APPENDIX 'A'

GEOTECHNICAL INVESTIGATION REPORT

Quality Engineering | Valued Relationships

Dillon Consulting Ltd.

2023 Local Streets Renewal 23-R-03

Prepared for:
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1558 Willson Place,
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Project Number: 1000-166-01

Date: October 27, 2022

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TREK GEOTECHNICAL Quality Engineering | Valued Relationships

October 27, 2022 Our File No. 1000-166-01

Calab Olfert
Dillon Consulting Ltd.
1558 Willson Place,
Winnipeg, MB
R3T 0Y4

RE: 2023 Local Streets Renewal 23-R-03

TREK Geotechnical Inc. is pleased to submit our Final Report for the geotechnical investigation for 2023 Local Streets Renewal (23-R-03) project.

Please contact the undersigned should you have any questions.

Sincerely,

TREK Geotechnical Inc.
Per:

Nelson John Ferreira, Ph.D., P.Eng.
Senior Geotechnical Engineer

Encl.

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Revision History

Revision No.	Author	Issue Date	Description
0	AFK	October 27, 2022	Final Report

Authorization Signatures

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PROVINCE OF MANITOBA
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22892
REGISTERED PROFESSIONAL ENGINEER
Oct. 27, 2022

Nelson John Ferreira, Ph.D., P.Eng.
Senior Geotechnical Engineer

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
TREK GEOTECHNICAL INC.
No. 4877 Date: Oct. 27, 2022

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1.0 Introduction

This report summarizes the results of the road investigation completed for the Local Streets Renewal 23-R-03 project. The project included drilling test holes and collecting pavement cores along several streets. The test hole information collected describes the pavement structure of the existing road as well as the soil stratigraphy beneath the pavement structure. The investigation was carried out following the City of Winnipeg RFP No. 44-2022 (Appendix B – Site Investigation requirement for public works street projects).

2.0 Road Investigation

The investigation included coring of pavement at 26 locations on 8 different local streets with drilling of test holes occurring at 20 of the cored locations along six streets. The investigation locations are shown on Figures 01 to 08 (attached) and the table below summarizes the investigation program per street.

Table 1 – Road Investigation Program

Pavement and Geotechnical Investigation	# of Locations	Investigation
McMicken Street – Cumberland Ave to Sargent Ave	4	4 test holes to 2.0 m depth
Sprague Street – Portage Ave to Wolseley Ave	4	4 test holes to 2.0 m depth
Langside Street - Cumberland Ave to Sargent Ave	4	4 test holes to 2.0 m depth
Alley – Sherbrook St, Cumberland Ave, Sargent Ave and Furby Street	3	3 test holes to 2.0 m depth
Alley -Sherbrook St., Furby Ave, Sargent Ave and Ellice Ave	3	3 test holes to 2.0 m depth
Alley – Broadway, Maryland St, Sherbrook St and Sara Ave	2	2 test holes to 2.0 m depth
Pavement Investigation	**# of Locations**	**Investigation**
Assiniboine Ave – Navy Way to Hargrave St.	2	2 Cores
Alley – Cathedrale Ave, De La Morenie St, Des Meurons St. And Hamel Ave	4	4 Cores

The road investigation was conducted between September 1, 2022 and September 8, 2022. The pavement structure (asphalt/concrete) was cored by Jashandeep Bhuller of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 100 mm or 150 mm diameter diamond core drill bits. The test holes were drilled by Tyler Chapko of TREK to a depth of approximately 2.0 m below road surface by Maple Leaf Drilling Ltd. using a truck mounted drill rig equipped with 125 mm

diameter solid stem augers. The sub-surface conditions were observed during drilling and visually classified by Tyler Chapko of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples and bulk samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Pavement core samples were also retrieved and logged at TREK's material testing laboratory

Core and test hole logs noted on the summary tables and test hole locations are based on UTM coordinates obtained using a hand-held GPS, and their location relative to the nearest address or intersection, measured distance from the edge of pavement, or other permanent features.

The laboratory testing program consisted of moisture content determination on all samples, as well as Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods) on select samples between 0.6 and 0.9 m below pavement as well as Standard Proctor and CBR testing. Information gathered for each street package is included in separate appendices (Appendices A to H). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, photos of the concrete cores, and summary of pavement compressive strength.

Fifteen CBR's were completed on bulk samples of the soil units present below the pavement. Tests were performed on clay, silt, ~~and silt~~and silt and clay layers encountered within the prescribed sample depth for CBR testing and the results are shown in the table below.

Table 1: CBR Testing Summary

Soil Unit	Street	Depth (m)	SPMDD (kg/m^3)	Opt. Moisture (%)	Percent Proctor (%)	Moisture Content (%)	CBR Value at 2.54 mm	CBR Value at 5.08 mm
Clay	McMicken Street (TH22-01)	1.4-2.0	1,418	29.1	94.4	29.7	3.3%	2.4%
Silt	McMicken Street (TH22-02)	1.0-1.8	1,896	12.2	94.8	12.8	6.2%	5.5%
Clay and Silt	McMicken Street (TH22-03)	1.4-2.3	1,483	26.6	94.7	25.7	3.3%	2.5%
Silt	Sprague Street (TH22-05)	1.0-1.8	1,874	13.9	95.5	14.3	6.8%	6.4%
Silt	Sprague Street (TH22-06)	0.7-1.8	1,913	13.2	95.1	13.3	7.1%	6.0%
Silt	Sprague Street (TH22-08)	0.8-1.9	1,758	17.9	95.1	17.9	5.3%	4.4%
Silt	Langside Street (TH22-10)	0.8-1.6	1,946	12.2	95.5	12.2	7.9%	5.6%
Clay and Silt	Langside Street (TH22-11)	1.1-2.4	1,887	13.7	95.3	13.6	6.4%	5.2%
Clay	Langside Street (TH22-12)	0.8-2.0	1,510	27.7	95.1	27.5	4.0%	3.0%
Clay	Alley (Sargent/Cumberland/Furby/Sherbrook) (TH22-14)	0.8-1.8	1,485	26.6	95.6	25.8	2.6%	2.0%
Silt	Alley (Sargent/Cumberland/Furby/Sherbrook) (TH22-15)	0.8-1.5	1,910	13.3	95.4	13.4	7.2%	5.5%
Clay	Alley (Sargent/Ellice/Furby/Sherbrook) (TH22-17)	1.1-1.9	1,431	29.1	95.4	28.9	2.4%	1.8%
Silt	Alley (Sargent/Ellice/Furby/Sherbrook) (TH22-18)	0.5-1.5	1,861	14.7	95.5	14.8	6.9%	5.6%
Clay	Alley (Broadway/Sara/Sherbrook/Maryland) (TH22-19)	0.7-1.8	1,437	29.0	95.7	28.5	2.6%	1.8%
Clay	Alley (Broadway/Sara/Sherbrook/Maryland) (TH22-20)	0.8-1.9	1,435	27.3	95.5	27.4	2.5%	1.9%

The test hole logs include a description of the soil units encountered during drilling and other pertinent information such as groundwater conditions and a summary of the laboratory testing results. The soils were classified in general accordance with the Unified Soil Classification System (USCS) and the AASHTO soil classification system (American Association of state highway and transportation officials). The AASHTO system classifies soils based on laboratory testing results from Atterberg Limits and grain size testing methods (hydrometer and mechanical sieve method). Where laboratory testing was not conducted, the AASHTO classification of the soils were interpreted based on a visual assessment as indicated with a (I) on the test hole logs and attached tables. For cohesive soils, the AASHTO system uses a combination of testing results to determine the Group Index of the soils and thus, were only determined where sufficient laboratory test data was available.

Four concrete cores were selected for concrete compressive strength breaks and the length to diameter ratio ranged between 1.05 to 1.82 for the cores collected. The core compressive strength tests were tested in accordance with CSA A23.2-14C – wet dried condition. The measured compressive strengths were also corrected based on an adapted ACI 214.4R-03 Standard to estimate the in-place concrete strengths. The table below summarizes the compressive strength results while the compressive strength testing details and the correction factor methodology are included in Appendix G and H.

Table 2: Concrete Core Compressive Strength Results

Core ID (Location)	Uncorrected Compressive Strength (MPa)	Corrected Compressive Strength (MPa)
PC-21 Assiniboine Ave)	52.54	53.98
PC-22 (Assiniboine Ave)	67.93	74.00
PC-24 (Alley- Cathedrale/ De La Morenie/Des Meurons/ Hamel)	44.69	46.21
PC-26 (Alley- Cathedrale/ De La Morenie/Des Meurons/ Hamel	43.24	44.92

