5.05 mbgs
Ground Elevation: 263 masl	**W.L. upon Well Completion (S.):** N/A

APPENDIX D

HYDROGEOLOGICAL REPORT

APPENDIX E

PRELIMINARY STORM WATER MANAGEMENT CALCULATIONS



Etobicoke Creek Stormwater Management Quantity Control Release Rates

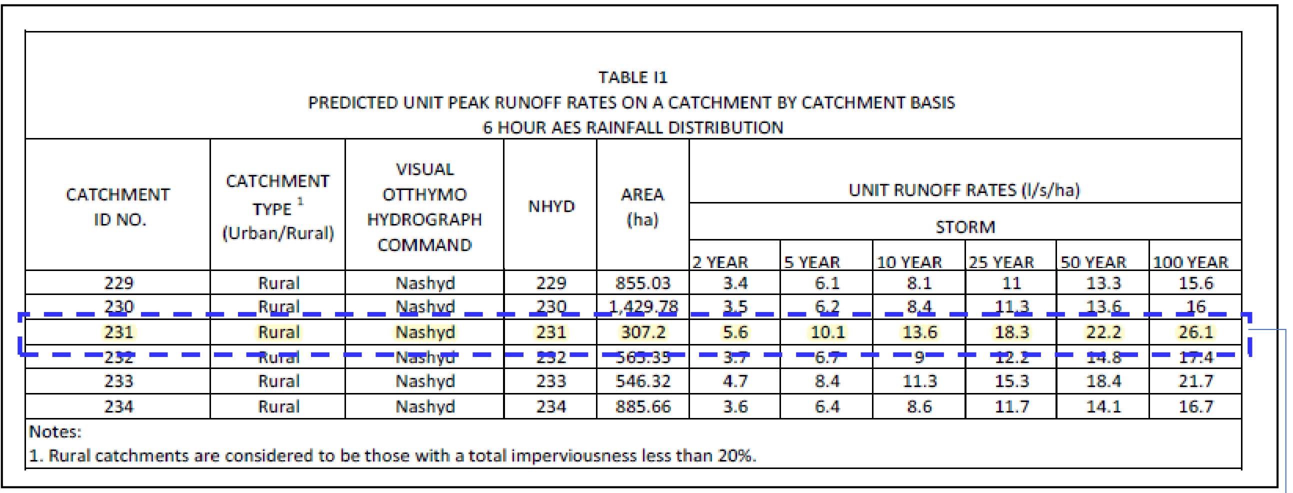


TABLE I1
PREDICTED UNIT PEAK RUNOFF RATES ON A CATCHMENT BY CATCHMENT BASIS
6 HOUR AES RAINFALL DISTRIBUTION

CATCHMENT ID NO.	CATCHMENT TYPE [1] (Urban/Rural)	VISUAL OTTHYMO HYDROGRAPH COMMAND	NHYD	AREA (ha)	UNIT RUNOFF RATES (l/s/ha)					
					STORM					
					2 YEAR	5 YEAR	10 YEAR	25 YEAR	50 YEAR	100 YEAR
229	Rural	Nashyd	229	855.03	3.4	6.1	8.1	11	13.3	15.6
230	Rural	Nashyd	230	1,429.78	3.5	6.2	8.4	11.3	13.6	16
231	Rural	Nashyd	231	307.2	5.6	10.1	13.6	18.3	22.2	26.1
232	Rural	Nashyd	232	565.35	3.7	6.7	9	12.2	14.8	17.4
233	Rural	Nashyd	233	546.32	4.7	8.4	11.3	15.3	18.4	21.7
234	Rural	Nashyd	234	885.66	3.6	6.4	8.6	11.7	14.1	16.7

Notes:
1. Rural catchments are considered to be those with a total imperviousness less than 20%.

Table extracted from TRCA SWM Criteria Manual (August Version 2012)

SWM Pond No.	Pond Area	Unit Runoff Rates (L/s/Ha)					
		2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
	(Ha)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)	(L/s)
		5.6	10.1	13.6	18.3	22.2	26.1
1	2.30	13	23	31	42	51	60
2	9.34	52	94	127	171	207	244
3	8.79	49	89	120	161	195	229
4	33.72	189	341	459	617	748	880
5	18.01	101	182	245	330	400	470
6	7.94	44	80	108	145	176	207
7	2.99	17	30	41	55	66	78
8	11.66	65	118	159	213	259	304

Drainage Area vs Landuse Type Breakdown (Pond P1)

Total Site Area draining to Proposed SWM Pond = 2.30 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	0	
Low/Medium-Density Residential	60%	0.50	2.02	
High-Density Residential	80%	0.75	0	
School	80%	0.75	0	
SWM Pond Area	100%	0.90	0.29	
		Total Catchment Area =	**2.30**	**Ha**
		Composite Imperviousness =	**65%**	

MOECP Requirements (@ 65% Imp) = 213.33 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 491.33 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)
262.50	24	23	47				
				110	0.50	55	
263.00	89	84	173				55
				568	1.00	568	
264.00			**963**				**623**
264.00			963				0
				1263	1.00	1263	
265.00			1563				1263
				1915	1.00	1915	
266.00			2267				3178

Permanent Pool Storage

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 2.30 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 15.289 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **352** **m^3**

25mm Volume Provided = 379 **m^3**

(@ Elv = 264.30m)

Drainage Area vs Landuse Type Breakdown (Pond P2)

Total Site Area draining to Proposed SWM Pond = 9.34 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	1.070	
Low/Medium-Density Residential	60%	0.50	5.354	
High-Density Residential	80%	0.75	2.035	
School	80%	0.75	0.000	
SWM Pond Area	100%	0.90	0.880	
		Total Catchment Area =	**9.34**	**Ha**
		Composite Imperviousness =	**62%**	

MOECP Requirements (@ 62% Imp) = 207.3 m^3/ha

167.3 m^3/ha (Excludes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 1,562.1 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
262.50	103	257	360					
				680	1.00	680		
263.50	436	565	1000				680	
				2013	0.50	1007		
264.00			**3026**				**1687**	**Permanent Pool Storage**
264.00			3026				0	
				4003	1.00	4003		
265.00			4979				4003	
				5692	1.00	5692		
266.00			6405				9694	
				6840	0.50	3420		
266.50			7275				13114	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 9.34 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 14.992 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **1,400 m^3**

25mm Volume Provided = 1,601 **m^3**

(@ Elv = 264.40m)

Drainage Area vs Landuse Type Breakdown (Pond P3)

Total Site Area draining to Proposed SWM Pond = 8.79 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	0.000	
Low/Medium-Density Residential	60%	0.50	5.028	
High-Density Residential	80%	0.75	2.694	
School	80%	0.75	0.000	
SWM Pond Area	100%	0.90	1.070	
		Total Catchment Area =	**8.79**	**Ha**
		Composite Imperviousness =	**71%**	

MOECP Requirements (@ 71% Imp) = 227.3 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 1,998 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
256.50	931	1155	2086					
				2378	0.50	1189		
257.00	1183	1487	2670				1189	
				3844	1.00	3844		
258.00			**5017**				**5033**	**Permanent Pool Storage**
258.00			5017				0	
				5917	1.00	5917		
259.00			6818				5917	
				7591	1.00	7591		
260.00			8364				13508	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 8.79 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 16.772 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **1,474 m^3**

25mm Volume Provided = 1,479 m^3

(@ Elv = 258.25m)

Drainage Area vs Landuse Type Breakdown (Pond P4)

Total Site Area draining to Proposed SWM Pond = 33.72 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	5.800	
Low/Medium-Density Residential	60%	0.50	19.053	
High-Density Residential	80%	0.75	4.292	
Elementary School	80%	0.75	2.890	
SWM Pond Area	100%	0.90	1.680	
		Total Catchment Area =	**33.72**	**Ha**
		Composite Imperviousness =	**58%**	

MOECP Requirements (@ 58% Imp) = 196.2 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 6,615 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
256.00	1199	2225	3424					
				4251	1.00	4251		
257.00	1780	3298	5078				4251	
				6400	1.00	6400		
258.00			**7722**				**10650**	**Permanent Pool Storage**
258.00			7722				0	
				8577	1.00	8577		
259.00			9433				8577	
				10174	1.00	10174		
260.00			10915				18751	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 33.72 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 14.004 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **4,722 m^3**

25mm Volume Provided = 4,972 **m^3**

(@ Elv = 258.58m)

Drainage Area vs Landuse Type Breakdown (Pond P5)

Total Site Area draining to Proposed SWM Pond = 18.01 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	3.49	
Commercial	95%	0.90	1.40	
Low/Medium-Density Residential	60%	0.50	8.71	
High-Density Residential	80%	0.75	3.31	
Elementary School	80%	0.75	0.00	
SWM Pond Area	100%	0.90	1.10	
		Total Catchment Area =	**18.01**	**Ha**
		Composite Imperviousness =	**59%**	

MOECP Requirements (@ 59% Imp) = 199.7 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 3,597 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
254.00	588	1082	1670					
				2215	1.00	2215		
255.00	1048	1710	2759				2215	
				3793	1.00	3793		
256.00			**4827**				**6007**	**Permanent Pool Storage**
256.00			4827				0	
				5618	1.00	5618		
257.00			6409				5618	
				7244	1.00	7244		
258.00			8080				12862	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 18.01 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 14.146 mm (Refer to VO Results)
(R. V x Drainage Area)

25mm Volume Required = **2,548 m^3**

25mm Volume Provided = 2,809 **m^3**

(@ Elv = 264.50m)

Drainage Area vs Landuse Type Breakdown (Pond P6)

Total Site Area draining to Proposed SWM Pond = 7.94 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	0.40	
Commercial	95%	0.90	3.51	
Low/Medium-Density Residential	60%	0.50	2.56	
High-Density Residential	80%	0.75	0.82	
Elementary School	80%	0.75	0.00	
SWM Pond Area	100%	0.90	0.65	
		Total Catchment Area =	**7.94**	**Ha**
		Composite Imperviousness =	**78%**	

MOECP Requirements (@ 78% Imp) = 238.8 m^3/ha

198.8 m^3/ha (Excludes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 1,579 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
260.50	59	209	267					
				537	0.50	269		
261.00	258	549	807				269	
				1501	1.00	1501		
262.00			**2194**				**1769**	**Permanent Pool Storage**
262.00			2194				0	
				2664	1.00	2664		
263.00			3134				2664	
				3631	1.00	3631		
264.00			4129				6295	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 7.94 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 17.101 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **1,358** **m^3**

25mm Volume Provided = 1,465 **m^3**

(@ Elv = 262.55m)

Drainage Area vs Landuse Type Breakdown (Pond 7)

Total Site Area draining to Proposed SWM Pond = 2.99 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	0.00	
Low/Medium-Density Residential	60%	0.50	2.70	
High-Density Residential	80%	0.75	0.00	
Elementary School	80%	0.75	0.00	
SWM Pond Area	100%	0.90	0.29	
		Total Catchment Area =	**2.99**	**Ha**
		Composite Imperviousness =	**64%**	

MOECP Requirements (@ 64% Imp) = 210.8 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 631 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
259.00			58					
				169	1.00	169		
260.00			281				169	
				659	1.00	659		
261.00			**1036**				**828**	**Permanent Pool Storage**
261.00			1036				0	
				1322	1.00	1322		
262.00			1608				1322	
				1800	0.50	900		
262.50			1992				2222	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 2.99 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 15.021 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **450 m^3**

25mm Volume Provided = 463 **m^3**

(@ Elv = 261.35m)

Drainage Area vs Landuse Type Breakdown (Pond P8)

Total Site Area draining to Proposed SWM Pond = 11.66 Ha

Catchment Type	Typical Imperviousness	Typical Run-Off "C"	Area (Ha)	
Park/Open Space	10%	0.25	0.00	
Low/Medium-Density Residential	60%	0.50	8.82	
High-Density Residential	75%	0.75	1.64	
Elementary School	80%	0.75	0.00	
SWM Pond Area	100%	0.90	1.20	
		Total Catchment Area =	**11.66**	**Ha**
		Composite Imperviousness =	**66%**	

MOECP Requirements (@ 66% Imp) = 216.2 m^3/ha (Includes 40m^3/ha Extended Detention)

Permanent Pool Volume Requirement = 2,520 m^3

Elevations (m)	Forebay Area (m^2)	Main Cell Area (m^2)	Total Area (m^2)	Average Area (m^2)	Depth (m)	Delta Volume (m^3)	Total Volume (m^3)	
260.00	553	1040	1593					
				1957	1.00	1957		
261.00	1141	1179	2320				1957	
				3684	1.00	3684		
262.00			**5048**				**5641**	**Permanent Pool Storage**
262.00			5048				0	
				5932	1.00	5932		
263.00			6817				5932	
				7721	1.00	7721		
264.00			8625				13653	**Total Active Storage**

TRCA's 25mm Erosion Control Requirement

Contributing Drainage Area (ha) = 11.66 Ha

25mm 4Hr Chicago Post Development Runoff Volume in Depth = 15.772 mm (Refer to VO Results)

(R. V x Drainage Area)

25mm Volume Required = **1,839 m^3**

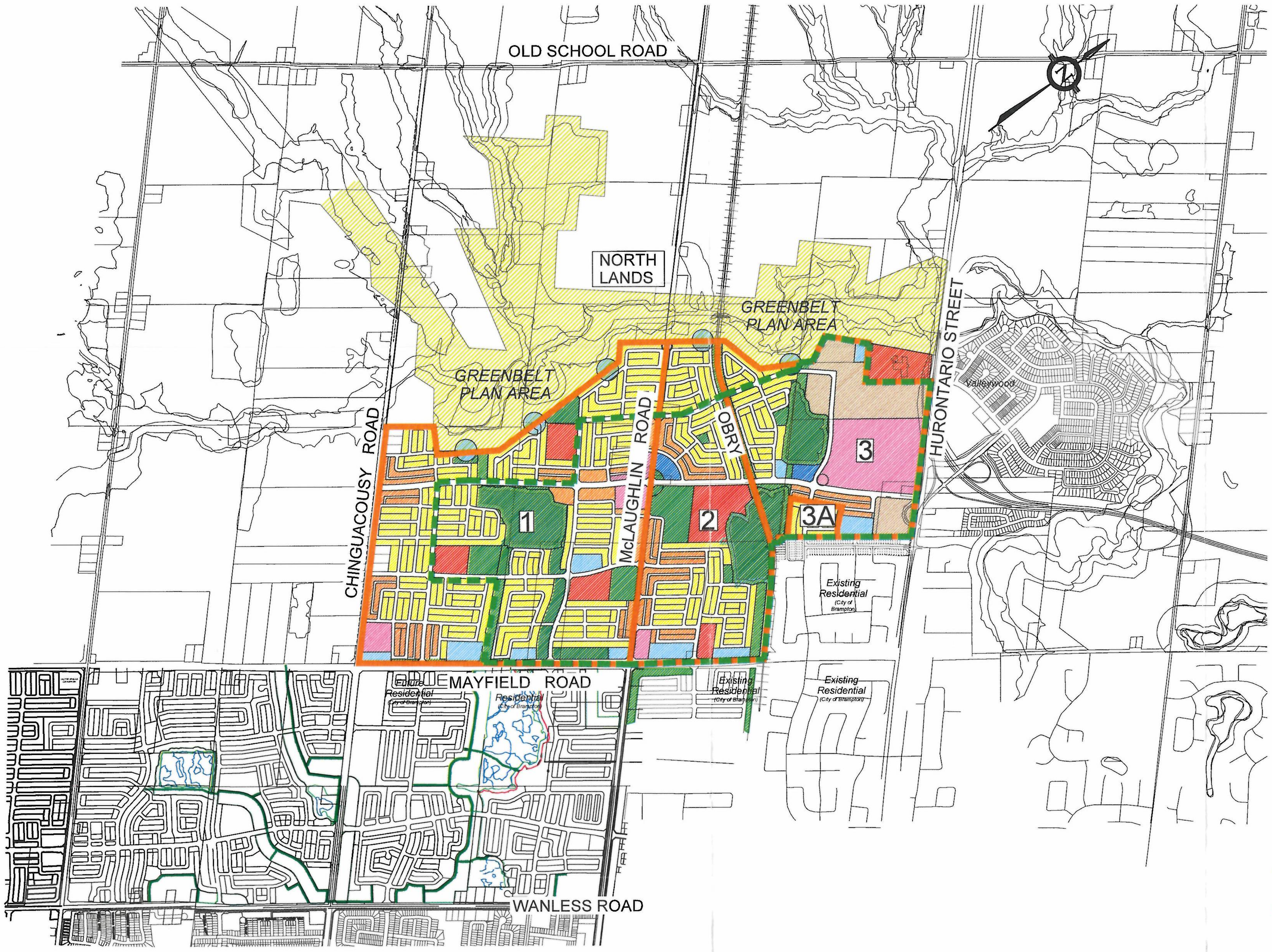
25mm Volume Provided = 2,076 m^3

(@ Elv = 262.35m)

APPENDIX F

REFERENCE PLANS

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg,   Layout : FIG 4   Date :Jan 13, 2014 - 4:21pm,   Edit By : cwilson



LEGEND

- STAGE 1 BOUNDARY
- SERVICING AREAS
- 1 SERVICING AREA LABELS

TMIG
The Municipal Infrastructure Group Ltd

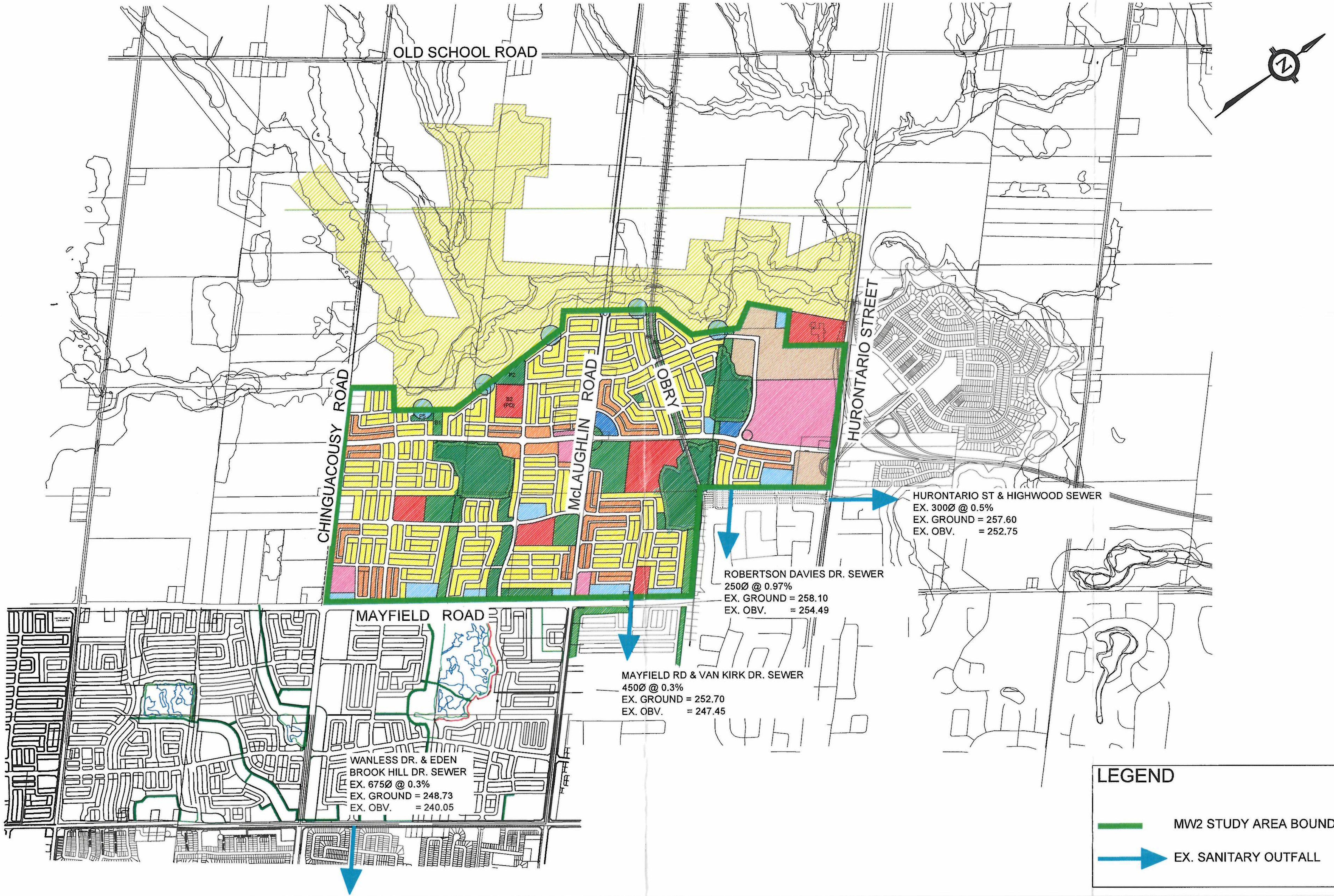
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
SERVICING AREAS

SCALE: N.T.S.
DATE: JANUARY 2014
DESIGNED BY: B.A.
DRAWN BY: CAD
CHECKED BY: D.S.
CHECKED BY: B.A.
PROJECT No. 08105
FIGURE No. 4

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg,   Layout : FIG 5   Date :Jan 13, 2014 - 4:21pm,   Edit By : cwilson



TMIG
The Municipal Infrastructure Group Ltd

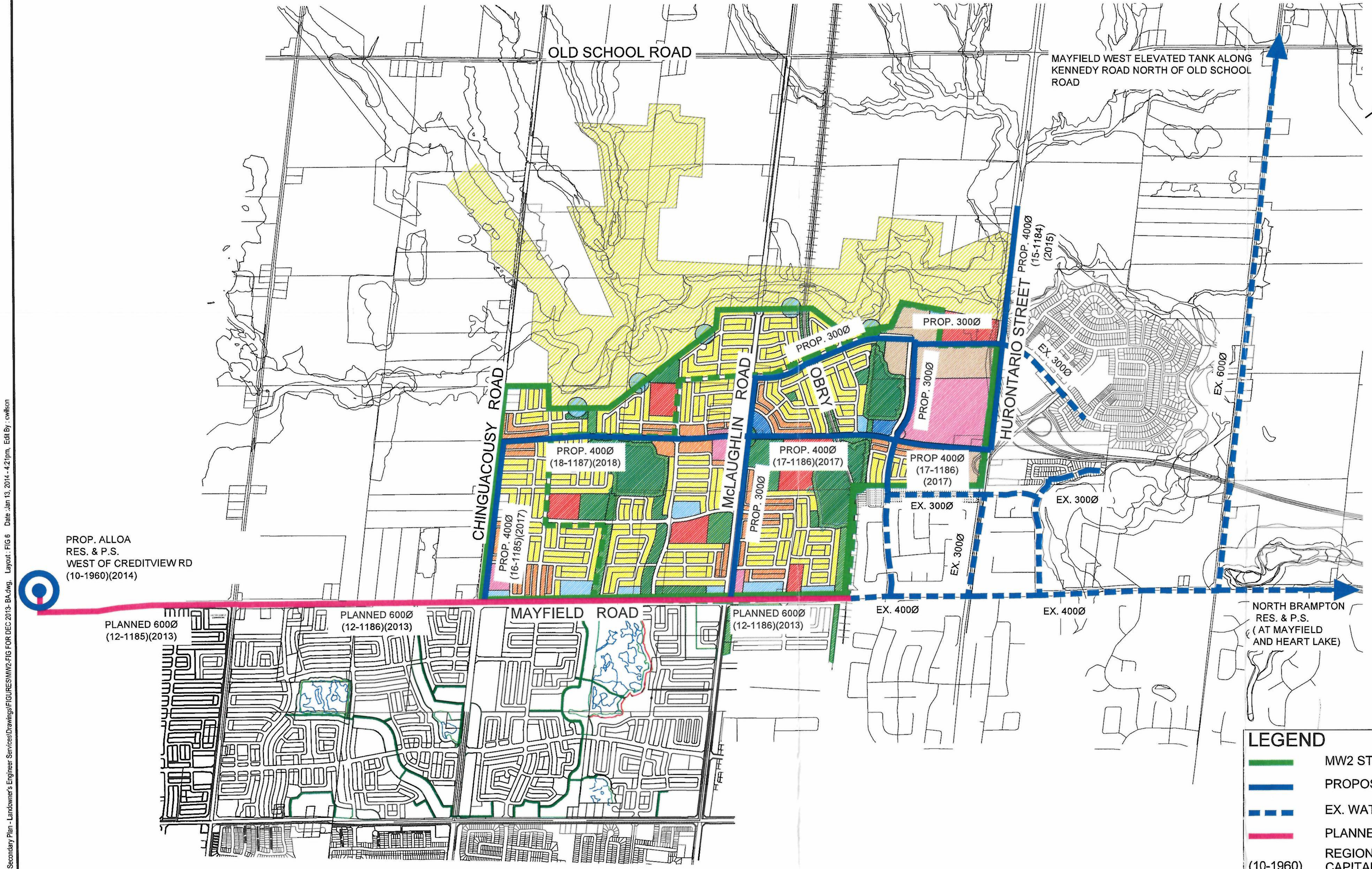
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
EXISTING WASTEWATER SERVICING PLAN

SCALE:	N.T.S.		PROJECT No. 08105
DATE:	JANUARY 2014		
DESIGNED BY: B.A.	DRAWN BY: CAD		FIGURE No. 5
CHECKED BY: D.S.	CHECKED BY: B.A.		

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg,   Layout : FIG 6   Date :Jan 13, 2014 - 4:21pm,   Edit By : cwilson



LEGEND

🟩	MW2 STUDY AREA BOUNDARY
🟦	PROPOSED WATERMAIN
▬ ▬	EX. WATERMAIN
🟥	PLANNED 600Ø WATERMAIN
(10-1960)	REGION OF PEEL 10 YEAR CAPITAL WOKS PLAN PROJECT NUMBER

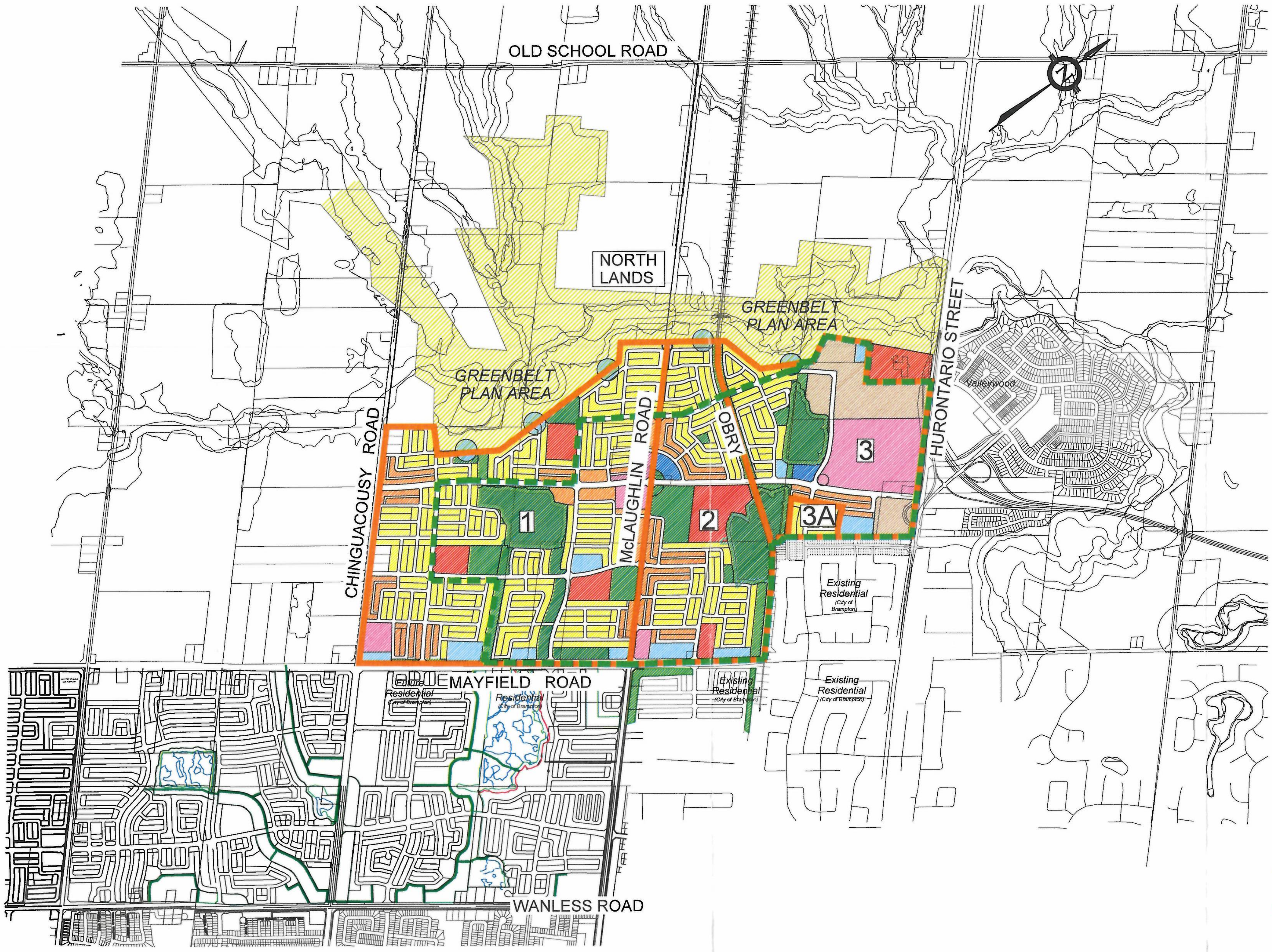
TMIG
The Municipal Infrastructure Group Ltd

8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE 2 SECONDARY PLAN
RECOMMENDED WATER SERVICING CONCEPT PLAN (ZONE7)

SCALE: N.T.S.		PROJECT No.	08105
DATE: JANUARY 2014			
DESIGNED BY: B.A.	DRAWN BY: CAD	FIGURE No.	6
CHECKED BY: D.S.	CHECKED BY: B.A.		



LEGEND

🟩 STAGE 1 BOUNDARY

🟧 SERVICING AREAS

1 SERVICING AREA LABELS

TMIG
The Municipal Infrastructure Group Ltd

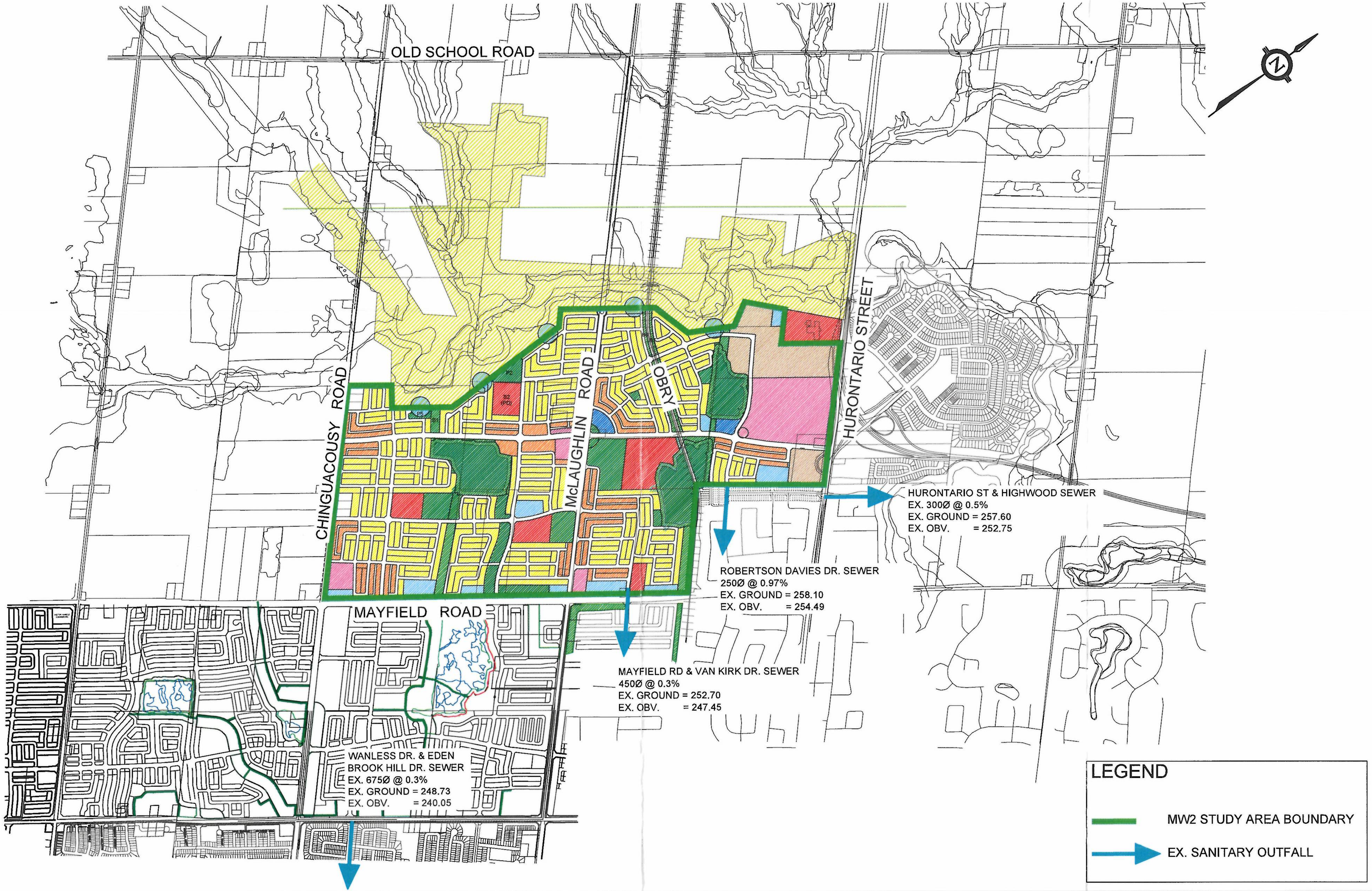
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
SERVICING AREAS

SCALE: N.T.S.		PROJECT No. 08105
DATE: JANUARY 2014		
DESIGNED BY: B.A.	DRAWN BY: CAD	FIGURE No. 4
CHECKED BY: D.S.	CHECKED BY: B.A.	

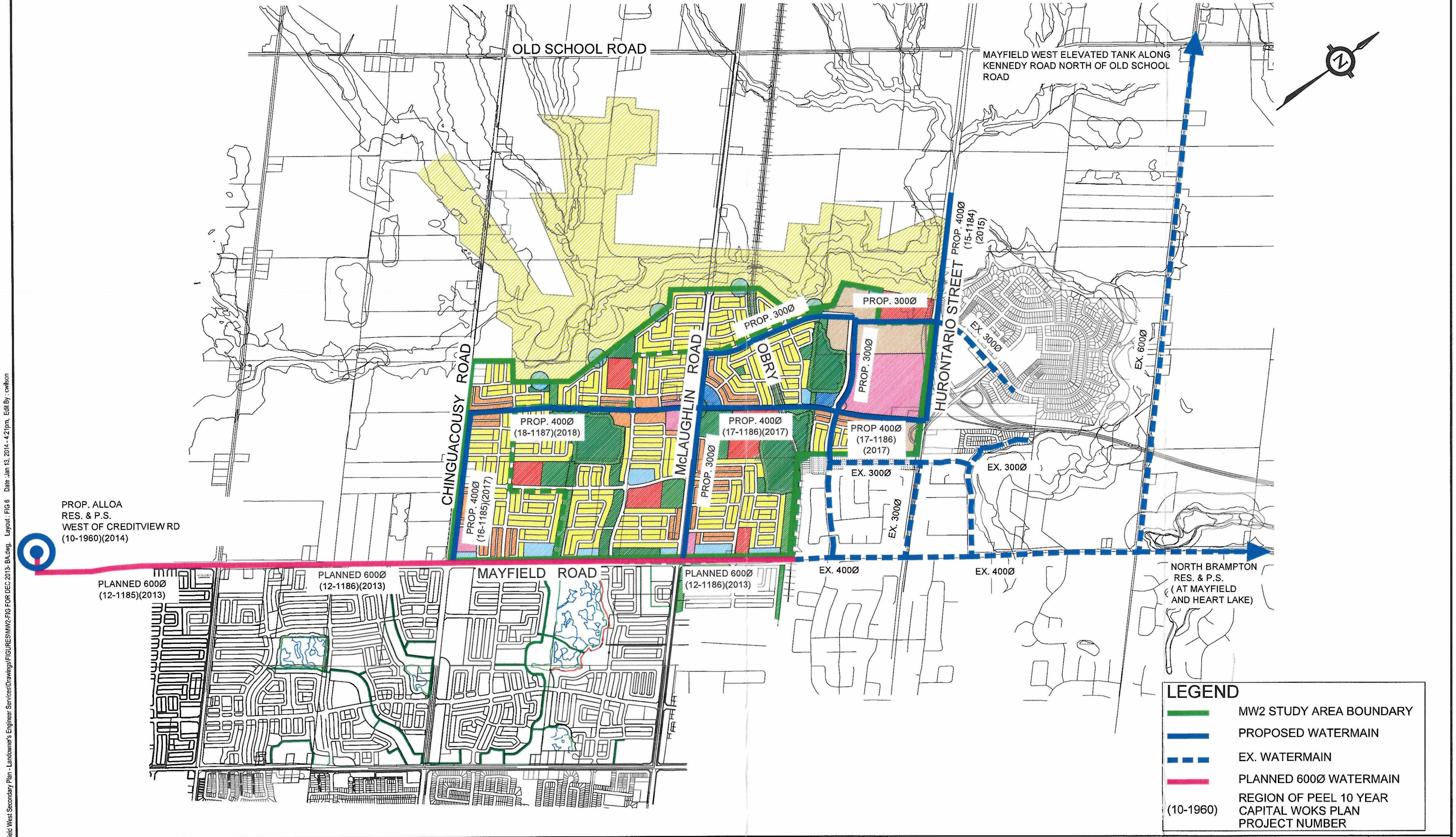
File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 4 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson