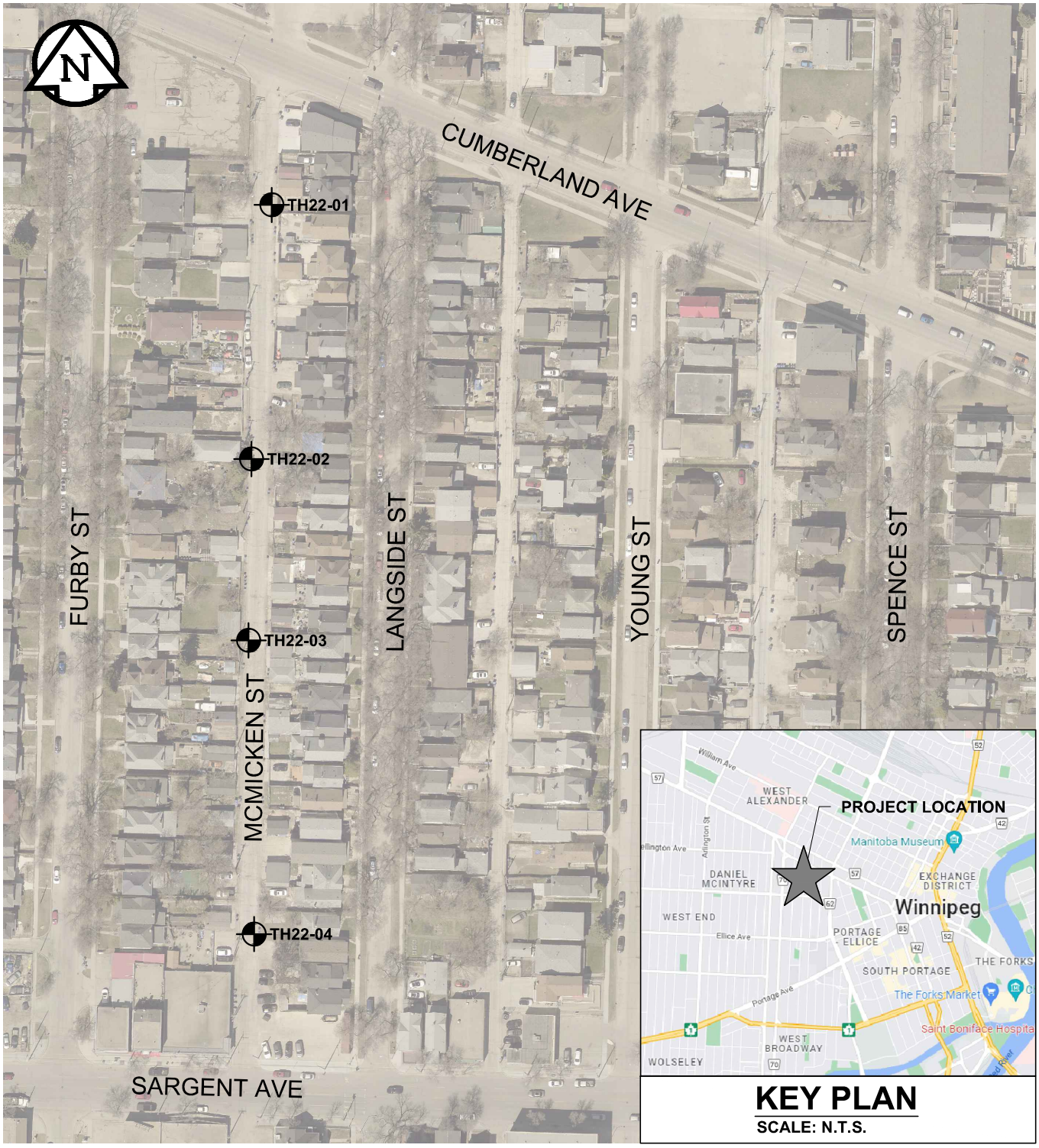
3.0 Closure

The information provided in this report is in accordance with current engineering principles and practices (Standard of Practice). The findings of this report were based on information provided (field investigation, laboratory testing, geometries). Soil conditions are natural deposits that can be highly variable across a site. If sub-surface conditions are different than the conditions previously encountered on-site or those presented here, we should be notified to adjust our findings if necessary.

All information provided in this report is subject to our standard terms and conditions for engineering services, a copy of which is provided to each of our clients with the original scope of work, or a mutually executed standard engineering services agreement. If these conditions are not attached, and you are not already in possession of such terms and conditions, contact our office and you will be promptly provided with a copy.

This report has been prepared by TREK Geotechnical Inc. (the Consultant) for the exclusive use of Dillon Consulting Ltd. (the Client) and their agents for the work product presented in the report. Any findings or recommendations provided in this report are not to be used or relied upon by any third parties, except as agreed to in writing by the Client and Consultant prior to use.

Figures



KEY PLAN
SCALE: N.T.S.

LEGEND:

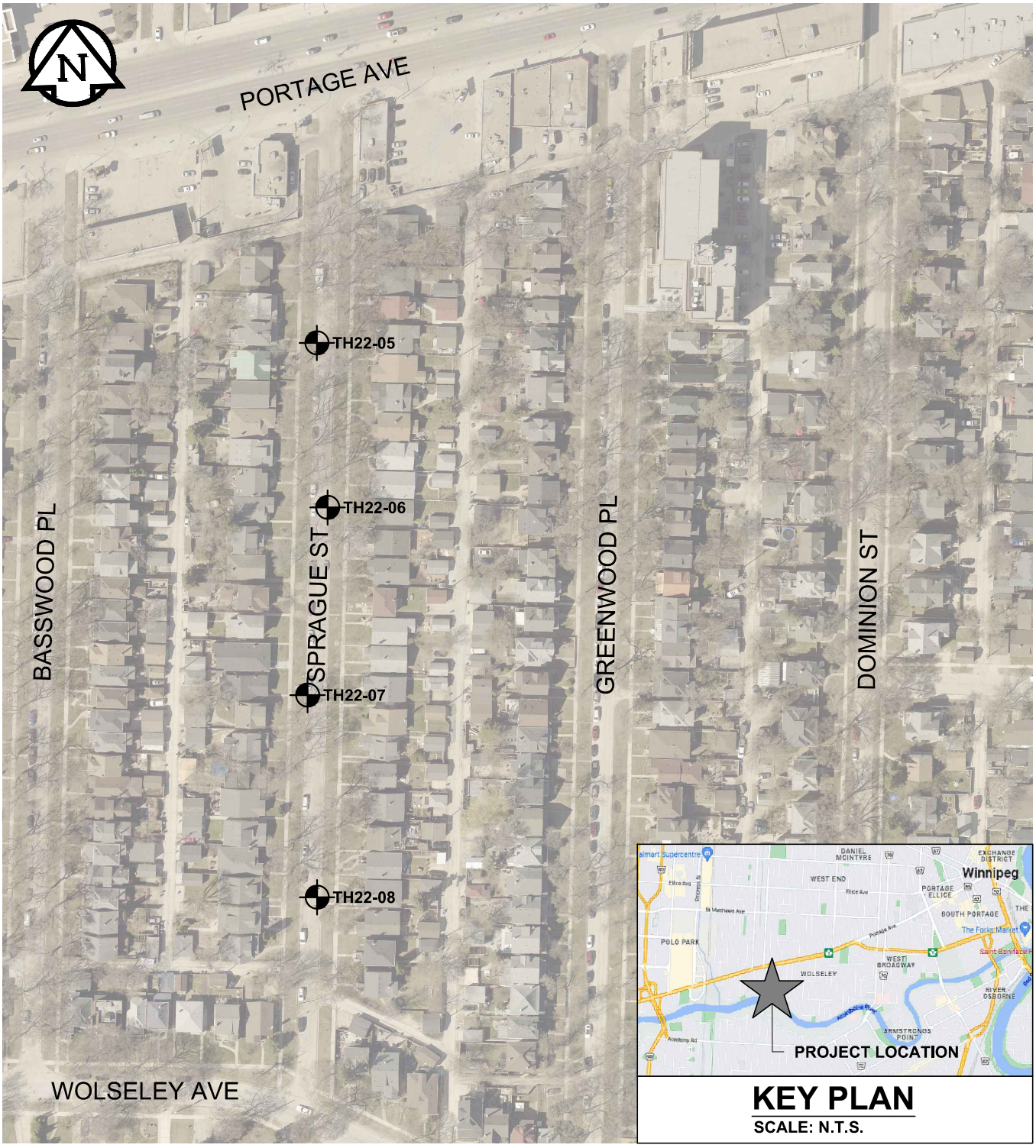
TEST HOLE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 m
SCALE = 1 : 1 750 (216 mm x 279 mm)

Figure 01
Test Hole Location Plan



KEY PLAN
SCALE: N.T.S.

LEGEND:

TEST HOLE (TREK, 2022)

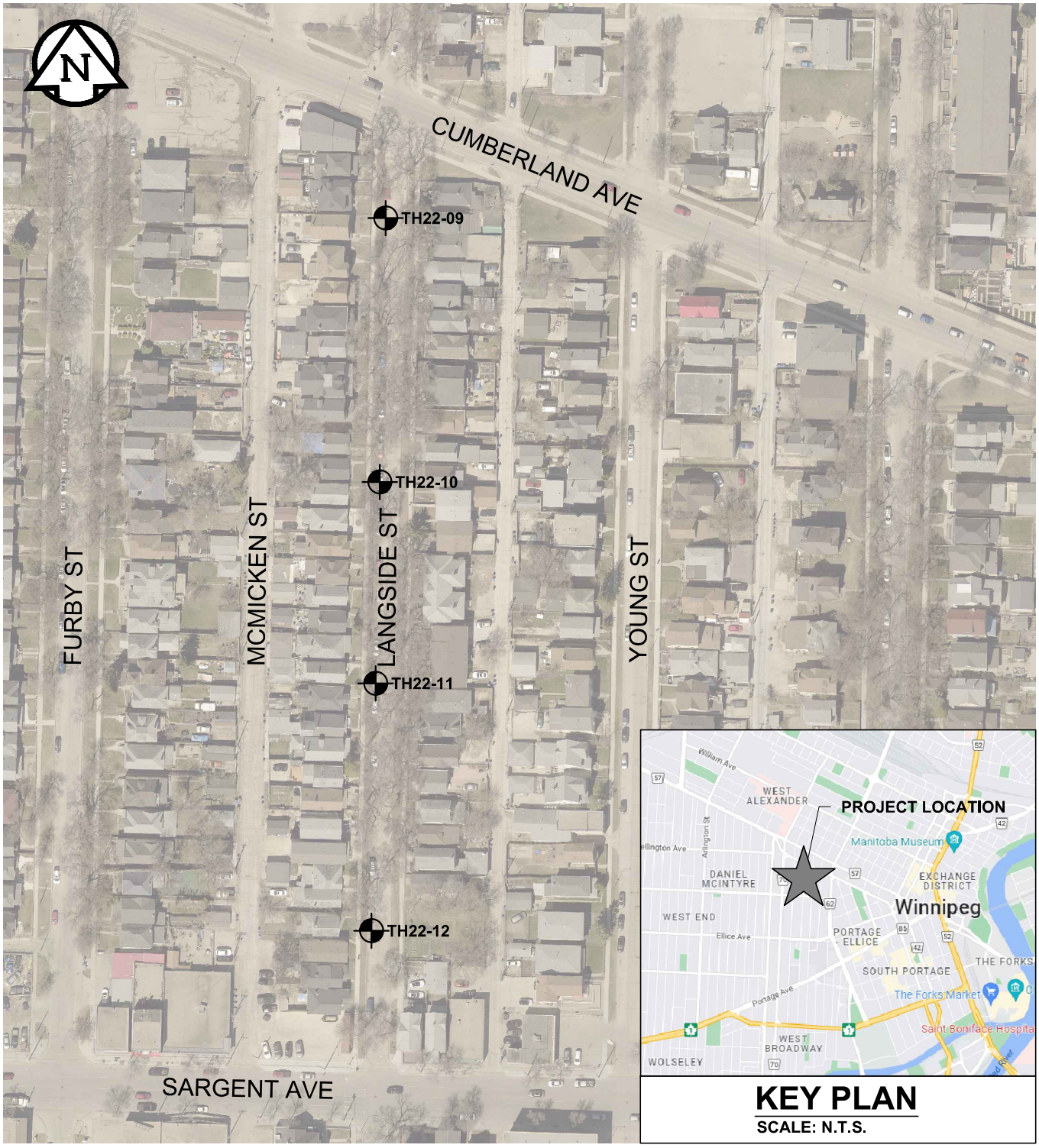
NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 100 m