TMIG
The Municipal Infrastructure Group Ltd
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5
p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
EXISTING WASTEWATER SERVICING PLAN

SCALE: N.T.S.
DATE: JANUARY 2014
DESIGNED BY: B.A. DRAWN BY: CAD
CHECKED BY: D.S. CHECKED BY: B.A.
PROJECT No. 08105
FIGURE No. 5



LEGEND

🟩	MW2 STUDY AREA BOUNDARY
━	PROPOSED WATERMAIN
┅	EX. WATERMAIN
🟥	PLANNED 600Ø WATERMAIN
(10-1960)	REGION OF PEEL 10 YEAR CAPITAL WOKS PLAN PROJECT NUMBER

TMIG
The Municipal Infrastructure Group Ltd

8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE 2 SECONDARY PLAN
RECOMMENDED WATER SERVICING CONCEPT PLAN (ZONE7)

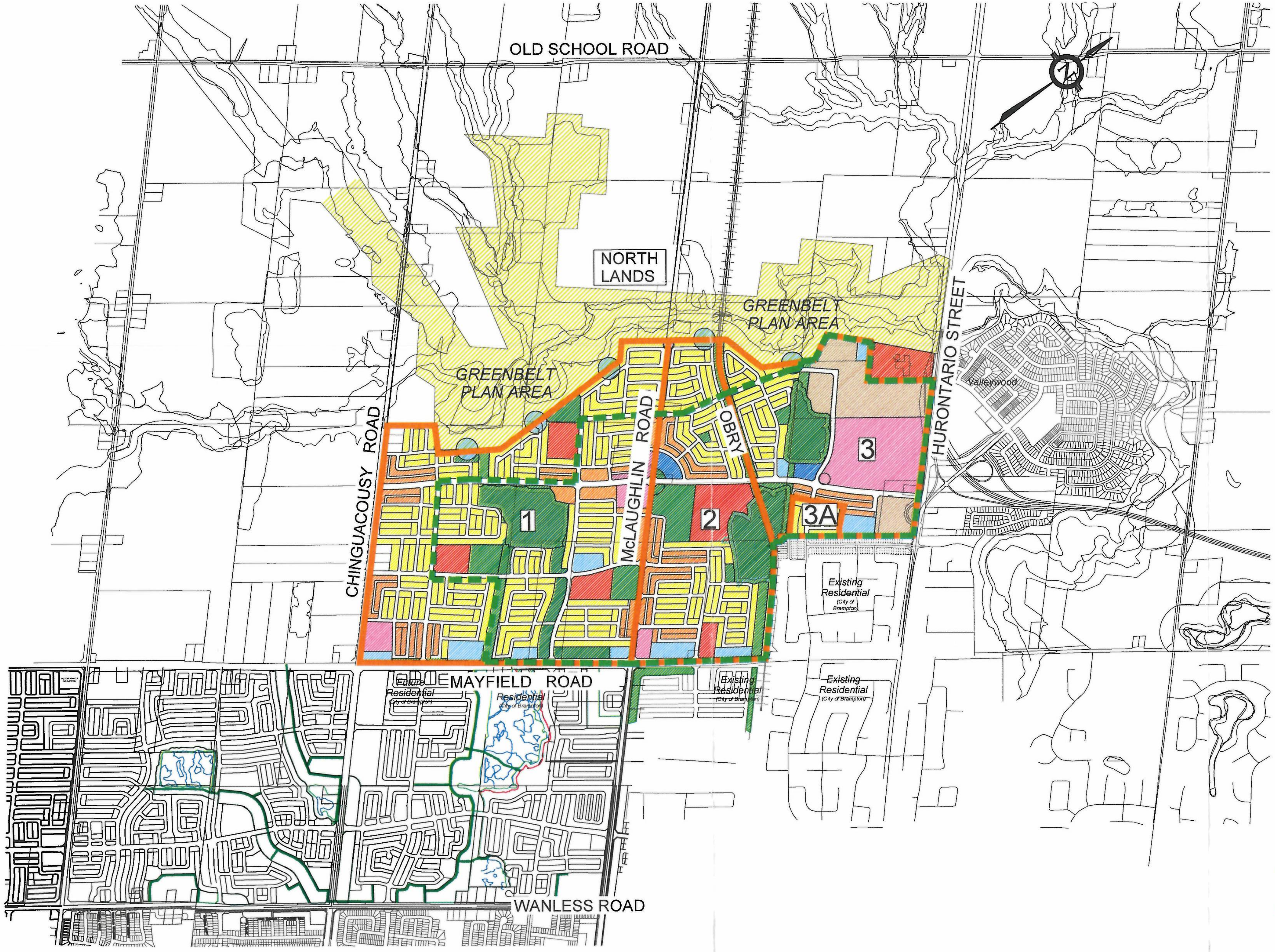
SCALE: N.T.S.			PROJECT No. 08105
DATE: JANUARY 2014			
DESIGNED BY: B.A.	DRAWN BY: CAD		FIGURE No. 6
CHECKED BY: D.S.	CHECKED BY: B.A.		

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 6 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson

APPENDIX F

REFERENCE PLANS

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg,   Layout : FIG 4   Date :Jan 13, 2014 - 4:21pm,   Edit By : cwilson



LEGEND

▬ ▬ ▬	STAGE 1 BOUNDARY
▬▬▬	SERVICING AREAS
1	SERVICING AREA LABELS

TMIG
The Municipal Infrastructure Group Ltd

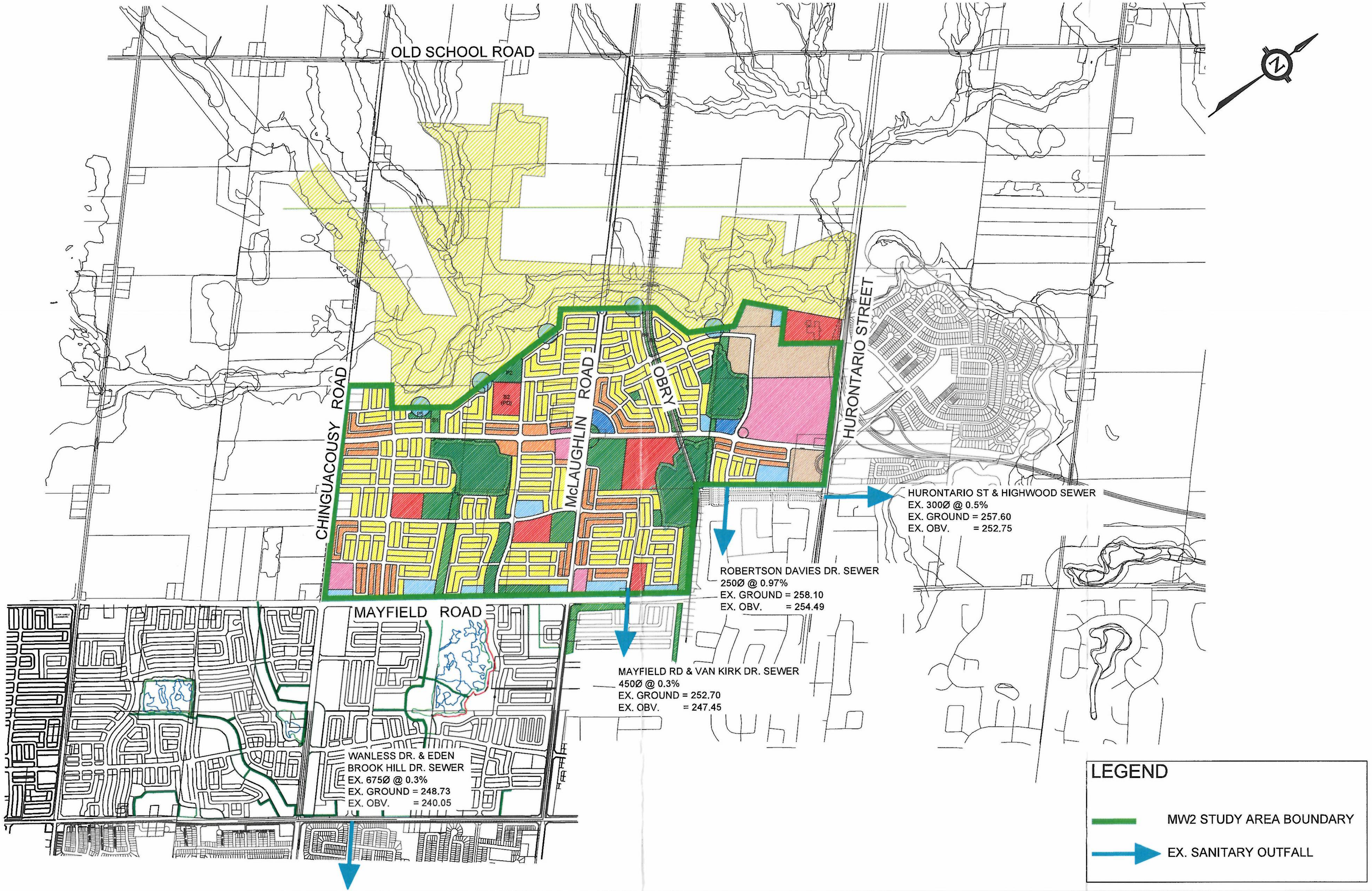
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
SERVICING AREAS

SCALE: N.T.S.		PROJECT No.	08105
DATE: JANUARY 2014			
DESIGNED BY: B.A.	DRAWN BY: CAD	FIGURE No.	4
CHECKED BY: D.S.	CHECKED BY: B.A.		

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg,   Layout : FIG 5   Date :Jan 13, 2014 - 4:21pm,   Edit By : cwilson

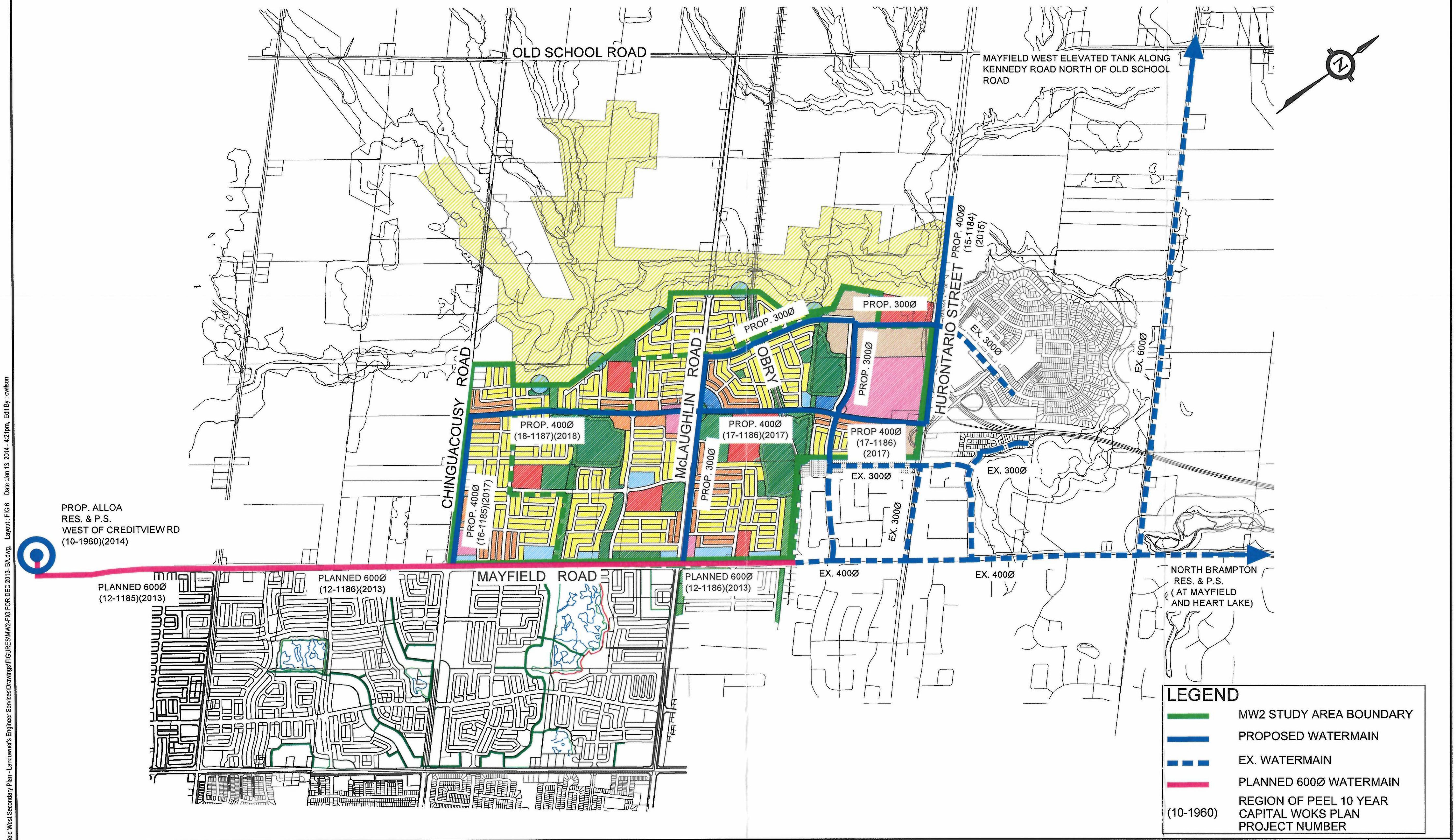


TMIG
The Municipal Infrastructure Group Ltd
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5
p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
EXISTING WASTEWATER SERVICING PLAN

SCALE: N.T.S.
DATE: JANUARY 2014
DESIGNED BY: B.A. DRAWN BY: CAD
CHECKED BY: D.S. CHECKED BY: B.A.
PROJECT No. 08105
FIGURE No. 5

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 6 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson



TMIG
The Municipal Infrastructure Group Ltd

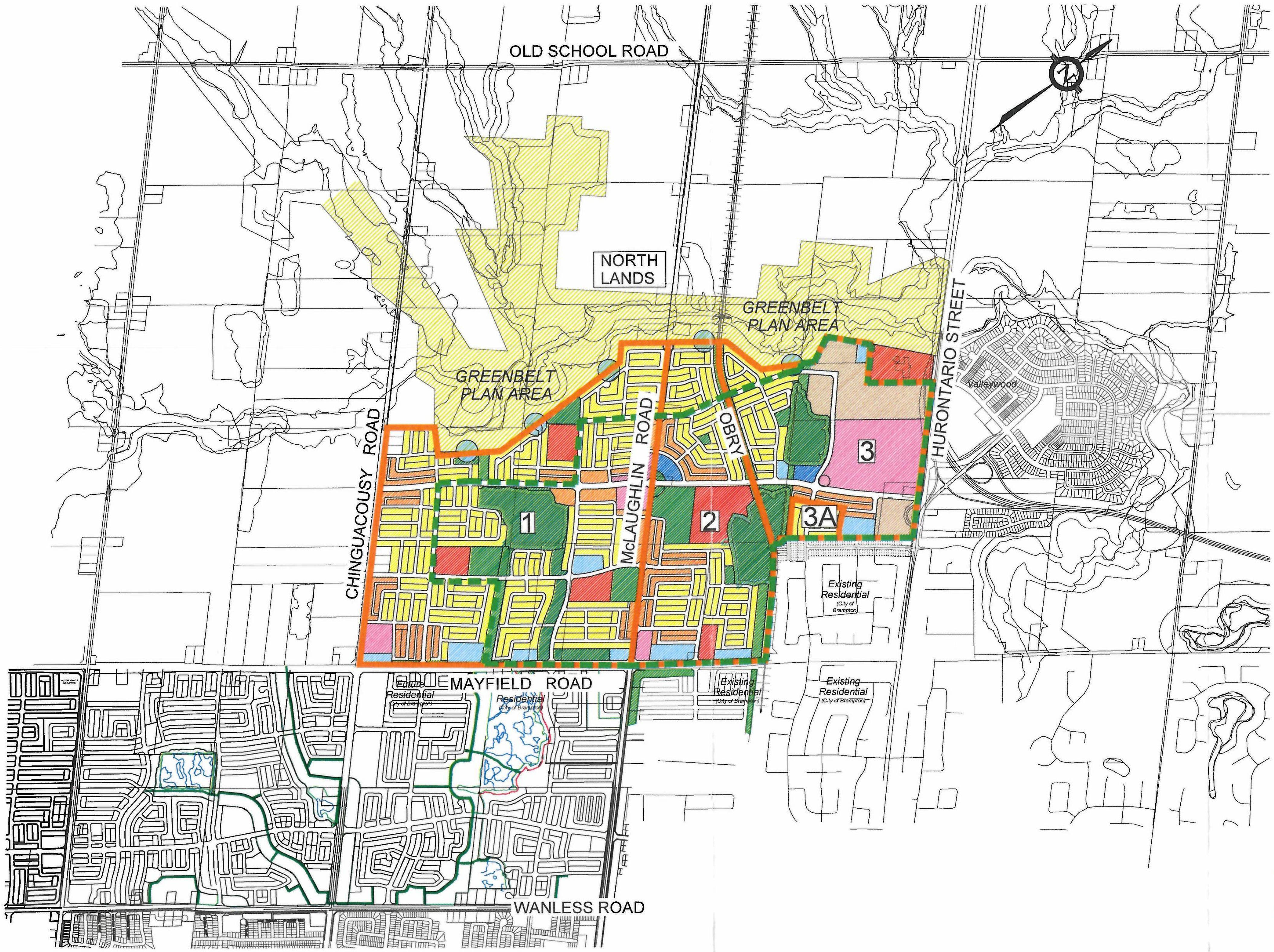
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE 2 SECONDARY PLAN
RECOMMENDED WATER SERVICING CONCEPT PLAN (ZONE7)

SCALE: N.T.S.
DATE: JANUARY 2014
DESIGNED BY: B.A.
DRAWN BY: CAD
CHECKED BY: D.S.
CHECKED BY: B.A.
PROJECT No. 08105
FIGURE No. 6

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 4 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson



LEGEND

▪ ▪ ▪	STAGE 1 BOUNDARY
▬	SERVICING AREAS
1	SERVICING AREA LABELS

TMIG
The Municipal Infrastructure Group Ltd

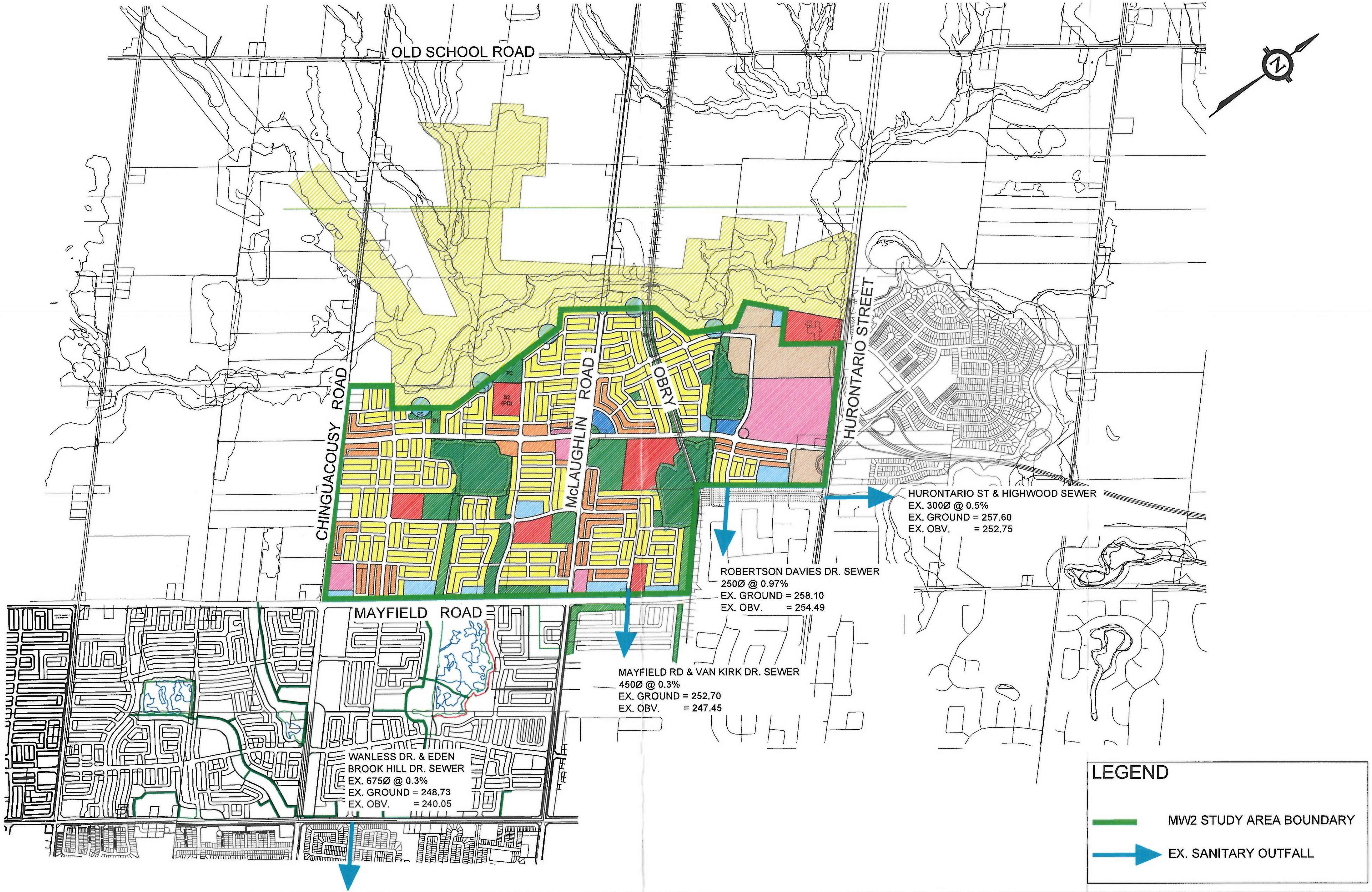
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5

p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
SERVICING AREAS

SCALE: N.T.S.			PROJECT No. 08105
DATE: JANUARY 2014			
DESIGNED BY: B.A.	DRAWN BY: CAD		FIGURE No. 4
CHECKED BY: D.S.	CHECKED BY: B.A.		

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 5 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson



TMIG
The Municipal Infrastructure Group Ltd

8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5
p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE2 SECONDARY PLAN
EXISTING WASTEWATER SERVICING PLAN

SCALE: N.T.S.

DATE: JANUARY 2014

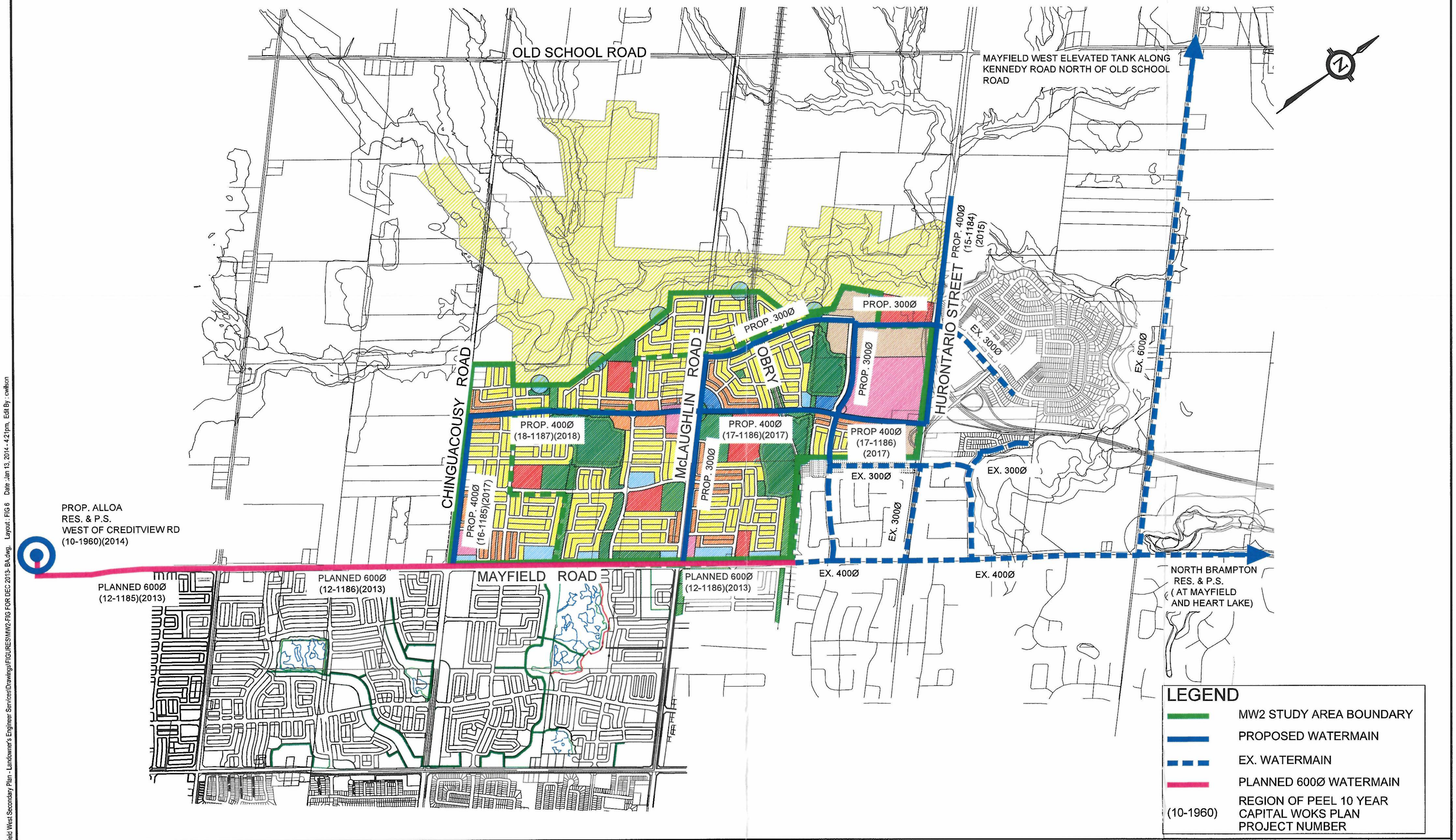
DESIGNED BY: B.A. DRAWN BY: CAD

CHECKED BY: D.S. CHECKED BY: B.A.

PROJECT No. 08105

FIGURE No. 5

File : G:\Projects\2008\08105 - Mayfield West Secondary Plan - Landowner's Engineer Services\Drawings\FIGURES\MW2-FIG FOR DEC 2013- BA.dwg, Layout : FIG 6 Date :Jan 13, 2014 - 4:21pm, Edit By : cwilson



TMIG
The Municipal Infrastructure Group Ltd
8800 Dufferin Street,
Suite 200
Vaughan, ON
L4K 0C5
p: 905.738.5700
f: 905.738.0065

MAYFIELD WEST PHASE 2 SECONDARY PLAN
RECOMMENDED WATER SERVICING CONCEPT PLAN (ZONE7)

SCALE: N.T.S.
DATE: JANUARY 2014
DESIGNED BY: B.A. DRAWN BY: CAD
CHECKED BY: D.S. CHECKED BY: B.A.
PROJECT No. 08105
FIGURE No. 6

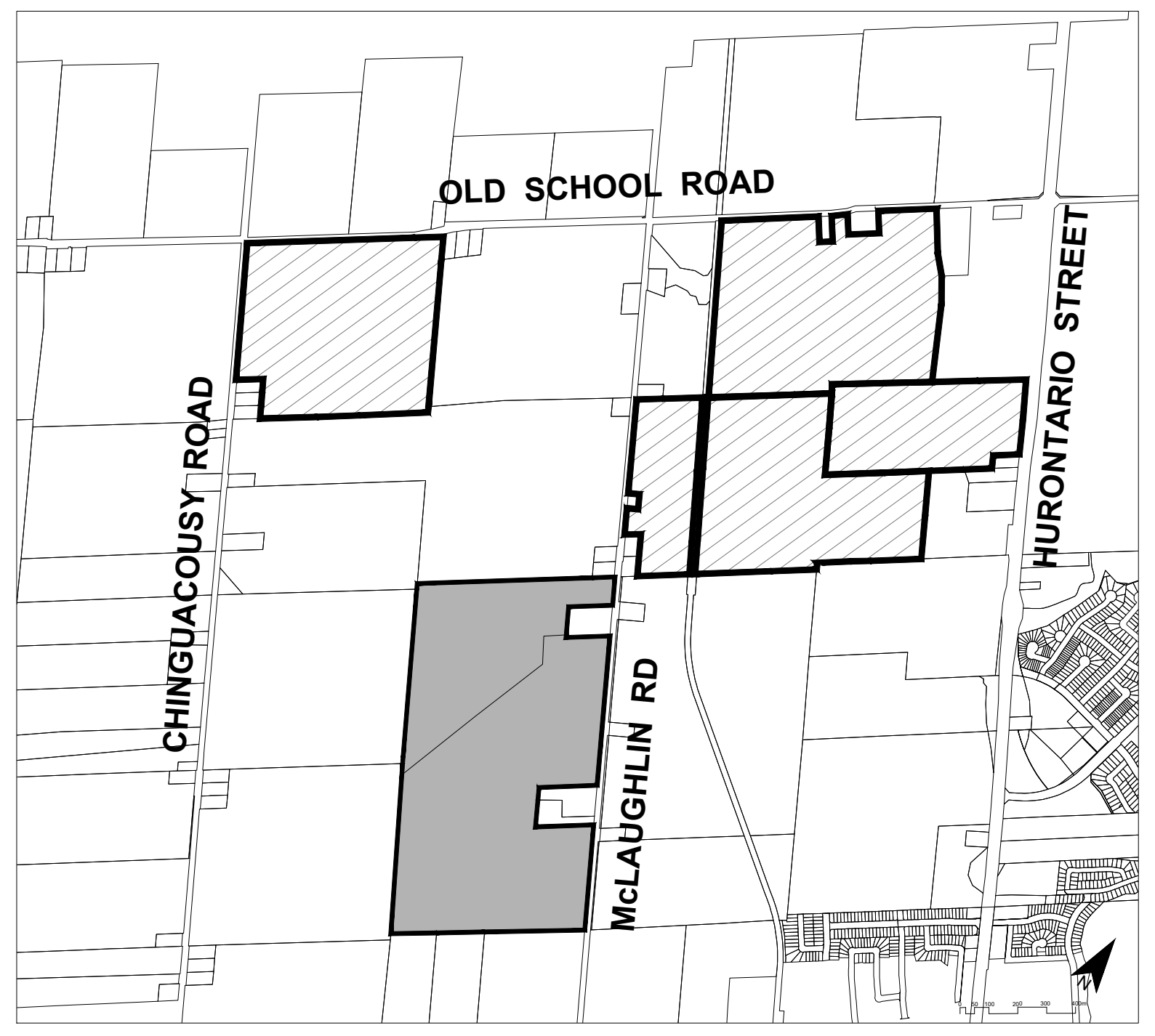
DRAWINGS

DRAFT PLAN OF SUBDIVISION

19T - _____

Part of Lot 21 and 22,
Concession 1 and Part of Lot 22,
Concession 2
West of Hurontario Street,
(Geographic Township of Chinguacousy)
Town of Caledon,
Regional Municipality of Peel

KEY PLAN



▨ SUBJECT PROPERTY
■ OTHER LANDS OWNED BY APPLICANTS

SCHEDULE OF LAND USE

LOT/BLOCK	LAND USE		UNITS	AREA (ha)
1-1031	11.6m x 20.0m Single Detached	+	575	20.87
	9.20m x 28.0m Single Detached	o	456	12.72
1032-1152	6.1m x 28.0m Townhouse Street	x	726	14.43
1153-1157	6.1m x 27.0m Townhouse Lane	=	32	0.66
1158-1160	Medium Density Blocks		630	7.87
1161-1162	Commercial			4.92
1163	Elementary School			2.89
1164-1167	Park			10.80
1168-1175	Storm Water Management Facilty			7.14
1176-1177	Vista / Walkways			0.09
1178-1187	Natural Heritage System			45.17
1188	Future Natural Heritage System			0.03
1189-1226	Future Development / Part Lots		(49)	1.27
1227-1234	Future Roadway/Lane	145 m		0.30
1235-1237	Arterial Road Widening			0.60
1238-1247	0.3m Reserves			0.01
1248	Pumping Station			0.09
Streets A-B	22.0m Road length	1,545 m		3.42
Streets C-D	20.0m Road length	1,360 m		2.75
Streets 1-40	18.0m Road length	10,096 m		18.48
Sts. 2,7 & 31	16.0m Road length	687 m		1.09
Lane 1-2	8.0m Lane length	276 m		0.22
TOTAL		**13,964 m**	**2,419**	**155.82**
		(14,109 m)	**(2,468)**	

SURVEYOR'S CERTIFICATE

I hereby certify that the boundaries of the lands to be subdivided as shown on this Plan and their relationship to the adjacent lands are accurately and correctly shown.

Budziak March 4, 2024

MONIKA BUDZIAK, OLS
J.D. Barnes Ltd.

Date

OWNER'S AUTHORIZATION

I hereby authorize Malone Given Parsons Ltd. to prepare and submit this Draft Plan of Subdivision to the City of Vaughan.

Date

ADDITIONAL INFORMATION

AS REQUIRED UNDER SECTION 51(17) OF THE PLANNING ACT, CHAPTER P.13(R.S.O. 1990).

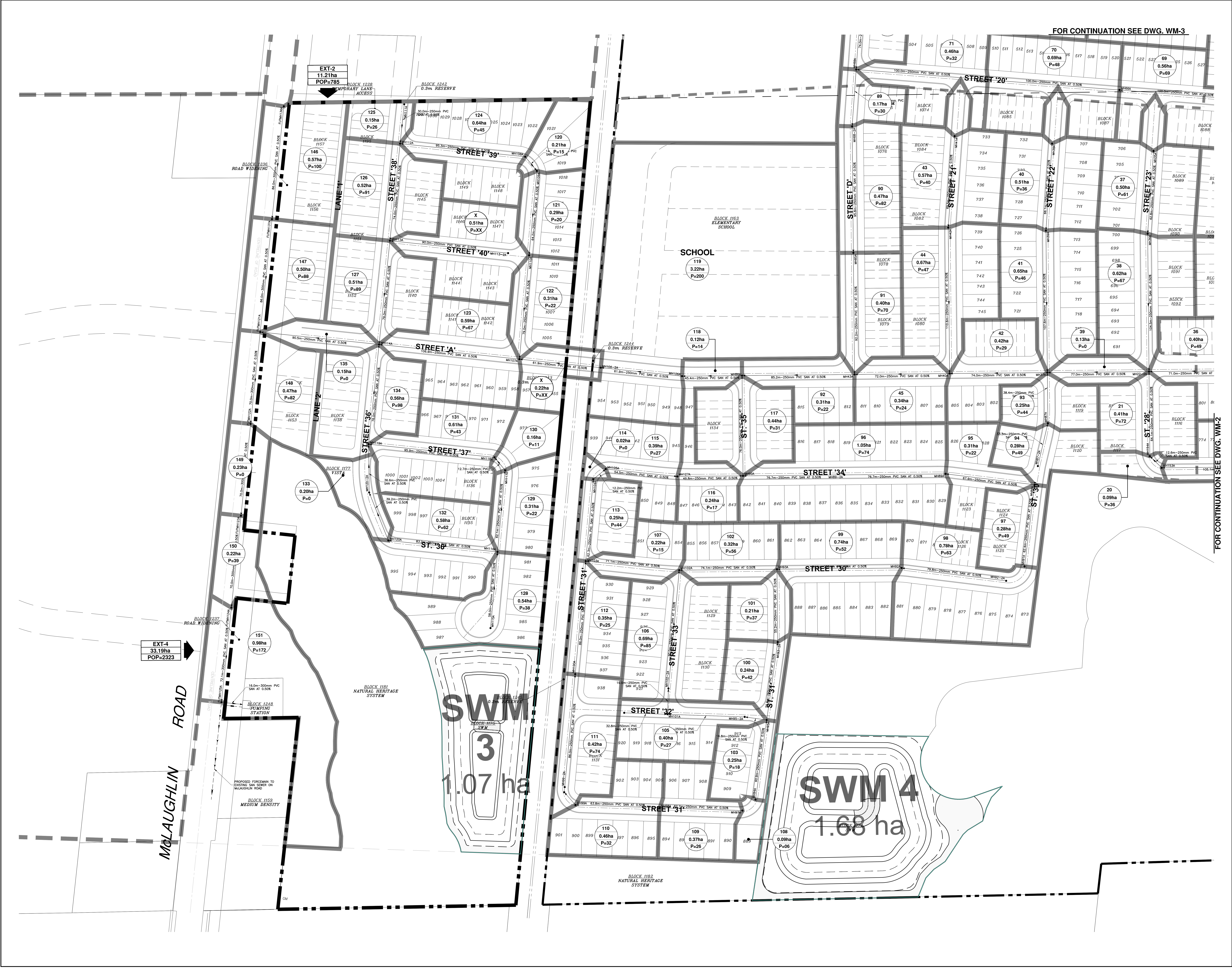
(a),(e),(f),(g),(j),(l) - As shown of the Draft Plan.
(b),(c) - As shown on the Draft and Key Plan.
(d) - Land to be used in accordance with the Schedule of Land Use.
(i) - Soil is clay loam.
(h),(k) - Full municipal services to be provided.

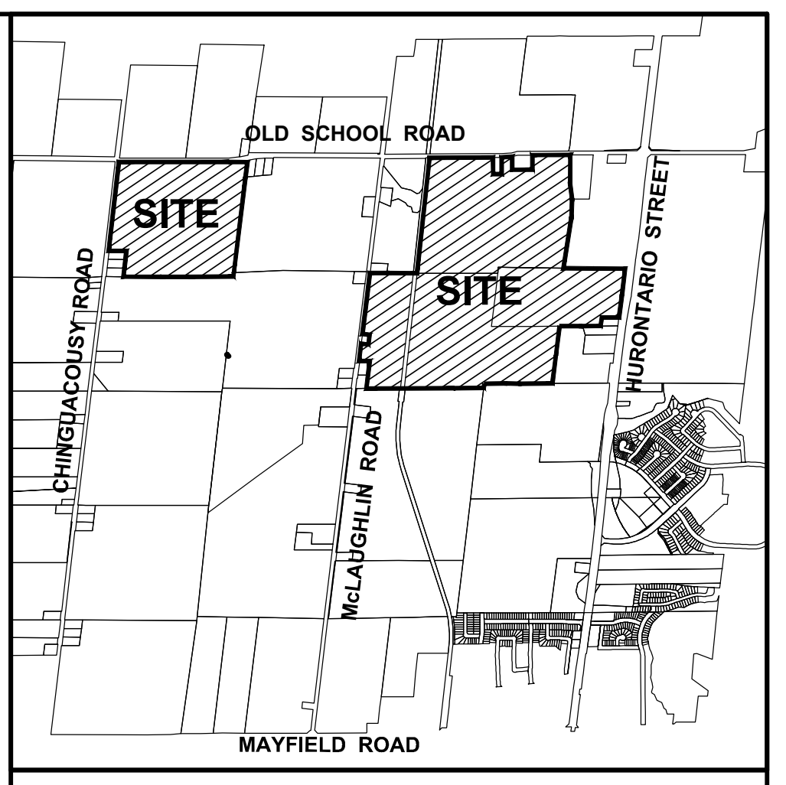
Date: March 28, 2024

Date	Revision	By

MGP Malone Given Parsons.

140 Renfrew Drive, Suite 201 | Markham, ON | L3R 6B3
905 513 0170 | mgp.ca





KEY PLAN

LEGEND:

- ▷● PROPOSED SAN SEWER
- - -▷● - - EXISTING SAN SEWER
- ● MH1A MAINTENANCE HOLE NUMBER
- ▬ DRAINAGE AREA BOUNDARY
- ▬ ▬ EXTERNAL DRAINAGE AREA BOUNDARY
- ▬ ▪ ▪ ▬ LIMIT OF SUBDIVISION
- - - - - EXISTING PROPERTY LINE
- 1 — DENOTES AREA NUMBER
- 0.12ha — DENOTES AREA IN HECTARES
- P=50 — DENOTES EQUIVALENT POPULATION

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

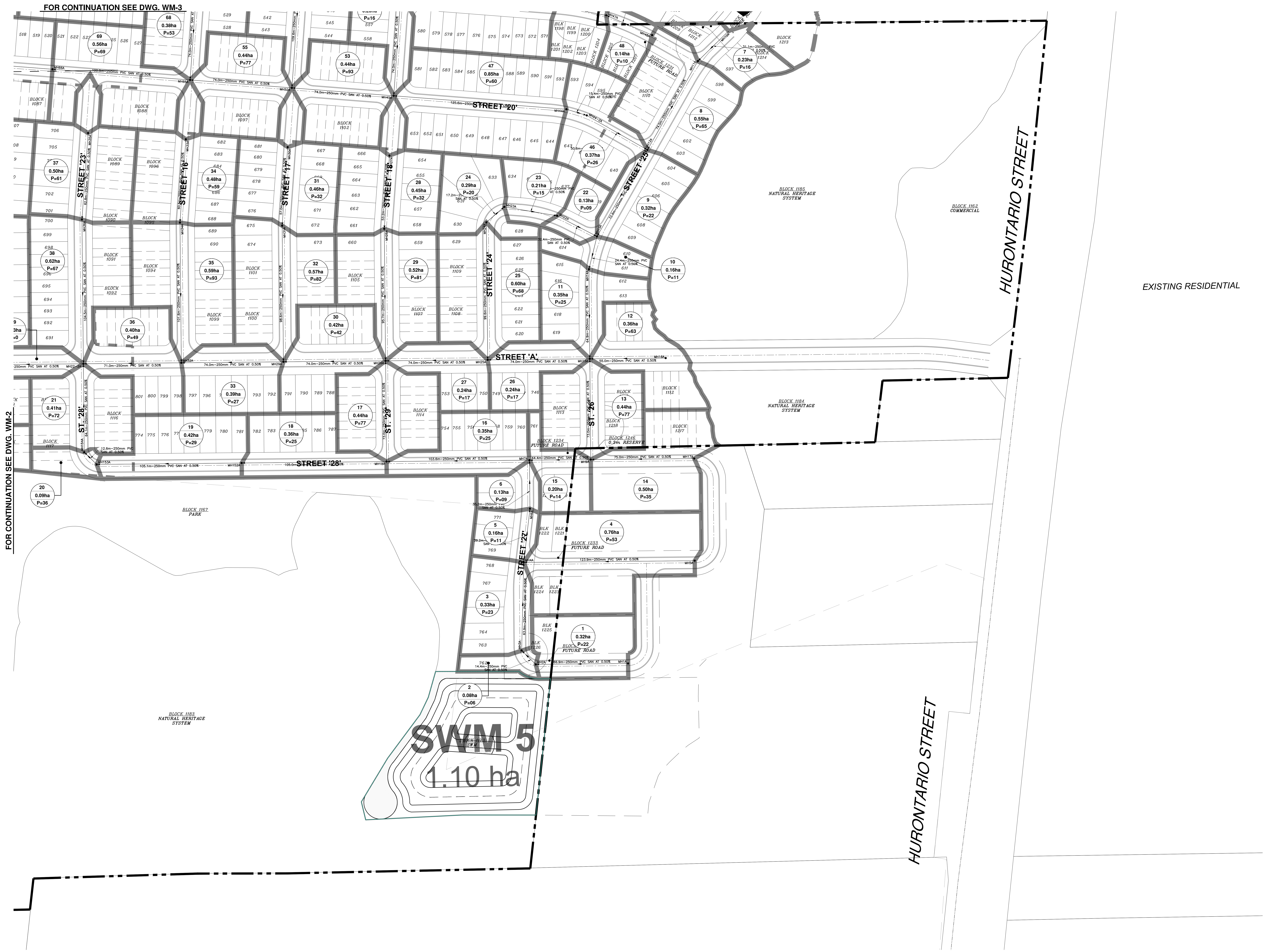
PH3 - ST 2

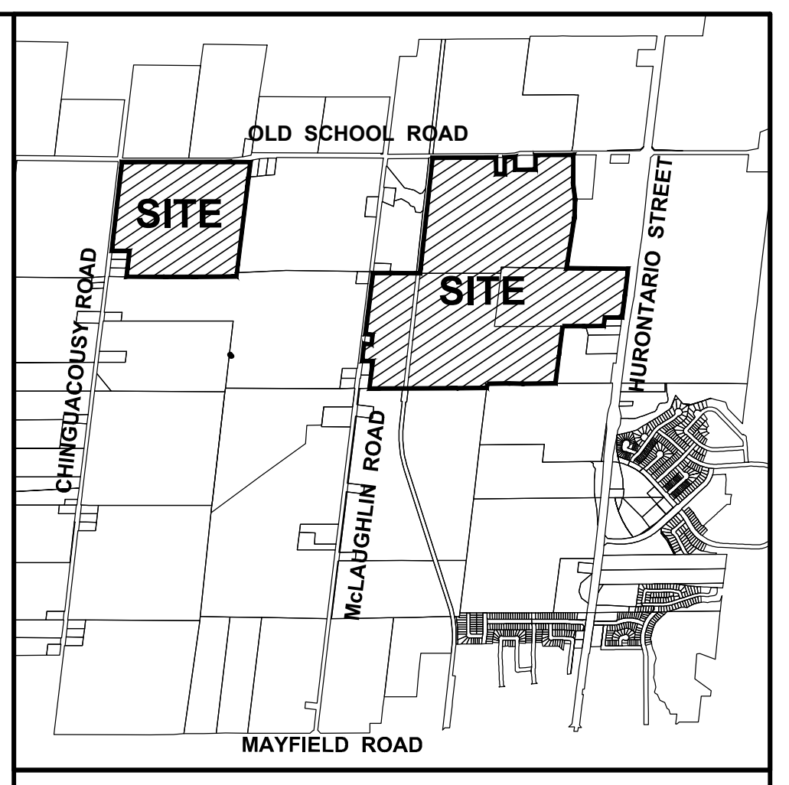
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

SANITARY DRAINAGE PLAN

DRAWN BY: S.C.
PROJECT No. W23093
CHECKED BY: S.L
DRAWING No. SA-1
SCALE: 1:1000
DATE: FEBRUARY 2024





KEY PLAN

LEGEND:

▷●	PROPOSED SAN SEWER
- - ▷• - -	EXISTING SAN SEWER
● MH1A	MAINTENANCE HOLE NUMBER
▬	DRAINAGE AREA BOUNDARY
▬ ▬ ▬	EXTERNAL DRAINAGE AREA BOUNDARY
▬ ▪ ▪ ▬	LIMIT OF SUBDIVISION
- - - - -	EXISTING PROPERTY LINE
1	DENOTES AREA NUMBER
0.12ha	DENOTES AREA IN HECTARES
P=50	DENOTES EQUIVALENT POPULATION

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS–1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT–SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

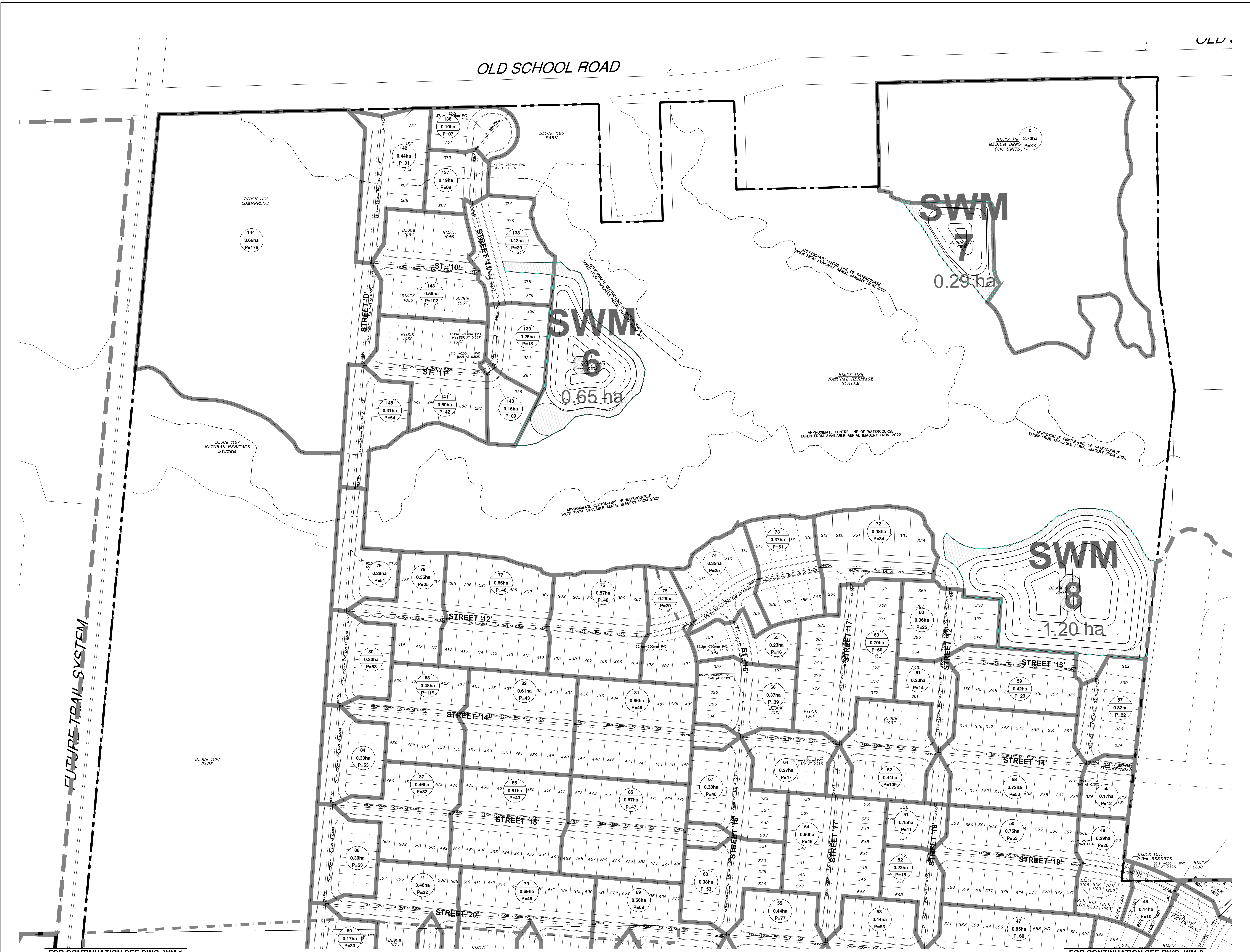
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

SANITARY DRAINAGE PLAN

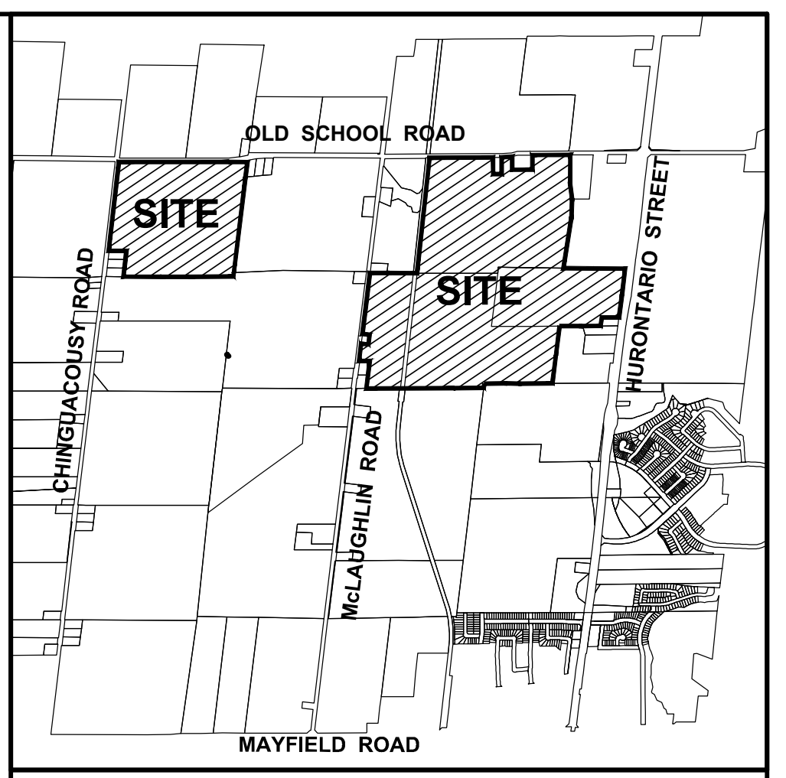
DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No. SA-2
SCALE: 1:1000	
DATE: FEBRUARY 2024	

J:\CDC-2023 WEST – Files\W23093– Mayfield west Ph2 ST3\FSR\MASTER DRAWINGS\W23093–SA–1–SANITARY DRAINAGE AREA PLAN.dwg (Apr 09, 2024 – 4:22pm)



FOR CONTINUATION SEE DWG. WM-1

FOR CONTINUATION SEE DWG. WM-2



KEY PLAN

LEGEND:

—▷—●—	PROPOSED SAN SEWER
– – ▷● – –	EXISTING SAN SEWER
● MH1A	MAINTENANCE HOLE NUMBER
▬▬▬	DRAINAGE AREA BOUNDARY
▬ ▬ ▬	EXTERNAL DRAINAGE AREA BOUNDARY
▬▬ ▪ ▪ ▬▬	LIMIT OF SUBDIVISION
- - - - - -	EXISTING PROPERTY LINE
1	DENOTES AREA NUMBER
0.12ha	DENOTES AREA IN HECTARES
P=50	DENOTES EQUIVALENT POPULATION