SCALE = 1 : 2 000 (216 mm x 279 mm)

Figure 02
Test Hole Location Plan



LEGEND:

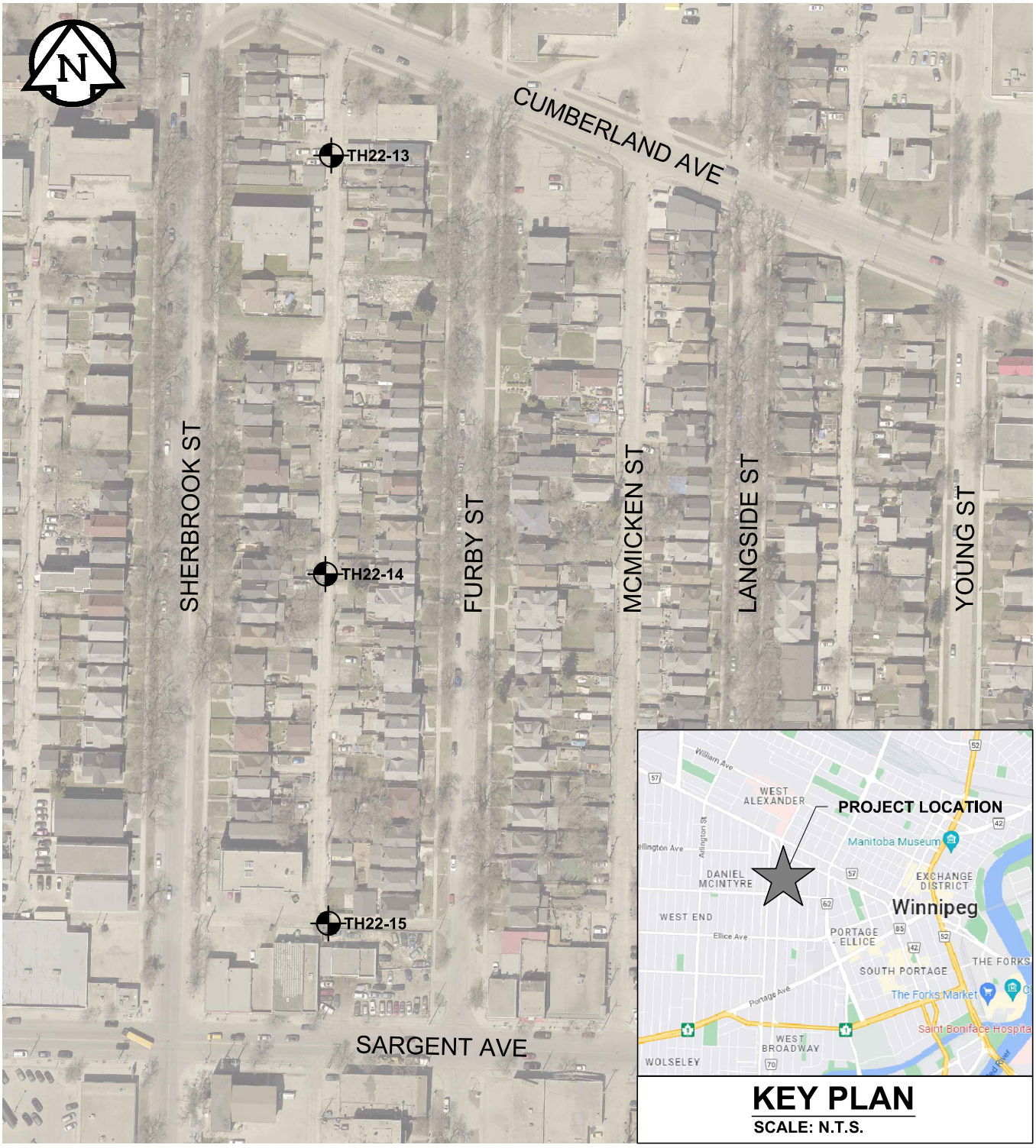
TEST HOLE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 m
SCALE = 1 : 1 750 (216 mm x 279 mm)

Figure 03
Test Hole Location Plan



KEY PLAN
SCALE: N.T.S.

LEGEND:

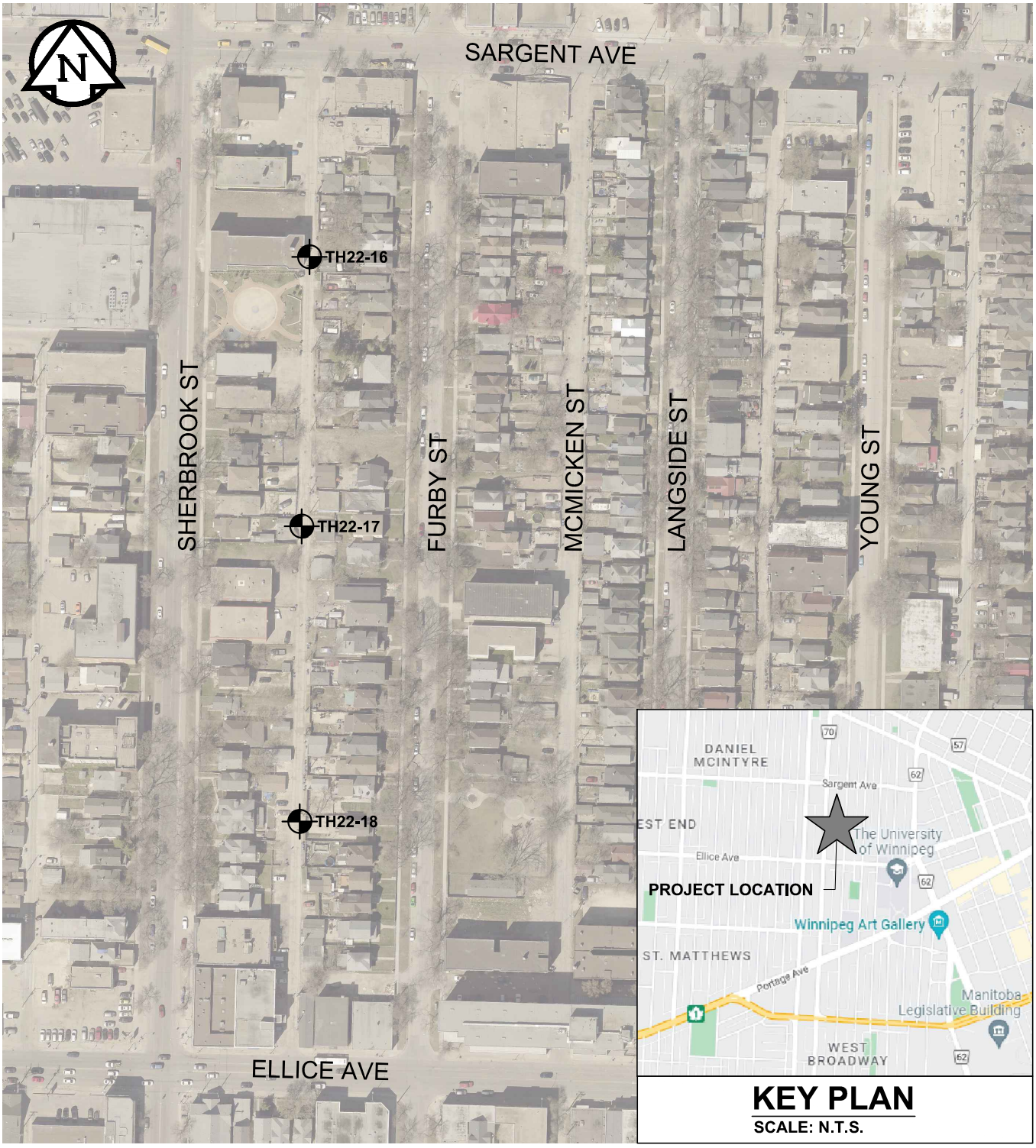
TEST HOLE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 100 m
SCALE = 1 : 2 000 (216 mm x 279 mm)

Figure 04
Test Hole Location Plan



KEY PLAN
SCALE: N.T.S.

LEGEND:

TEST HOLE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 100 m
SCALE = 1 : 2 250 (216 mm x 279 mm)

Figure 05
Test Hole Location Plan

KEY PLAN
SCALE: N.T.S.

LEGEND:

TEST HOLE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 m
SCALE = 1 : 1 500 (216 mm x 279 mm)

Figure 06
Test Hole Location Plan

KEY PLAN
SCALE: N.T.S.

LEGEND:

PAVEMENT CORE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 m
SCALE = 1 : 1 500 (216 mm x 279 mm)

Figure 07
Pavement Core Location Plan

Z:\Projects\1000 Soils Lab\Lab Projects\1000 Lab Projects\1000-166 Dillon Consulting\1000-166-01 2023 Local Street Renewal -23-R-03\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\Fig 07 2022-10-24 2023 Local Street Renewal -23-R-03 0_B 1000-166-01.dwg, 2022-10-24 8:20:39 AM

KEY PLAN
SCALE: N.T.S.