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

REGISTERED PROFESSIONAL ENGINEER
S. D. LANG
APRIL 10, 2024
PROVINCE OF ONTARIO

MAYFIELD WEST RESIDENTIAL SUBDIVISION

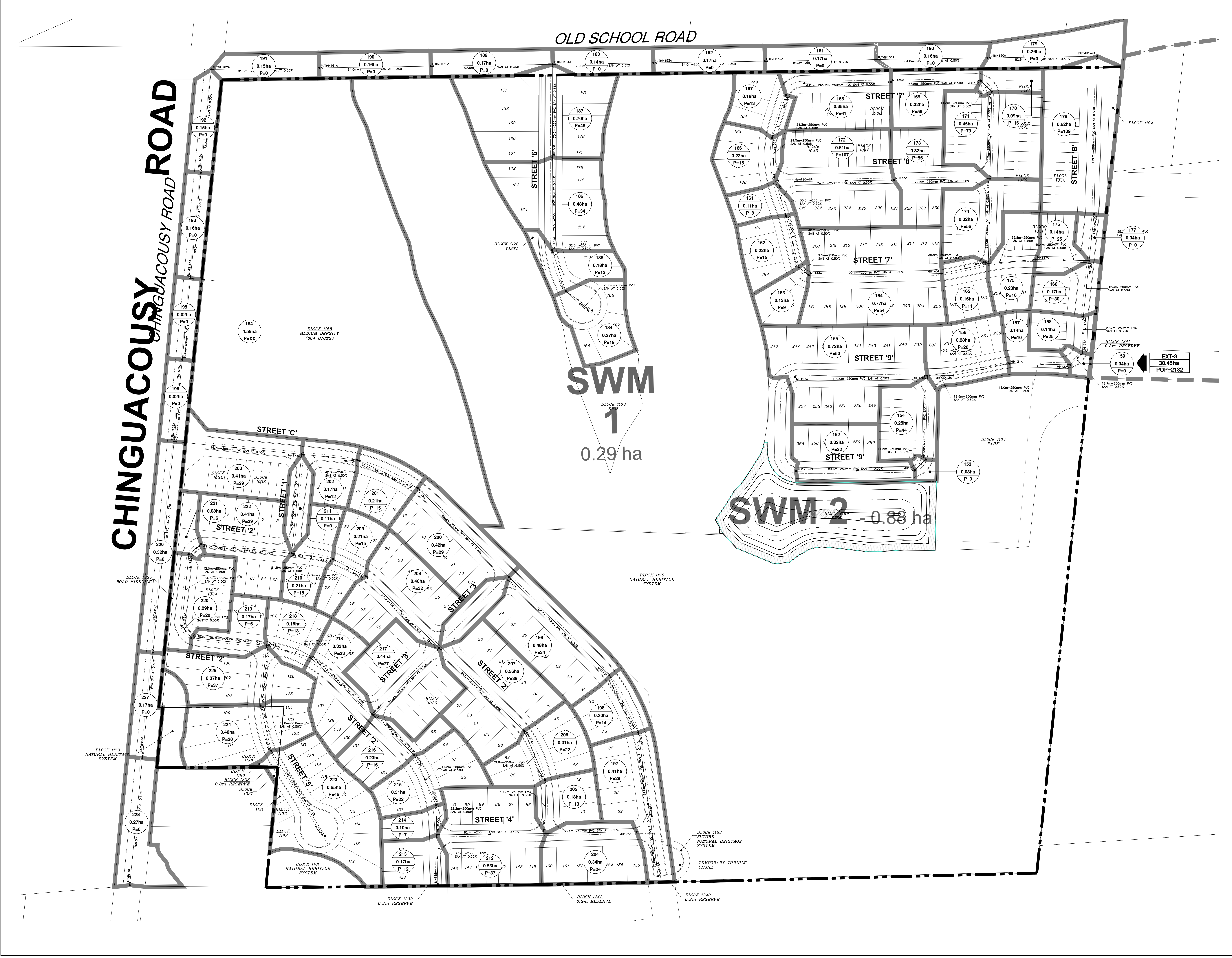
PH3 - ST 2

CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

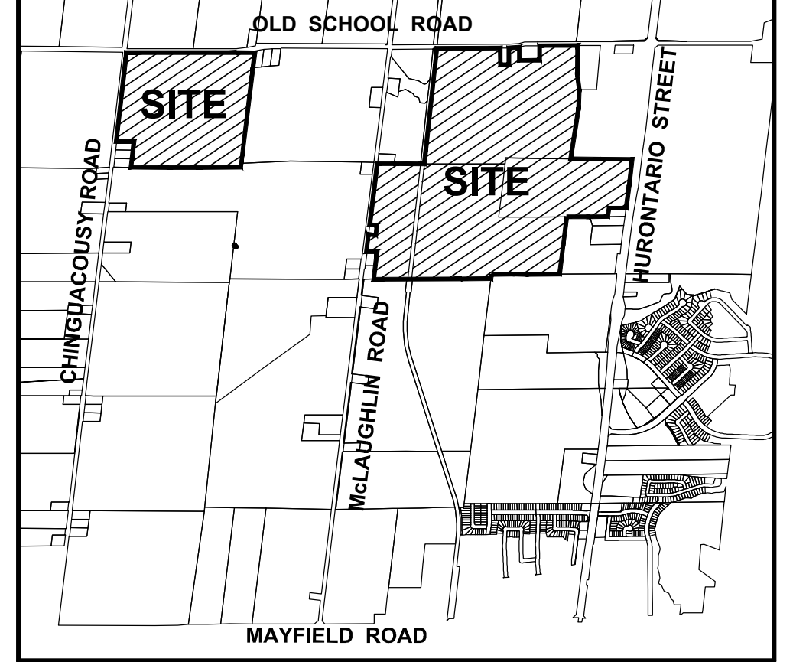
SHEET TITLE:

SANITARY DRAINAGE PLAN

DRAWN BY: S.C.
PROJECT No. W23093
CHECKED BY: S.L
DRAWING No. SA-3
SCALE: 1:1000
DATE: FEBRUARY 2024



J:\CDC-2023 WEST - Files\W23093 - Mayfield west Ph2 ST3\PSR\MASTER DRAWINGS\W23093-SA-1-SANITARY DRAINAGE AREA PLAN.dwg (Apr 09, 2024 - 4:23pm)



KEY PLAN

LEGEND:

—▷—●—	PROPOSED SAN SEWER
– – ▷● – –	EXISTING SAN SEWER
● MH1A	MAINTENANCE HOLE NUMBER
▬▬▬	DRAINAGE AREA BOUNDARY
▬ ▬ ▬	EXTERNAL DRAINAGE AREA BOUNDARY
▬▬ ▪ ▪ ▬▬	LIMIT OF SUBDIVISION
- - - - - -	EXISTING PROPERTY LINE
1	DENOTES AREA NUMBER
0.12ha	DENOTES AREA IN HECTARES
P=50	DENOTES EQUIVALENT POPULATION

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS–1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT–SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

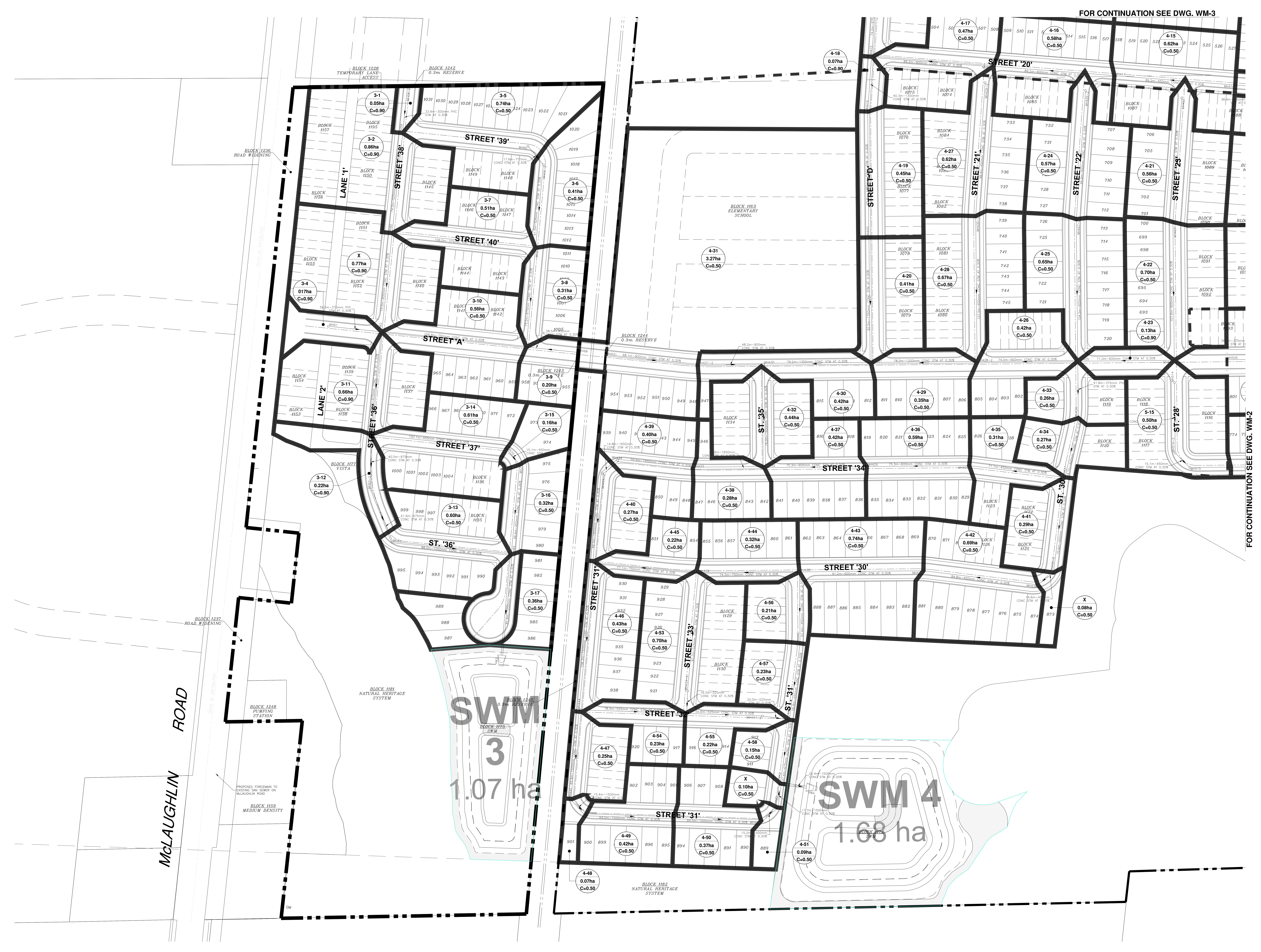
PH3 - ST 2

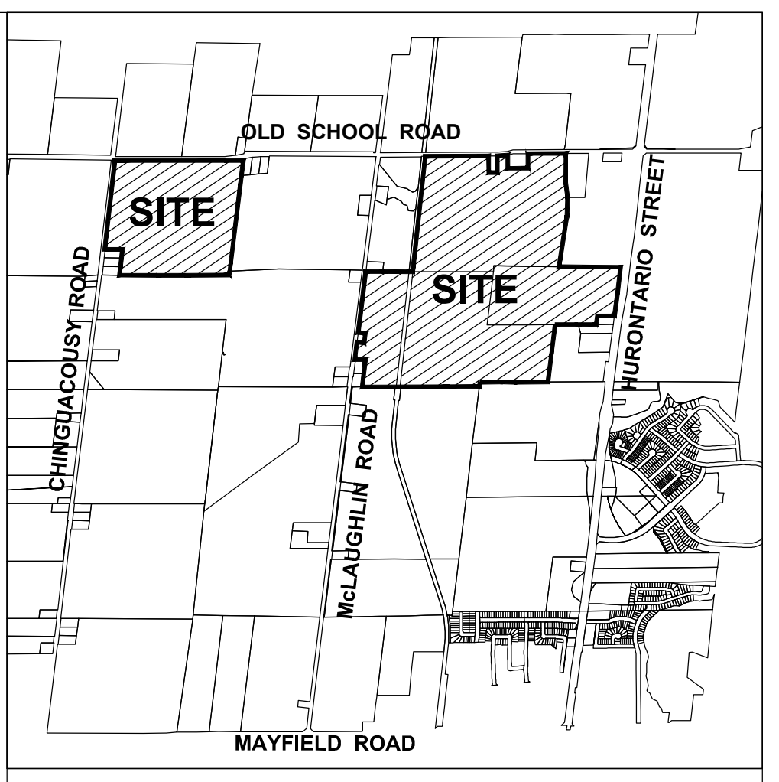
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

SANITARY DRAINAGE PLAN

DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No.
SCALE: 1:1000	SA-4
DATE: FEBRUARY 2024	





KEY PLAN

LEGEND:

LIMIT OF SUBDIVISION

EXISTING PROPERTY LINE

PROPOSED STORM SEWER

FUTURE STORM SEWER (BY OTHERS)

203.49 PROPOSED ELEVATIONS

202.37 PROPOSED STORM SEWER OBVERT

STORM DRAINAGE AREA BOUNDARY

OVERLAND FLOW ROUTE

G1-1 — DENOTES DRAINAGE NODE
0.12ha — DENOTES AREA IN HECTARES
C=0.50 — DENOTES DRAINAGE COEFFICIENT

EXT-1 — DENOTES EXTERNAL DRAINAGE NODE
0.65ha — DENOTES AREA IN HECTARES
AC=0.33 — DENOTES AREA X COEFFICIENT
TC=11.4min — DENOTES TIME OF CONCENTRATION

○ ○ ○ ○ ○ ○ EXISTING REGIONAL FLOOD LINE (2015 FLOWS)

INFILTRATION TRENCH

SIDE SLOPE SWALE

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

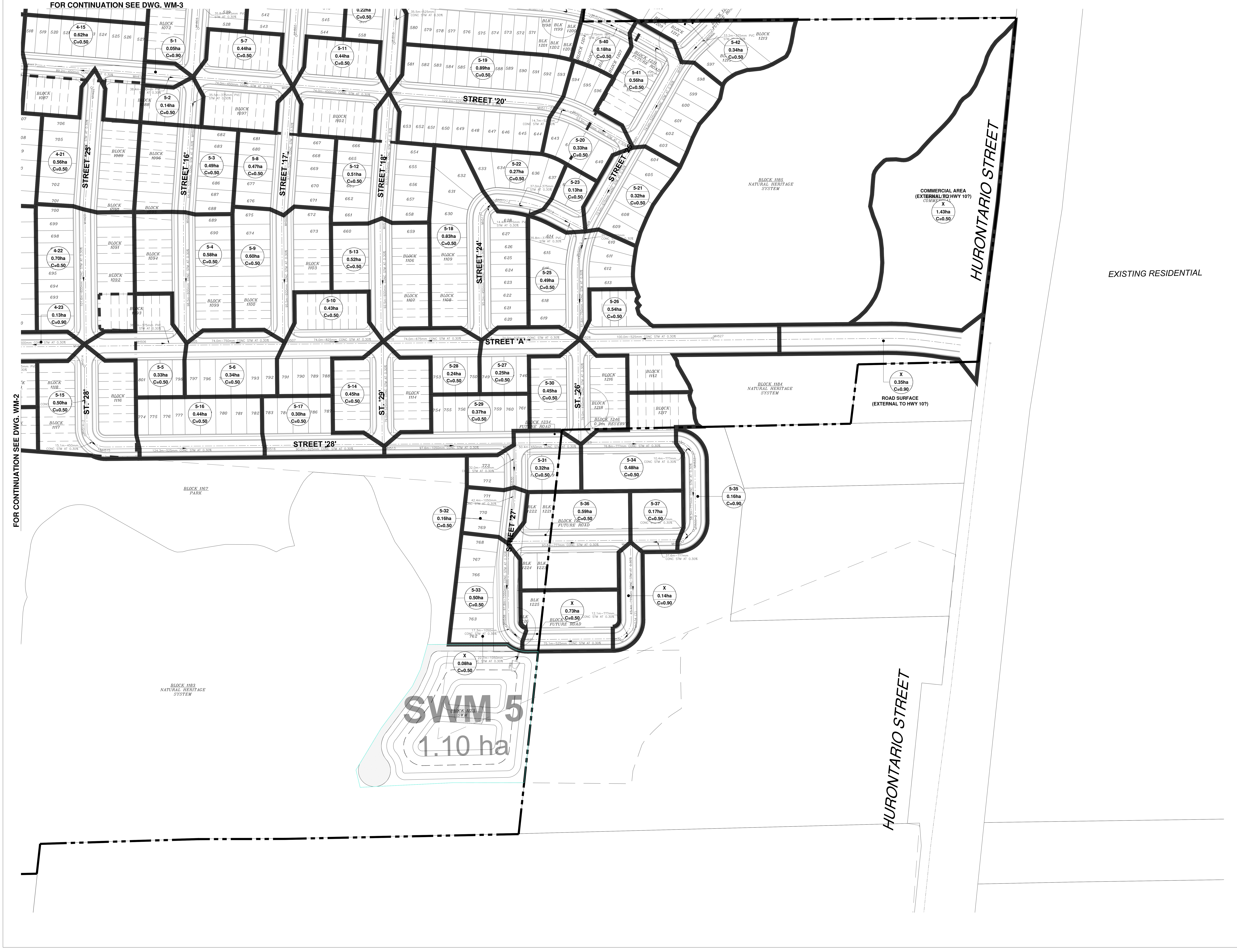
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

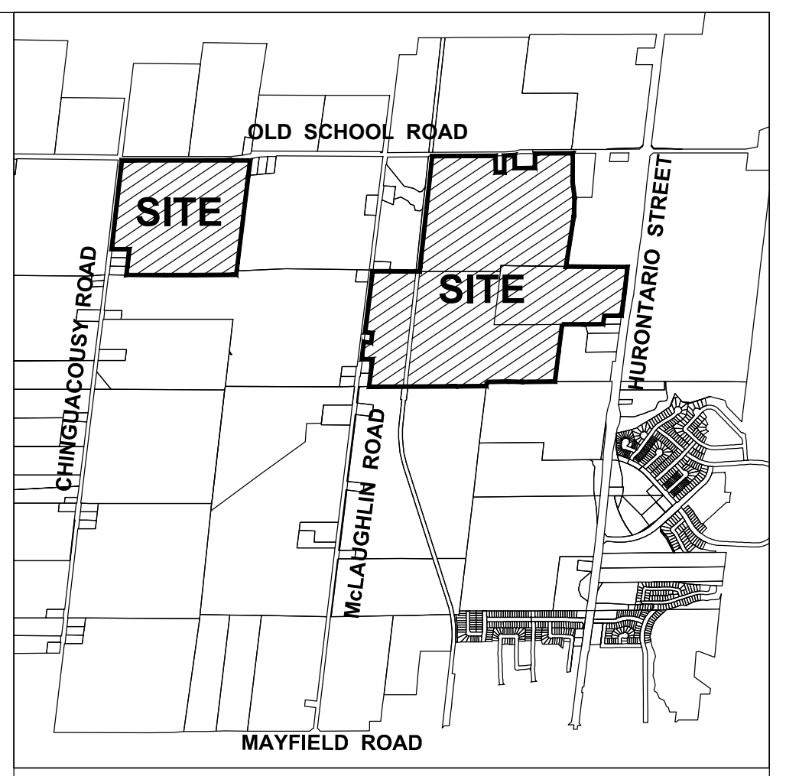
SHEET TITLE:

STORM DRAINAGE PLAN

W23093

DRAWN BY: S.C.
PROJECT No.
CHECKED BY: S.L
DRAWING No. ST-1
SCALE: 1:1000
DATE: FEBRUARY 2024





KEY PLAN

LEGEND:

- LIMIT OF SUBDIVISION
- EXISTING PROPERTY LINE
- PROPOSED STORM SEWER
- FUTURE STORM SEWER (BY OTHERS)
- 203.49 PROPOSED ELEVATIONS
- 202.37 PROPOSED STORM SEWER OBVERT
- STORM DRAINAGE AREA BOUNDARY
- OVERLAND FLOW ROUTE
- G1-1 — DENOTES DRAINAGE NODE
- 0.12ha — DENOTES AREA IN HECTARES
- C=0.50 — DENOTES DRAINAGE COEFFICIENT
- EXT-1 — DENOTES EXTERNAL DRAINAGE NODE
- 0.65ha — DENOTES AREA IN HECTARES
- AC=0.33 — DENOTES AREA X COEFFICIENT
- TC=11.4min — DENOTES TIME OF CONCENTRATION
- ○ ○ ○ ○ ○ ○ EXISTING REGIONAL FLOOD LINE (2015 FLOWS)
- INFILTRATION TRENCH
- SIDE SLOPE SWALE