LEGEND:

PAVEMENT CORE (TREK, 2022)

NOTES:

1. AERIAL IMAGERY FROM CITY OF WINNIPEG (2021).

0 25 50 75 100 m
SCALE = 1 : 2 000 (216 mm x 279 mm)

Figure 08
Pavement Core Location Plan

Z:\Projects\1000 Soils Lab\Lab Projects\1000 Lab Projects\1000-166 Dillon Consulting\1000-166-01 2023 Local Street Renewal -23-R-03\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\Fig 08 2022-10-24 2023 Local Street Renewal -23-R-03 0_B 1000-166-01.dwg, 2022-10-24 8:22:56 AM

Appendix A

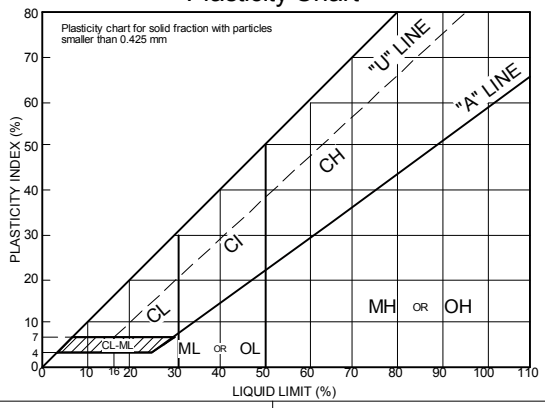
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – McMicken Street

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH22-01
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5529016, E-632412 (McMicken St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 25 mm thick CONCRETE - 165 mm thick		PC22-01
0.5		CLAY - Gravelly, some sand, some silt - black - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G43
1.0		SILT - some clay, trace sand - light brown - moist, soft - low plasticity - AASHTO: A-4 (I)		G44 G45
1.5		CLAY - silty, trace sand - grey - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (69)		G46 G47
2.0				G48
2.5		END OF TEST HOLE AT 2.5 m IN CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 40 80 120 160 200
Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #684 McMicken St, 3.7 m West of East edge of back lane.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-02

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528939, E-632415 (McMicken St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200 / Test Type: △ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○
		ASPHALT - 25 mm thick				
		CONCRETE - 102 mm thick		PC22-02		
		CLAY - silty, trace sand - grey - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G37	●	△ ✤
0.5				G38	●	△ ✤
1.0		SILT AND CLAY - trace sand - light brown - moist to wet, soft - low to intermediate plasticity - AASHTO: A-6 (10)		G39	●	
				G40	●	
1.5				G41	●	
2.0		CLAY - silty, trace sand - grey - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G42	●	△ ✤

END OF TEST HOLE AT 2.4 m IN CLAY

1) Seepage or sloughing not observed.
2) Test hole open to 2.4 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #656 McMicken St, 2.0 m West of East edge of back lane.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-03
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528884, E-632413 (McMicken St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200
	ASPHALT - 114 mm thick				
	CONCRETE - 76 mm thick		PC22-03		
	CLAY - some silt, trace sand - black - moist, very stiff - high plasticity - AASHTO: A-7-6 (58)				
0.5			G31		
	- silty, brown, stiff below 0.8 m depth		G32		
1.0			G33		
			G34		
1.5			G35		
2.0			G36		
2.5	END OF TEST HOLE AT 2.5 m IN CLAY				

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #640 McMicken St, 2.3 m East of West edge of back lane.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-04

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528795, E-632407 (McMicken St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 25 mm thick		
		CONCRETE - 190 mm thick		PC22-04
		CLAY - silty, trace sand, black, moist, stiff to very stiff, high plasticity - AASHTO: A-7-6 (I)		
0.5		SILT - clayey, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (I)		G25
				G26
1.0				G27
		CLAY - silty, trace sand - brown - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G28
1.5				G29
2.0				G30
2.5				

Bulk Unit Wt (kN/m^3): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100 — PL MC LL

Undrained Shear Strength (kPa): 0 40 80 120 160 200

Test Type: △ Torvane △ | ✿ Pocket Pen. ✿ | ☒ Qu ☒ | ○ Field Vane ○

END OF TEST HOLE AT 2.6 m IN CLAY

1) Seepage or sloughing not observed.
2) Test hole open to 2.6 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #612 McMicken St, 1.3 m West of East edge of back lane.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
McMicken Street - Cumberland Ave to Sargent Ave

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-01	UTM : 14U 5529016 N, 632412 E Located in front of #684 McMicken St., Northbound lane, 3.7 m West of East edge of back lane.	Asphalt	25	Concrete	165	Clay; AASHTO: A-7 (I)	0.4	0.6	13							
						Silt; AASHTO: A-4 (I)	0.7	0.9	30							
						Silt; AASHTO: A-4 (I)	1.0	1.2	25							
						Clay; AASHTO: A-7-6 (69)	1.3	1.5	31							
						Clay; AASHTO: A-7-6 (69)	1.7	1.9	31	71	28	1	0	28	86	59
						Clay; AASHTO: A-7-6 (69)	2.2	2.3	40							
TH22-02	UTM : 14U 5528939 N, 632415 E Located in front of #656 McMicken St, Northbound Lane, 2.0 m West of East edge of back lane	Asphalt	25	Concrete	102	Clay; AASHTO: A-7-6 (I)	0.4	0.5	34							
						Clay; AASHTO: A-7-6 (I)	0.7	0.8	31							
						Silt and Clay; AASHTO: A-6 (10)	1.0	1.1	22							
						Silt and Clay; AASHTO: A-6 (10)	1.3	1.4	21							
						Silt and Clay; AASHTO: A-6 (10)	1.6	1.8	25	18	75	7	0	17	29	12
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	42							
TH22-03	UTM : 14U 5528884 N, 632413 E Located in front of #640 McMicken St., Southbound Lane, 2.3 m East of West edge of back lane	Asphalt	114	Concrete	76	Clay; AASHTO: A-7-6 (58)	0.4	0.6	29							
						Clay; AASHTO: A-7-6 (58)	0.7	0.9	31							
						Clay; AASHTO: A-7-6 (58)	1.0	1.2	33							
						Clay; AASHTO: A-7-6 (58)	1.3	1.5	37							
						Clay; AASHTO: A-7-6 (58)	1.7	1.9	41	75	24	1	0	22	73	51
						Clay; AASHTO: A-7-6 (58)	2.2	2.3	45							
TH22-04	UTM : 14U 5528795 N, 632407 E Located in front of #612 McMicken St., Northbound Lane, 1.3 m West of East edge of back lane	Asphalt	25	Concrete	190	Silt; AASHTO: A-4 (I)	0.5	0.3	21							
						Silt; AASHTO: A-4 (I)	0.8	0.6	23							
						Silt; AASHTO: A-4 (I)	1.1	0.9	21							
						Clay; AASHTO: A-7-6 (I)	1.4	1.2	25							
						Clay; AASHTO: A-7-6 (I)	1.7	1.5	41							
						Clay; AASHTO: A-7-6 (I)	2.2	1.8	42							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - McMicken Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-01	TH22-01	TH22-01	TH22-01	TH22-01	TH22-01
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G43	G44	G45	G46	G47	G48
Tare ID	AC27	H48	F15	F61	F61	H35
Mass of tare	6.9	8.4	8.8	8.6	8.6	8.6
Mass wet + tare	220.3	207.3	205.9	200.5	200.5	204.0
Mass dry + tare	196.3	161.0	166.6	155.1	155.1	147.9
Mass water	24.0	46.3	39.3	45.4	45.4	56.1
Mass dry soil	189.4	152.6	157.8	146.5	146.5	139.3
Moisture %	12.7%	30.3%	24.9%	31.0%	31.0%	40.3%

Test Hole	TH22-02	TH22-02	TH22-02	TH22-02	TH22-02	TH22-02
Depth (m)	0.4 - 0.5	0.7 - 0.8	1.0 - 1.1	1.3 - 1.4	1.6 - 1.8	2.1 - 2.3
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	Z15	C26	P36	AA05	AC25	A8
Mass of tare	8.6	8.5	8.6	6.8	6.8	8.1
Mass wet + tare	201.7	202.9	202.8	209.1	418.8	216.9
Mass dry + tare	152.9	156.6	168.2	173.8	336.9	155.5
Mass water	48.8	46.3	34.6	35.3	81.9	61.4
Mass dry soil	144.3	148.1	159.6	167.0	330.1	147.4
Moisture %	33.8%	31.3%	21.7%	21.1%	24.8%	41.7%

Test Hole	TH22-03	TH22-03	TH22-03	TH22-03	TH22-03	TH22-03
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	AA18	Z134	D49	D27	K39	FB1
Mass of tare	6.8	8.8	8.5	8.5	8.6	8.5
Mass wet + tare	221.2	200.1	210.6	209.1	406.8	201.6
Mass dry + tare	173.6	154.7	160.0	155.3	290.8	141.4
Mass water	47.6	45.4	50.6	53.8	116.0	60.2
Mass dry soil	166.8	145.9	151.5	146.8	282.2	132.9
Moisture %	28.5%	31.1%	33.4%	36.6%	41.1%	45.3%

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - McMicken Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-04	TH22-04	TH22-04	TH22-04	TH22-04	TH22-04
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	Z67	E48	K20	N22	E133	F16
Mass of tare	8.5	8.6	8.5	8.6	8.4	8.7
Mass wet + tare	210.4	204.8	222.6	202.3	222.8	216.9
Mass dry + tare	176.2	168.2	186.1	163.8	160.1	155.6
Mass water	34.2	36.6	36.5	38.5	62.7	61.3
Mass dry soil	167.7	159.6	177.6	155.2	151.7	146.9
Moisture %	20.4%	22.9%	20.6%	24.8%	41.3%	41.7%

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Atterberg Limits
ASTM D4318-10e1