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS–1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT–SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S D. LANG
APRIL 10, 2024

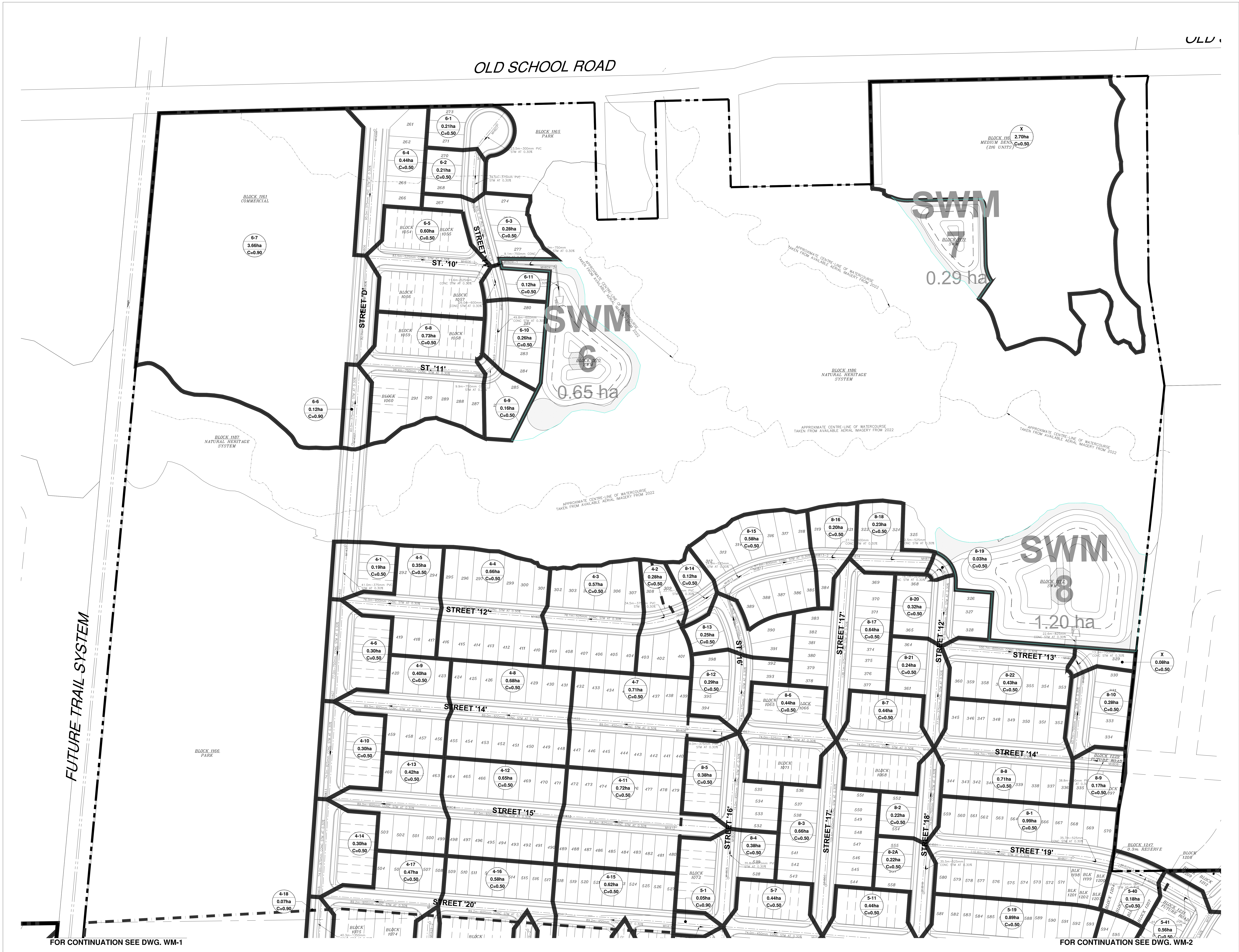
MAYFIELD WEST RESIDENTIAL SUBDIVISION
PH3 - ST 2

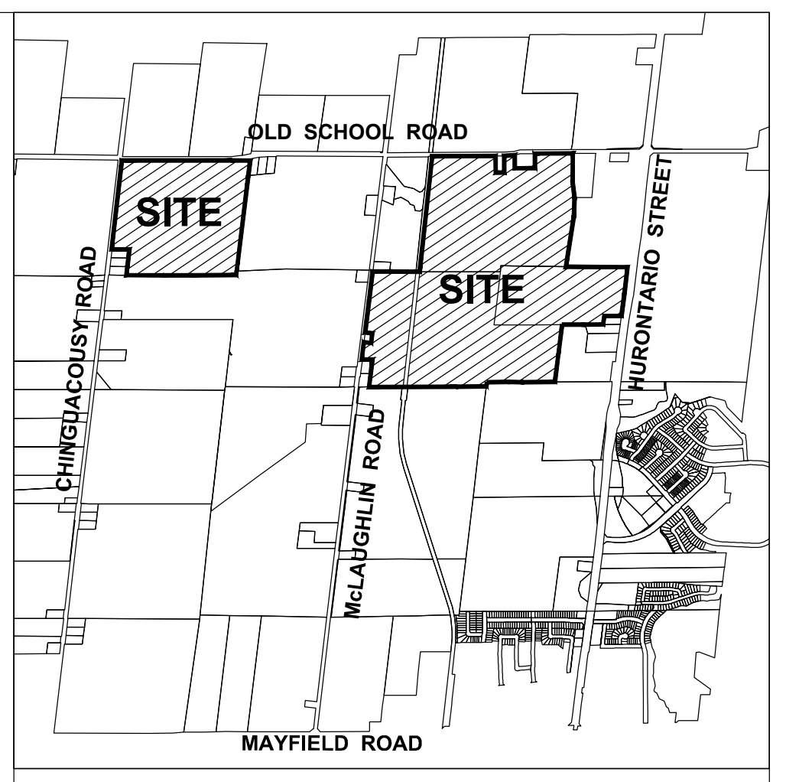
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

STORM DRAINAGE PLAN
W23093

DRAWN BY: S.C.
PROJECT No.
CHECKED BY: S.L
DRAWING No. ST-2
SCALE: 1:1000
DATE: FEBRUARY 2024





KEY PLAN

LEGEND:

- LIMIT OF SUBDIVISION
- EXISTING PROPERTY LINE
- PROPOSED STORM SEWER
- FUTURE STORM SEWER (BY OTHERS)
- 203.49 PROPOSED ELEVATIONS
- (202.37) PROPOSED STORM SEWER OBVERT
- STORM DRAINAGE AREA BOUNDARY
- ➡ OVERLAND FLOW ROUTE
- G1-1 — DENOTES DRAINAGE NODE
- 0.12ha — DENOTES AREA IN HECTARES
- C=0.50 — DENOTES DRAINAGE COEFFICIENT
- EXT-1 — DENOTES EXTERNAL DRAINAGE NODE
- 0.65ha — DENOTES AREA IN HECTARES
- AC=0.33 — DENOTES AREA X COEFFICIENT
- TC=11.4min — DENOTES TIME OF CONCENTRATION
- ○ ○ ○ ○ ○ ○ EXISTING REGIONAL FLOOD LINE (2015 FLOWS)
- INFILTRATION TRENCH
- SIDE SLOPE SWALE

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

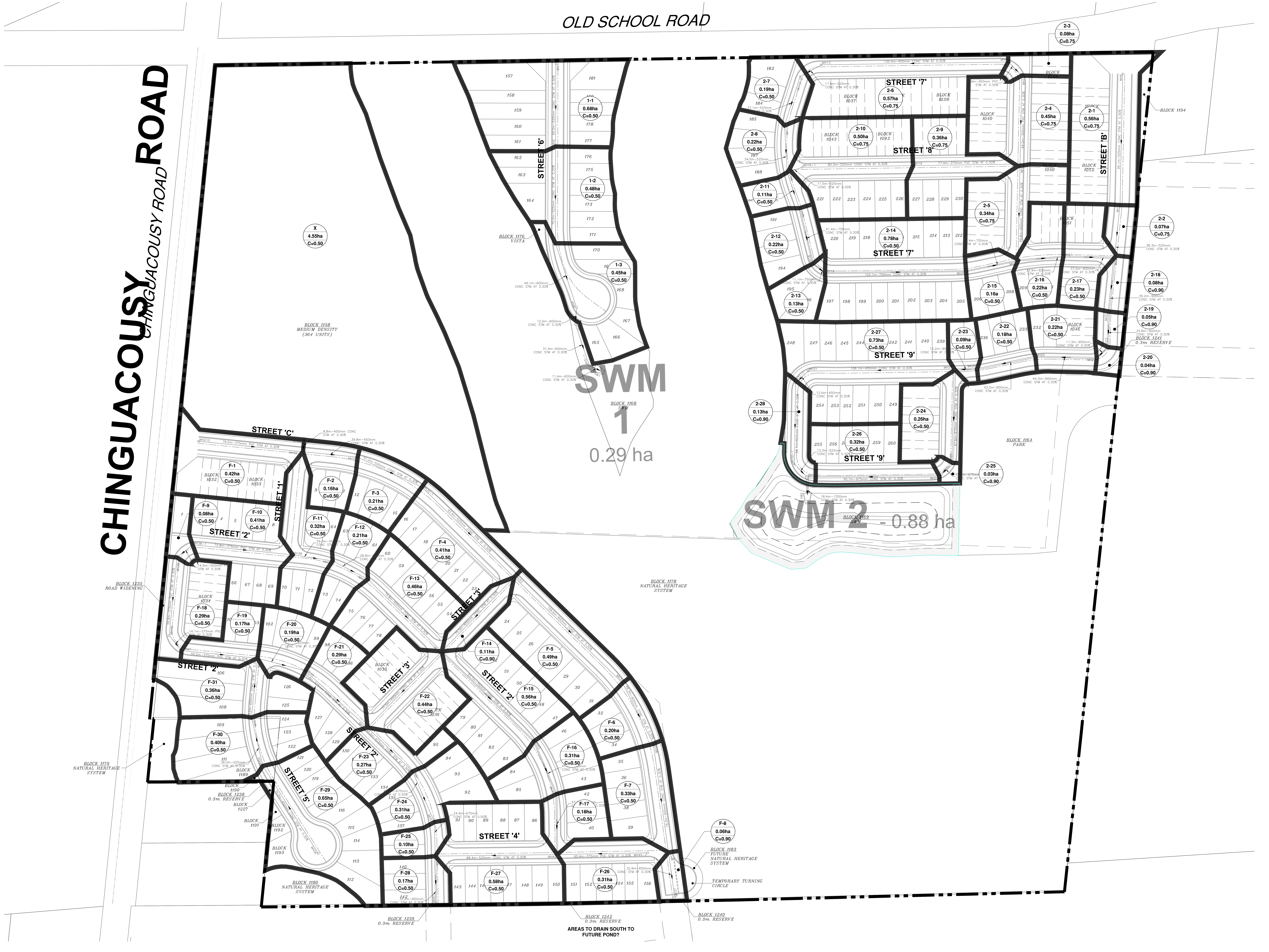
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

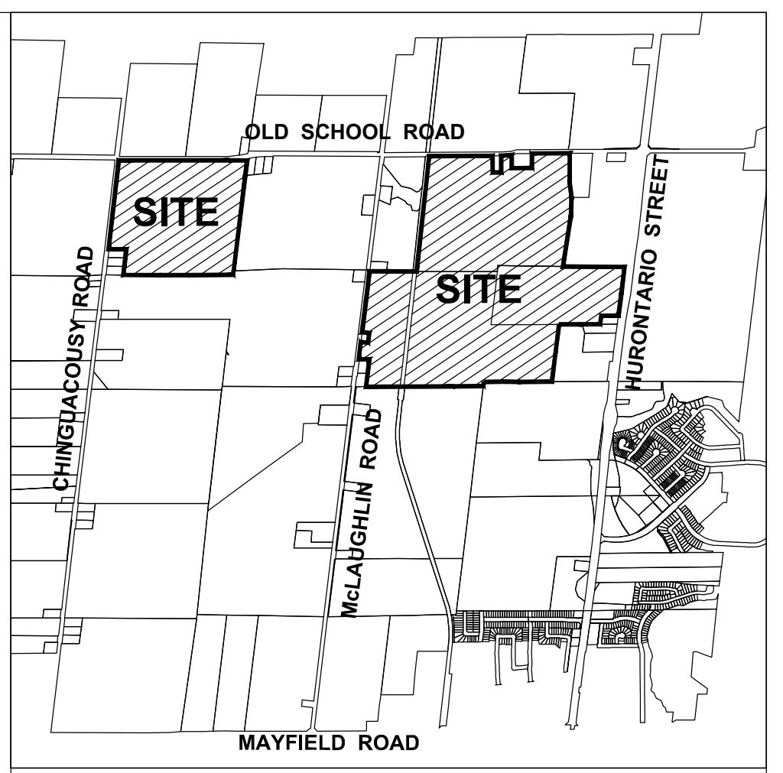
SHEET TITLE:

STORM DRAINAGE PLAN

W23093

DRAWN BY: S.C.
PROJECT No.
CHECKED BY: S.L
DRAWING No. ST-3
SCALE: 1:1000
DATE: FEBRUARY 2024





KEY PLAN

LEGEND:

	LIMIT OF SUBDIVISION
	EXISTING PROPERTY LINE
→	PROPOSED STORM SEWER FUTURE STORM SEWER (BY OTHERS)
203.49	PROPOSED ELEVATIONS
(202.37)	PROPOSED STORM SEWER OBVERT
	STORM DRAINAGE AREA BOUNDARY
➡	OVERLAND FLOW ROUTE
G1-1	DENOTES DRAINAGE NODE
0.12ha	DENOTES AREA IN HECTARES
C=0.50	DENOTES DRAINAGE COEFFICIENT
EXT-1	DENOTES EXTERNAL DRAINAGE NODE
0.65ha	DENOTES AREA IN HECTARES
AC=0.33	DENOTES AREA X COEFFICIENT
TC=11.4min	DENOTES TIME OF CONCENTRATION
○ ○ ○ ○ ○ ○	EXISTING REGIONAL FLOOD LINE (2015 FLOWS)
	INFILTRATION TRENCH
	SIDE SLOPE SWALE

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

REGISTERED PROFESSIONAL ENGINEER
S D. LANG
APRIL 10, 2024
PROVINCE OF ONTARIO

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

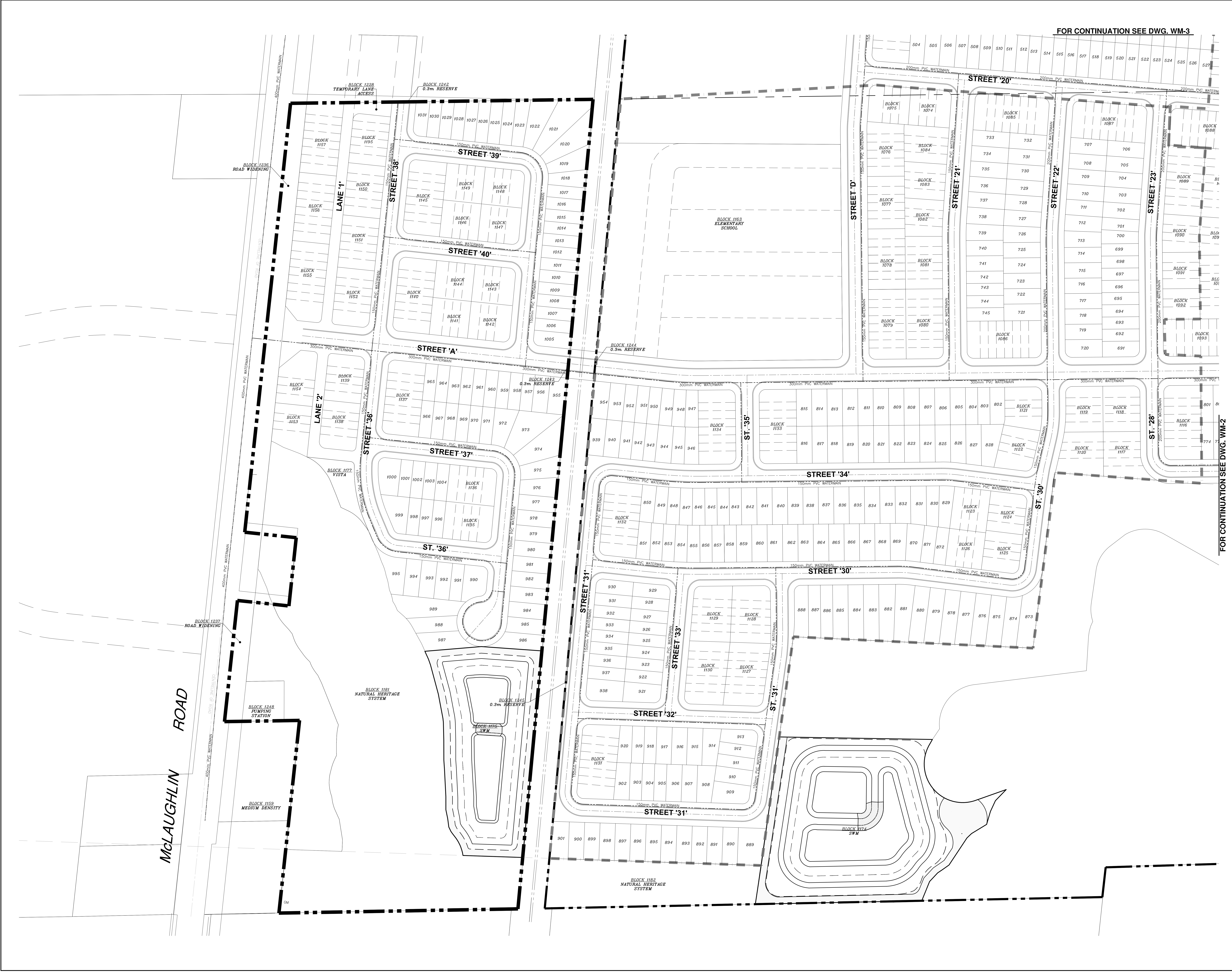
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

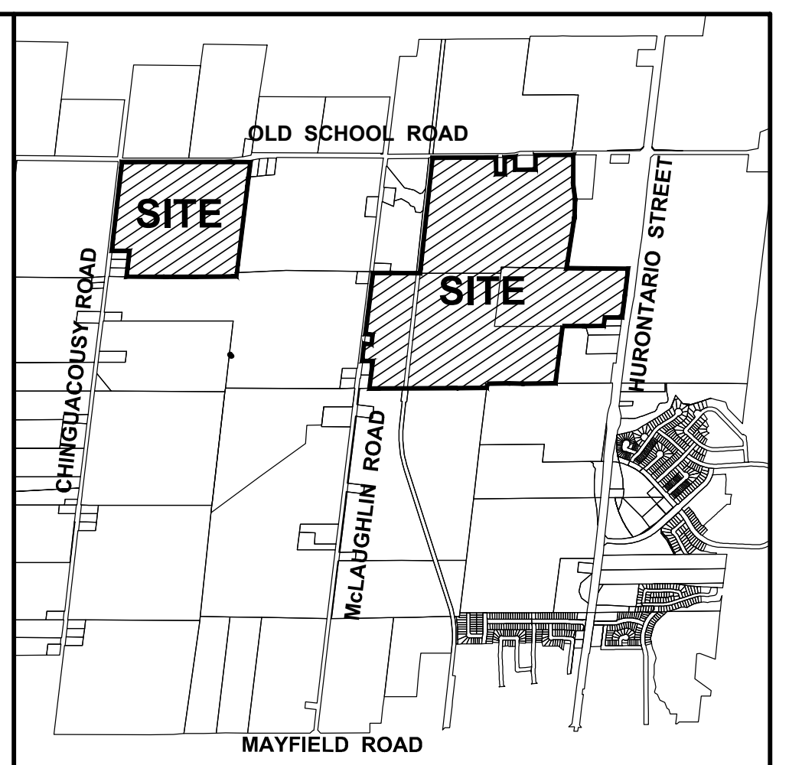
SHEET TITLE:

STORM DRAINAGE PLAN

W23093

DRAWN BY: S.C.
PROJECT No.:
CHECKED BY: S.L
DRAWING No.: ST-4
SCALE: 1:1000
DATE: FEBRUARY 2024





KEY PLAN

LEGEND:

LIMIT OF SUBDIVISION

EXISTING PROPERTY LINE

PROPOSED WATERMAIN

EXISTING WATERMAIN

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS–1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT–SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S. D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

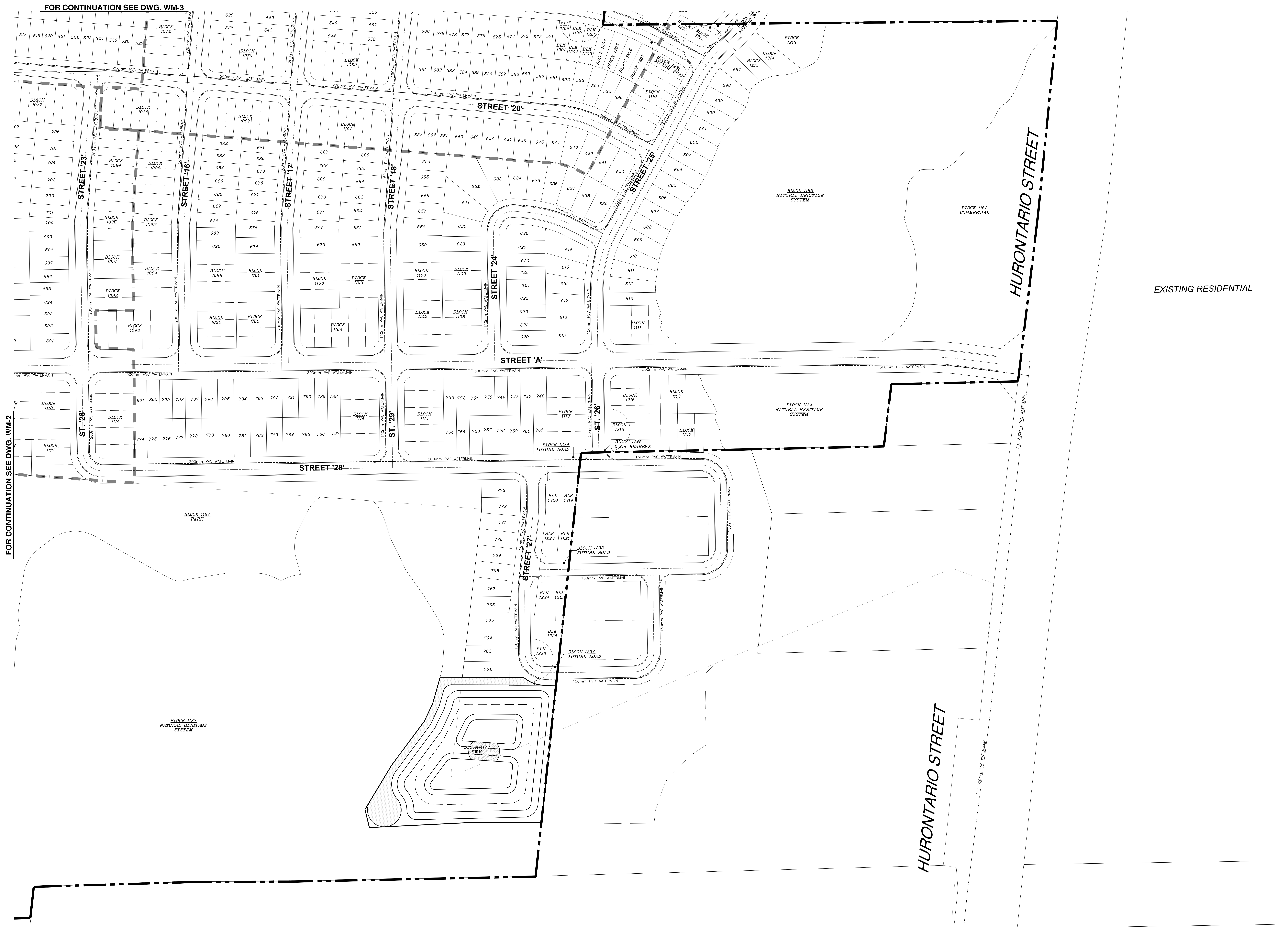
PH3 - ST 2

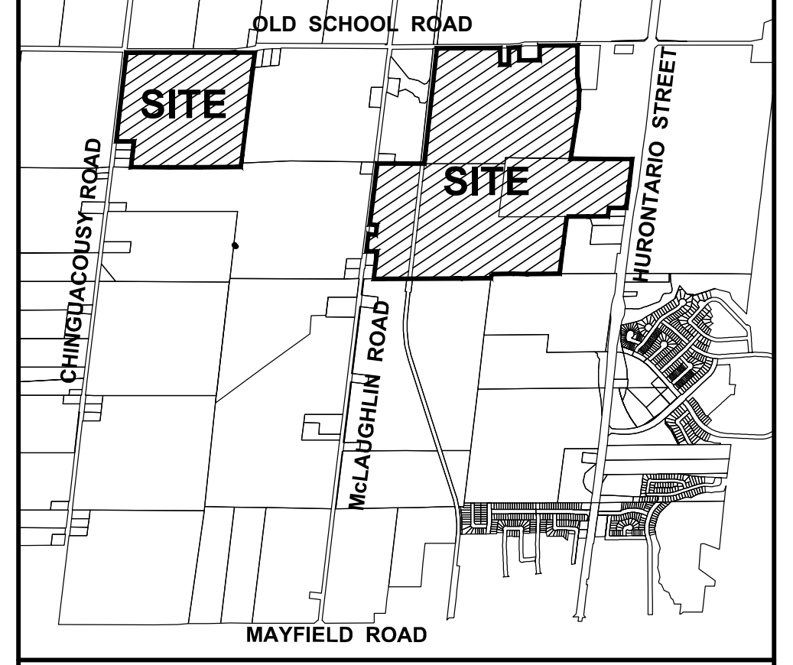
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

WATER DISTRIBUTION PLAN

DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No. WM-1
SCALE: 1:1000	
DATE: FEBRUARY 2024	





KEY PLAN

LEGEND:

LIMIT OF SUBDIVISION
EXISTING PROPERTY LINE
PROPOSED WATERMAIN
EXISTING WATERMAIN

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS–1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT–SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

S D. LANG
APRIL 10, 2024

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

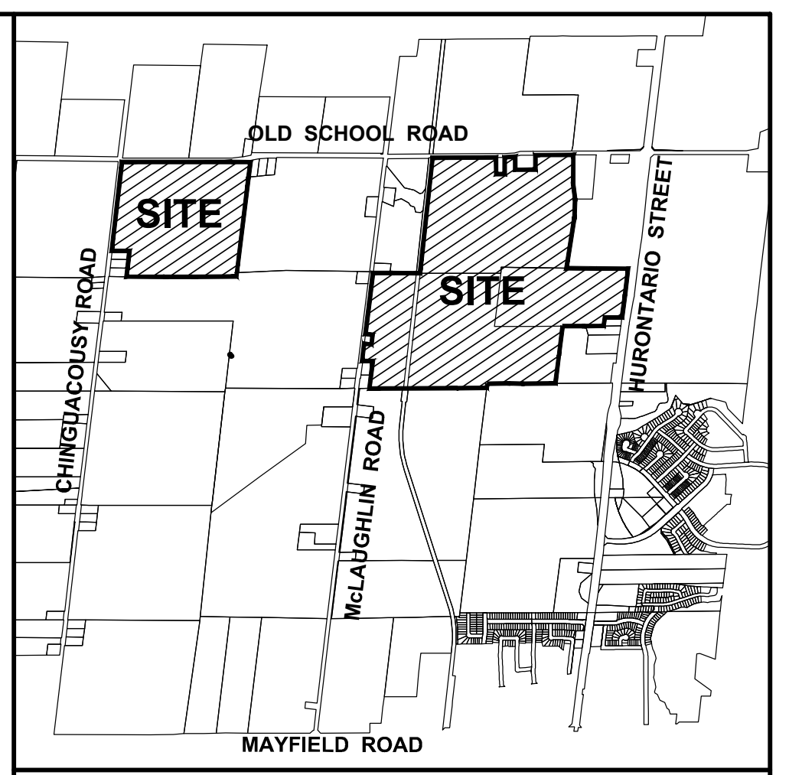
WATER DISTRIBUTION PLAN

DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No. WM-2
SCALE: 1:1000	
DATE: FEBRUARY 2024	

J:\CDC–2023 WEST – Files\W23093– Mayfield west Ph2 ST3\FSR\MASTER DRAWINGS\W23093–WM–1–WATER DISTRIBUTION PLAN.dwg (Apr 09, 2024 – 4:25pm)

FOR CONTINUATION SEE DWG. WM-1

FOR CONTINUATION SEE DWG. WM-2



KEY PLAN

LEGEND:

- LIMIT OF SUBDIVISION
- EXISTING PROPERTY LINE
- PROPOSED WATERMAIN
- EXISTING WATERMAIN

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

REGISTERED PROFESSIONAL ENGINEER
S. D. LANG
APRIL 10, 2024
PROVINCE OF ONTARIO

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

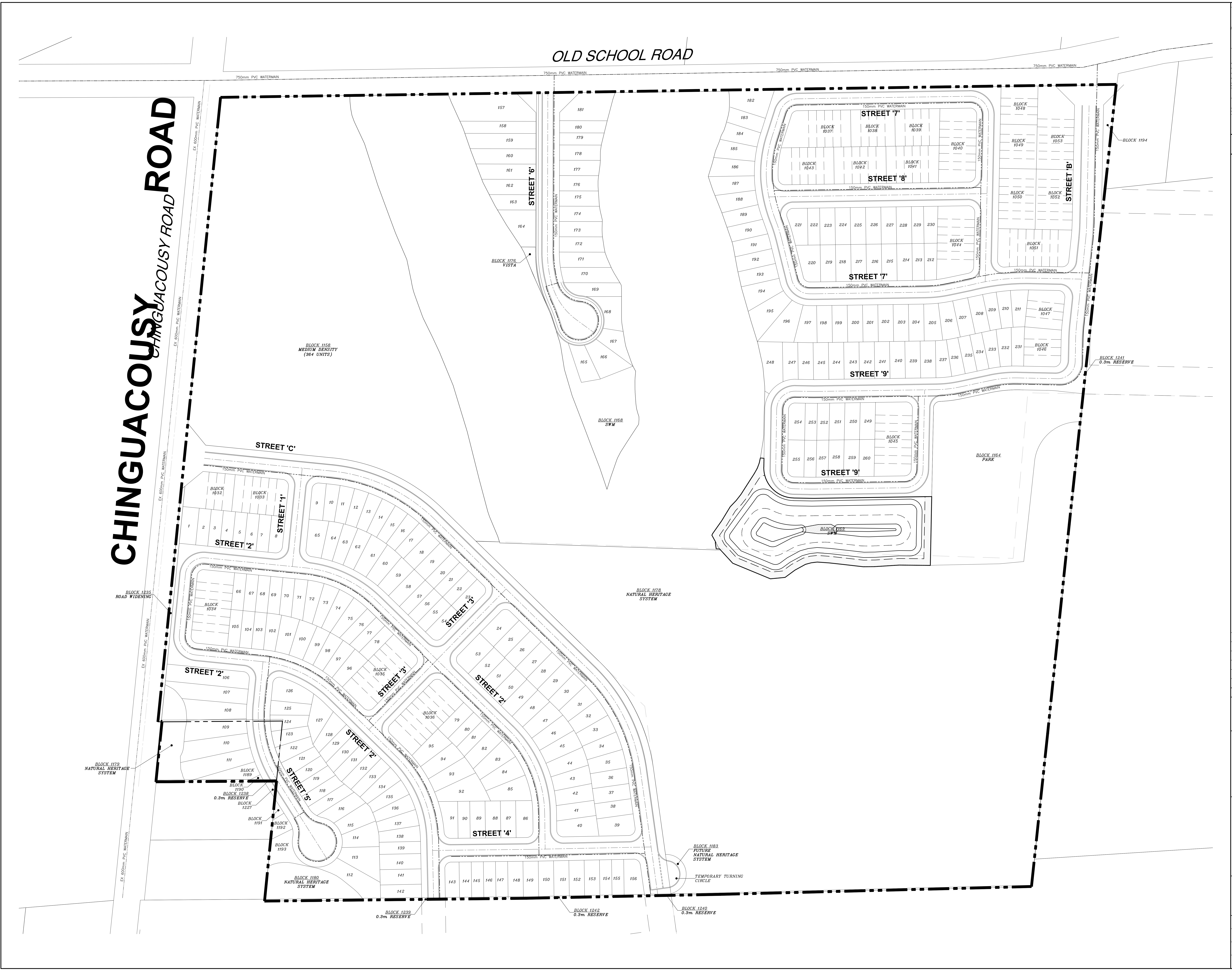
CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

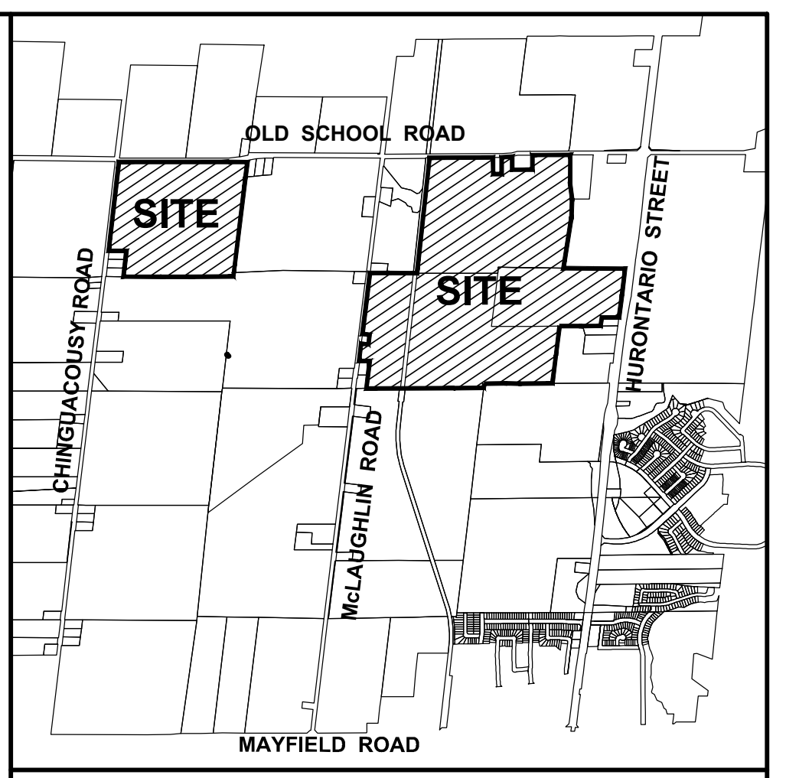
SHEET TITLE:

WATER DISTRIBUTION PLAN

DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No. WM-3
SCALE: 1:1000	
DATE: FEBRUARY 2024	

J:\CDC-2023 WEST - Files\W23093- Mayfield west Ph2 ST3\FSR\MASTER DRAWINGS\W23093-WM-1-WATER DISTRIBUTION PLAN.dwg (Apr 09, 2024 - 4:25pm)





KEY PLAN

LEGEND:

LIMIT OF SUBDIVISION
EXISTING PROPERTY LINE
PROPOSED WATERMAIN
EXISTING WATERMAIN

REFERENCE DRAWINGS:

1. REFER TO DRAFT PLAN PREPARED BY MGP DATED FEBRUARY 28, 2024
2. REFER TO DRAWING PS-1 FOR INFORMATION ON STORM, SANITARY & FDC
3. REFER TO DRAWING EXT-SA DRAWINGS FOR INFORMATION ON EXTERNAL SANITARY DRAINAGE AREAS.

NO.	DESCRIPTION	DATE	BY
5			
4			
3			
2			
1			

REVISIONS

CANDEVCON GROUP INC.
CONSULTING ENGINEERS AND PLANNERS
9358 GOREWAY DRIVE
BRAMPTON ON. L6P-0M7
TEL (905) 794-0600
FAX (905) 794-0611

REGISTERED PROFESSIONAL ENGINEER
S. D. LANG
APRIL 10, 2024
PROVINCE OF ONTARIO

MAYFIELD WEST RESIDENTIAL SUBDIVISION

PH3 - ST 2

CITY OF BRAMPTON
REGIONAL MUNICIPALITY OF PEEL

SHEET TITLE:

WATER DISTRIBUTION PLAN

DRAWN BY: S.C.	PROJECT No. W23093
CHECKED BY: S.L	DRAWING No. WM-4
SCALE: 1:1000	
DATE: FEBRUARY 2024	

J:\CDC-2023 WEST - Files\W23093- Mayfield west Ph2 ST3\FSR\MASTER DRAWINGS\W23093-WM-1-WATER DISTRIBUTION PLAN.dwg (Apr 09, 2024 - 10:31am)