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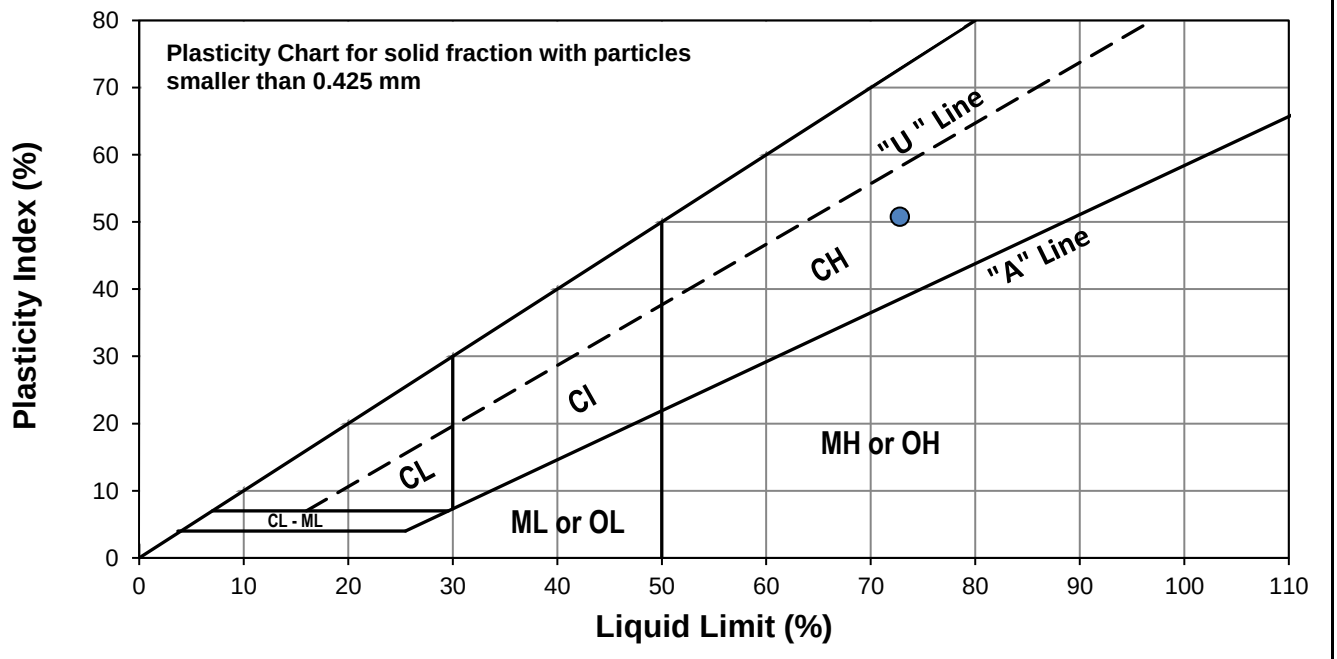
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - McMicken St.
Test Hole	TH22-03
Sample #	G35
Depth (m)	1.7 - 1.9
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	73
Plastic Limit	22
Plasticity Index	51

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	20	23	34		
Mass Tare (g)	14.086	14.197	13.952		
Mass Wet Soil + Tare (g)	21.930	23.314	23.185		
Mass Dry Soil + Tare (g)	18.594	19.462	19.345		
Mass Water (g)	3.336	3.852	3.840		
Mass Dry Soil (g)	4.508	5.265	5.393		
Moisture Content (%)	74.002	73.162	71.203		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.981	13.887			
Mass Wet Soil + Tare (g)	22.544	22.859			
Mass Dry Soil + Tare (g)	21.019	21.220			
Mass Water (g)	1.525	1.639			
Mass Dry Soil (g)	7.038	7.333			
Moisture Content (%)	21.668	22.351			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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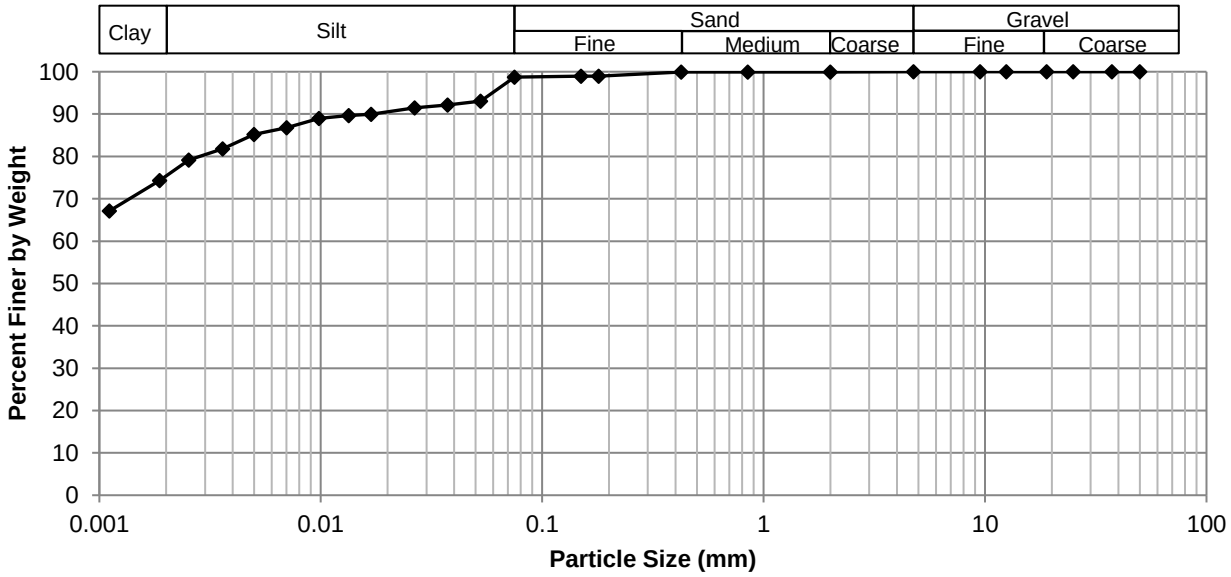
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -McMicken Street
Test Hole	TH22-03
Sample #	G35
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	1.3%
Silt	23.5%
Clay	75.3%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	98.75
37.5	100.00	2.00	99.97	0.0527	93.07
25.0	100.00	0.850	99.95	0.0374	92.13
19.0	100.00	0.425	99.95	0.0265	91.50
12.5	100.00	0.180	98.95	0.0169	89.94
9.50	100.00	0.150	98.95	0.0134	89.63
4.75	100.00	0.075	98.75	0.0098	89.00
				0.0070	86.82
				0.0050	85.18
				0.0036	81.83
				0.0025	79.18
				0.0019	74.35
				0.0011	67.16

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Atterberg Limits
ASTM D4318-10e1

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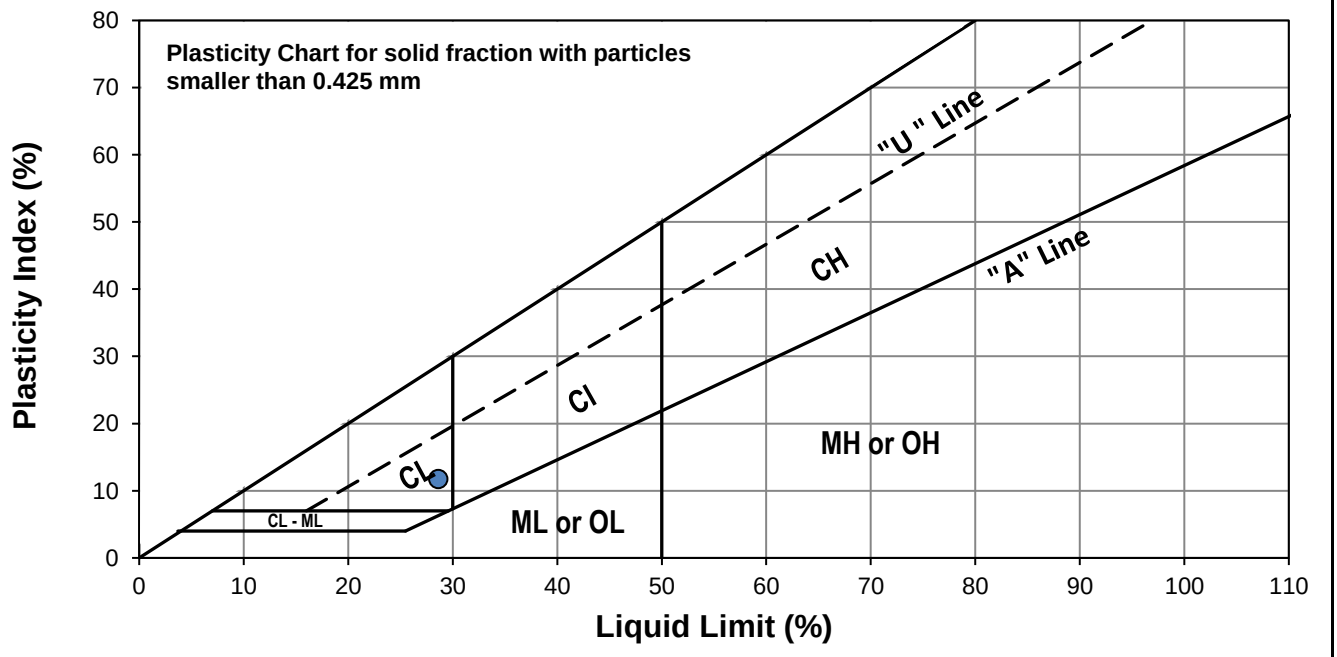
Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal - McMicken Street
Test Hole	TH22-02
Sample #	G41
Depth (m)	1.6 - 1.8
Sample Date	07-Sep-22
Test Date	24-Oct-22
Technician	TN

Liquid Limit	29
Plastic Limit	17
Plasticity Index	12

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	15	22	35		
Mass Tare (g)	14.134	14.090	14.198		
Mass Wet Soil + Tare (g)	29.754	29.551	27.201		
Mass Dry Soil + Tare (g)	26.156	26.067	24.385		
Mass Water (g)	3.598	3.484	2.816		
Mass Dry Soil (g)	12.022	11.977	10.187		
Moisture Content (%)	29.928	29.089	27.643		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.177	14.117			
Mass Wet Soil + Tare (g)	22.751	20.593			
Mass Dry Soil + Tare (g)	21.519	19.652			
Mass Water (g)	1.232	0.941			
Mass Dry Soil (g)	7.342	5.535			
Moisture Content (%)	16.780	17.001			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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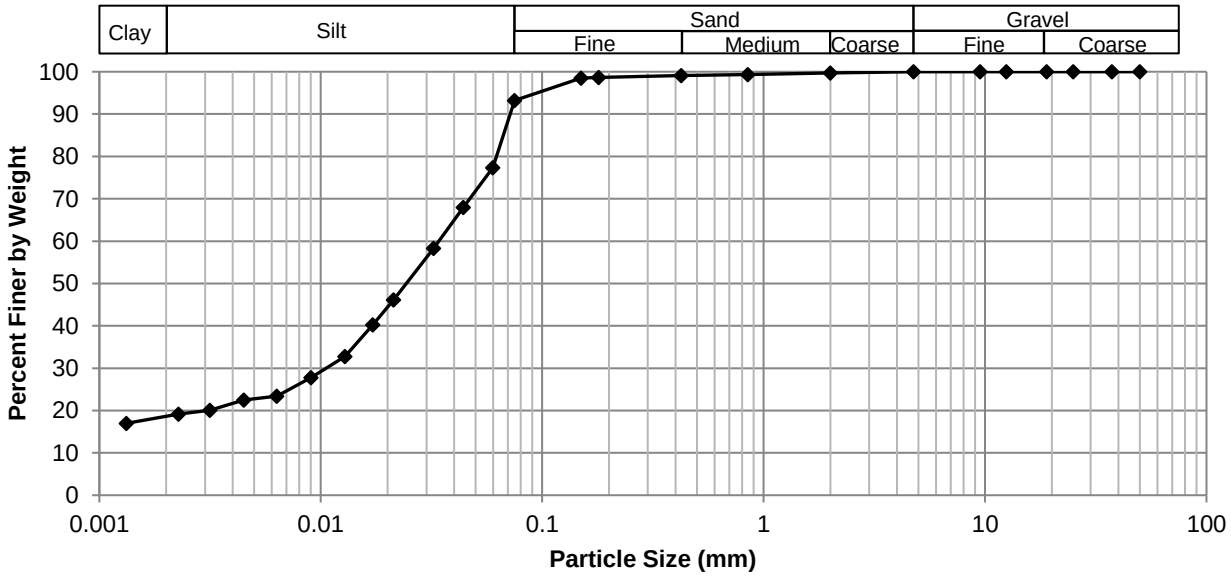
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - McMicken Street
Test Hole	TH22-02
Sample #	G41
Depth (m)	1.6 - 1.8
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	6.8%
Silt	74.7%
Clay	18.5%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	93.23
37.5	100.00	2.00	99.71	0.0599	77.31
25.0	100.00	0.850	99.34	0.0441	67.96
19.0	100.00	0.425	99.11	0.0323	58.33
12.5	100.00	0.180	98.65	0.0213	46.17
9.50	100.00	0.150	98.52	0.0172	40.24
4.75	100.00	0.075	93.23	0.0129	32.76
				0.0090	27.79
				0.0063	23.38
				0.0045	22.48
				0.0032	20.06
				0.0023	19.16
				0.0013	16.98

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Atterberg Limits
ASTM D4318-10e1

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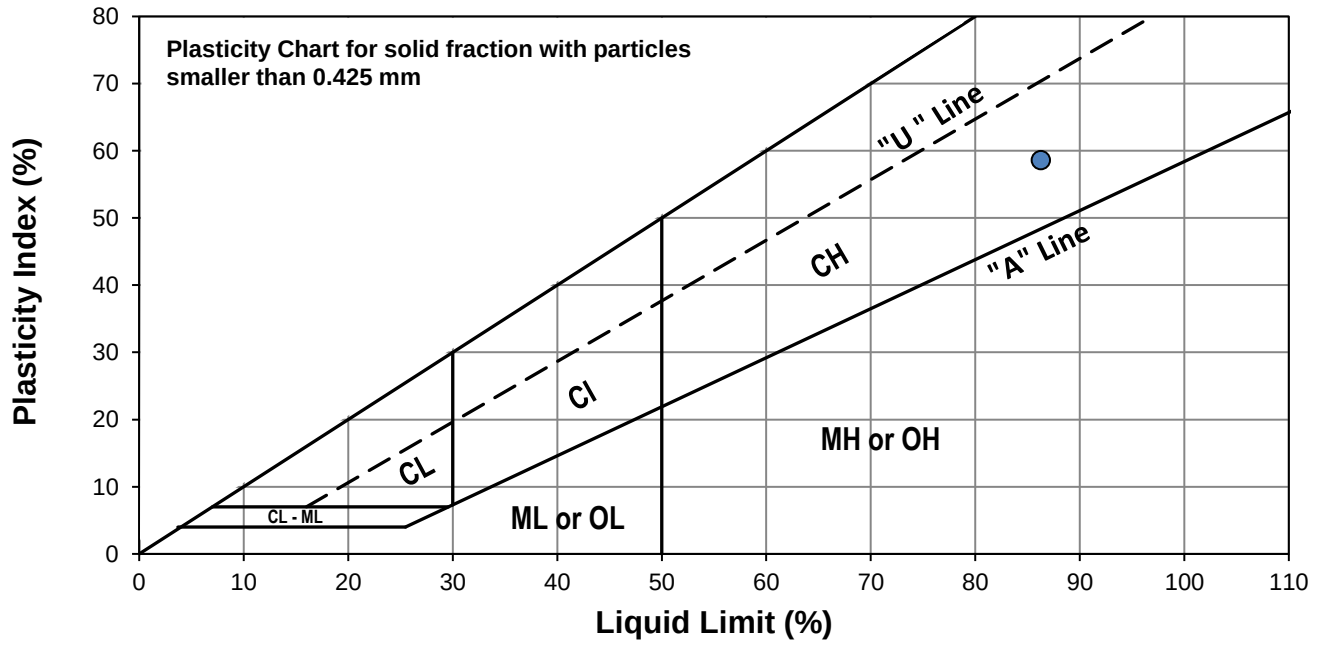
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - McMicken St.
Test Hole	TH22-01
Sample #	G47
Depth (m)	1.7 - 1.9
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	KF

Liquid Limit	86
Plastic Limit	28
Plasticity Index	59

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	24	31		
Mass Tare (g)	14.089	13.883	13.908		
Mass Wet Soil + Tare (g)	22.021	23.339	23.754		
Mass Dry Soil + Tare (g)	18.264	18.948	19.264		
Mass Water (g)	3.757	4.391	4.490		
Mass Dry Soil (g)	4.175	5.065	5.356		
Moisture Content (%)	89.988	86.693	83.831		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.139	13.940			
Mass Wet Soil + Tare (g)	25.157	22.823			
Mass Dry Soil + Tare (g)	22.746	20.916			
Mass Water (g)	2.411	1.907			
Mass Dry Soil (g)	8.607	6.976			
Moisture Content (%)	28.012	27.337			

Note: Additional information recorded/measured for this test is available upon request.

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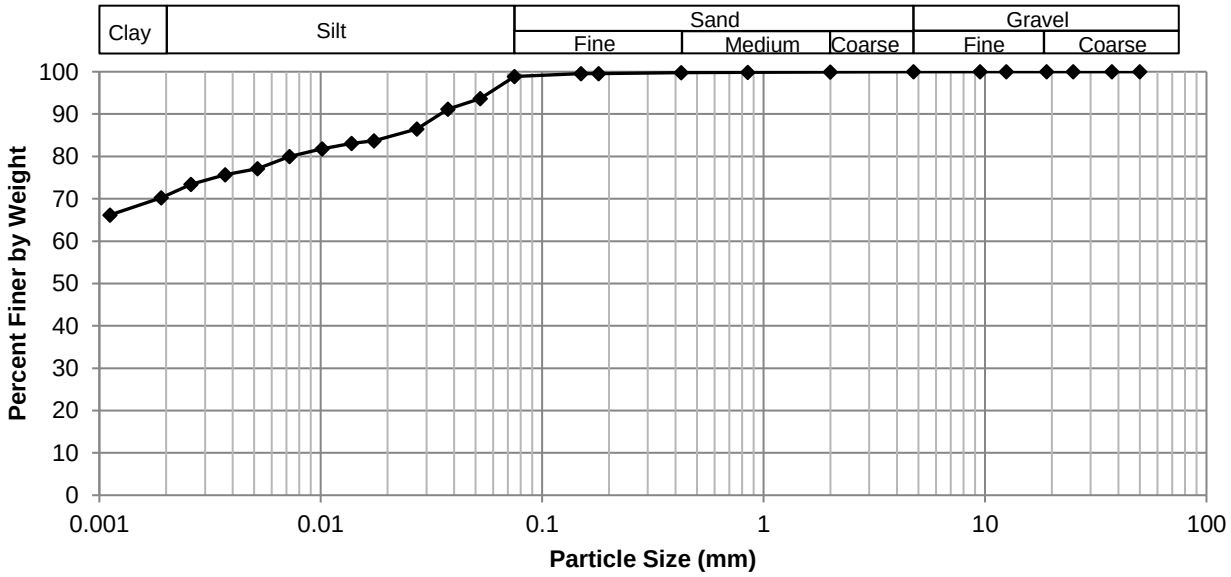
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - McMicken Street
Test Hole	TH22-01
Sample #	G47
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	1.1%
Silt	28.2%
Clay	70.7%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	98.86
37.5	100.00	2.00	99.95	0.0525	93.70
25.0	100.00	0.850	99.88	0.0376	91.20
19.0	100.00	0.425	99.78	0.0272	86.51
12.5	100.00	0.180	99.58	0.0174	83.70
9.50	100.00	0.150	99.58	0.0138	83.07
4.75	100.00	0.075	98.86	0.0101	81.82
				0.0072	79.95
				0.0052	77.09
				0.0037	75.72
				0.0026	73.44
				0.0019	70.23
				0.0011	66.17

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Standard Proctor Compaction Test

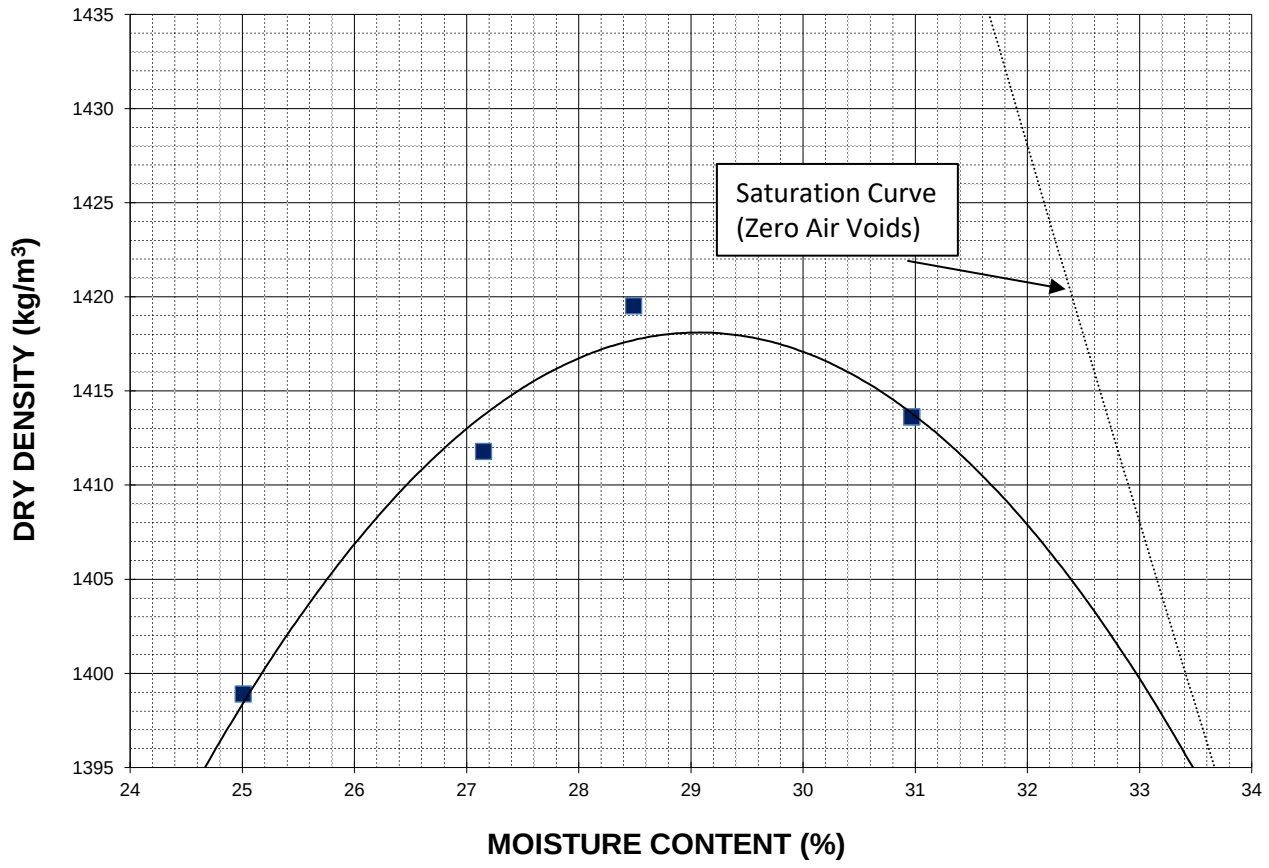
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -McMicken Street
Sample #	TH22-01
Source	McMicken Street
Material	Clay
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1418
Optimum Moisture (%)	29.1

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1749	1795	1824	1851	
Dry Density (kg/m^3)	1399	1412	1420	1414	
Moisture Content (%)	25.0	27.2	28.5	31.0	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	McMicken Street
Client	Dillon Consulting Ltd.	**Material**	Clay & Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-07
Sample #	TH22-01	**Test Date**	2022-10-22
		Technician	DS

Proctor Results (ASTM D698)

Maximum Dry Density	1418	kg/m3
Optimum Moisture Content	29.1	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1339	kg/m3
Initial Moisture Content	29.7	%
Relative Density	94.4	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	1.7	%
Moisture Content in top 25 mm	39.4	%
Immersion Period	96	h

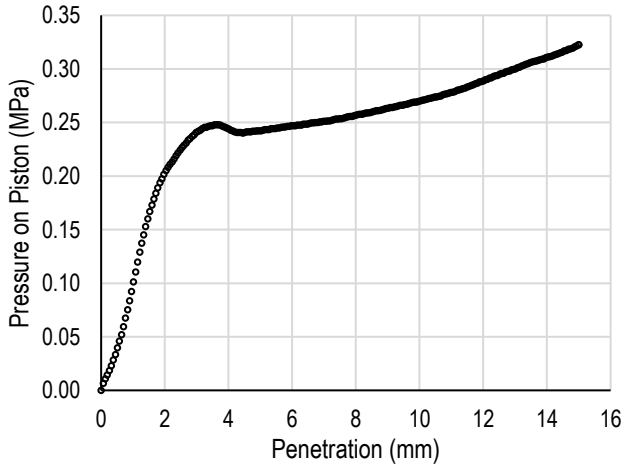
CBR Results

CBR at 2.54 mm	3.3	%
CBR at 5.08 mm	2.4	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.05	0.05
1.27	0.14	0.14
1.91	0.20	0.20
2.54	0.23	0.23
3.18	0.24	0.24
3.81	0.25	0.25
4.45	0.24	0.24
5.08	0.24	0.24
7.62	0.25	0.25
10.16	0.27	0.27
12.70	0.30	0.30

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

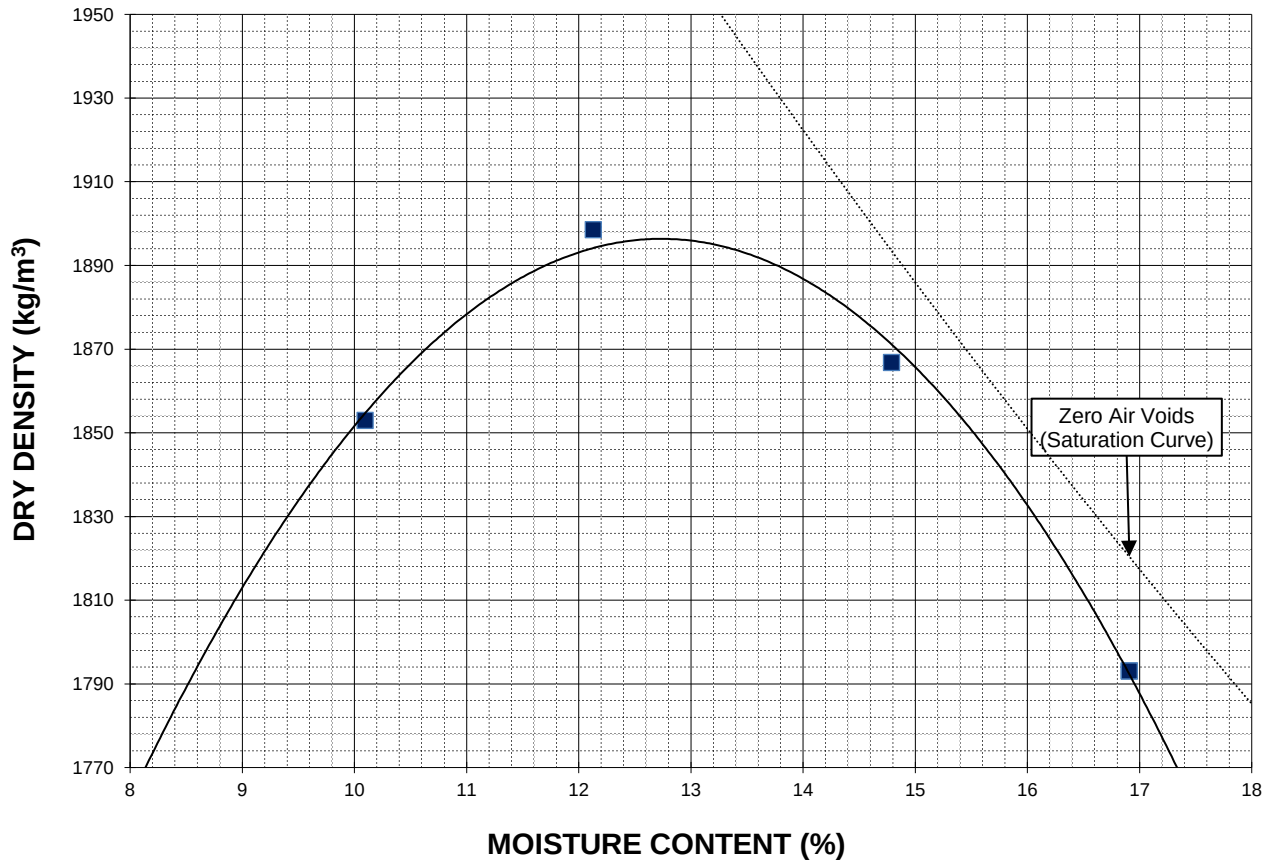
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -McMicken Street
Sample #	TH22-02
Source	McMicken Street
Material	Silt
Sample Date	07-Sep-22
Test Date	13-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1896
Optimum Moisture (%)	12.7

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2040	2129	2143	2096	
Dry Density (kg/m^3)	1853	1899	1867	1793	
Moisture Content (%)	10.1	12.1	14.8	16.9	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	McMicken Street
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-07
Sample #	TH22-02	**Test Date**	2022-10-22
		Technician	DS

Proctor Results (ASTM D698)

Maximum Dry Density	1896	kg/m3
Optimum Moisture Content	12.7	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1798	kg/m3
Initial Moisture Content	12.8	%
Relative Density	94.8	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.4	%
Moisture Content in top 25 mm	17.0	%
Immersion Period	96	h

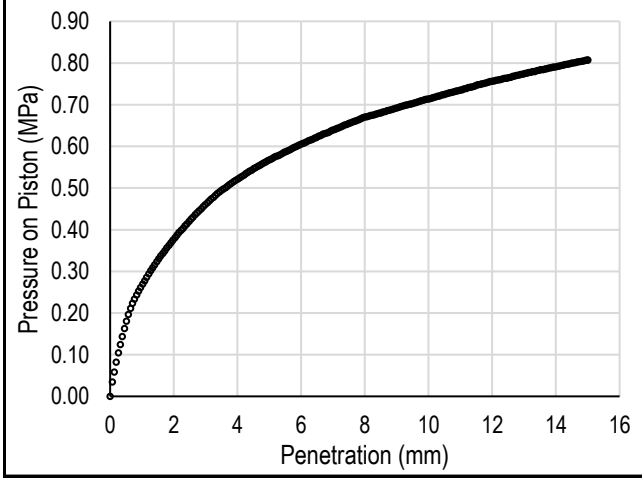
CBR Results

CBR at 2.54 mm	6.2	%
CBR at 5.08 mm	5.5	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.21	0.21
1.27	0.30	0.30
1.91	0.37	0.37
2.54	0.43	0.43
3.18	0.47	0.47
3.81	0.51	0.51
4.45	0.54	0.54
5.08	0.57	0.57
7.62	0.66	0.66
10.16	0.72	0.72
12.70	0.77	0.77

Load/Penetration Curve



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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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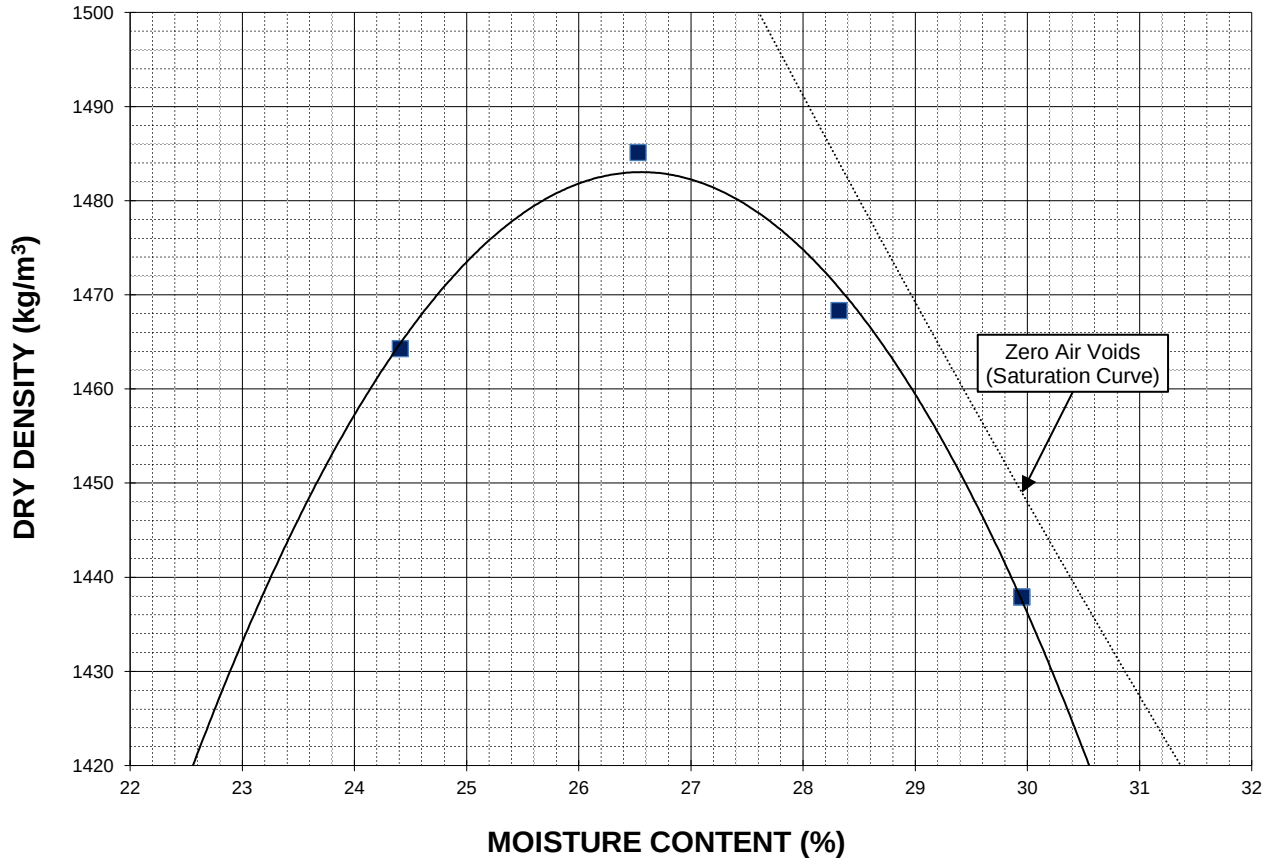
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -McMicken Street
Sample #	TH22-03
Source	McMicken Street
Material	Clay and Silt
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1483
Optimum Moisture (%)	26.6

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1822	1879	1884	1869	
Dry Density (kg/m^3)	1464	1485	1468	1438	
Moisture Content (%)	24.4	26.5	28.3	30.0	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	McMicken Street
Client	Dillon Consulting Ltd.	**Material**	Clay & Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-07
Sample #	TH22-03	**Test Date**	2022-10-22
		Technician	DS

Proctor Results (ASTM D698)

Maximum Dry Density	1483	kg/m3
Optimum Moisture Content	26.6	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1404	kg/m3
Initial Moisture Content	25.7	%
Relative Density	94.7	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.9	%
Moisture Content in top 25 mm	35.0	%
Immersion Period	96	h

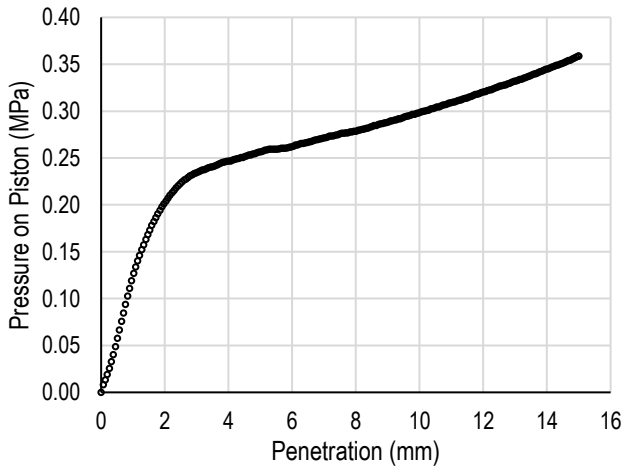
CBR Results

CBR at 2.54 mm	3.3	%
CBR at 5.08 mm	2.5	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.08	0.08
1.27	0.15	0.15
1.91	0.20	0.20
2.54	0.22	0.22
3.18	0.24	0.24
3.81	0.25	0.25
4.45	0.25	0.25
5.08	0.26	0.26
7.62	0.28	0.28
10.16	0.30	0.30
12.70	0.33	0.33

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-01

Photo 2: Pavement Core Sample at Test Hole TH22-02

Photo 3: Pavement Core Sample at Test Hole TH22-03

Photo 4: Pavement Core Sample at Test Hole TH22-04

Appendix B

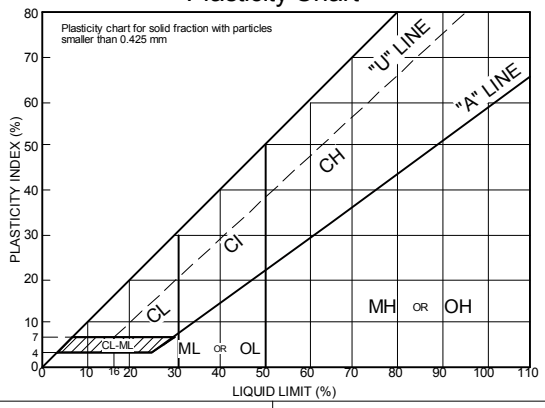
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Sprague Street

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH22-05
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5527205, E-630652 (Sprague St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number
	ASPHALT - 63 mm thick	PC	PC22-05
	CONCRETE - 102 mm thick		
	CLAY - silty, trace rootlets, trace sand - black - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)	G	G103
0.5		G	G104
	- brown, intermediate to high plasticity below 0.9 m depth	G	G105
1.0		G	G106
	SILT - some clay - light brown - moist, soft - low plasticity - AASHTO: A-4 (I)	G	G107
1.5		G	G108
	CLAY - silty - brown - moist, stiff - high plasticity - AASHTO: A-7-6 (44)		
2.0			
2.5	END OF TEST HOLE AT 2.5 m IN CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 40 80 120 160 200

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #429 Sprague St, 2.0 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-06
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5527148, E-630672 (Sprague St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200
0.0	ASPHALT - 63 mm thick				
	CONCRETE - 102 mm thick		PC22-06		
	CLAY - some silt, trace gravel, trace sand - black - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G97		
0.5	- brown below 0.5 m depth		G98		
1.0			G99		
			G100		
1.5	SILT AND CLAY - trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-6 (16)		G101		
	CLAY - silty, trace silt inclusions (5-10 mm dia.) - brown - moist, very stiff - high plasticity - AASHTO: A-7-6 (I)		G102		
2.5	END OF TEST HOLE AT 2.5 m IN CLAY				

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #501 Sprague St, 2.0 m West of East curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-07

TREK GEOTECHNICAL

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5527083, E-630664 (Sprague St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200 / Test Type: △ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○
0		ASPHALT - 13 mm thick		PC22-07		
		CONCRETE - 127 mm thick				
		CLAY - some silt, trace sand - dark grey - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		G91	●	✤ △
0.5		- brown below 0.7 m depth		G92	●	△ ✤
1.0				G93	●	△ ✤
		SILT - some clay - light brown - moist, soft - low plasticity - AASHTO: A-4 (I)		G94	●	
1.5				G95	●	
		CLAY - silty - brown - moist, stiff - high plasticity - AASHTO: A-7-6 (I)		G96	●	✤ △
2.5		END OF TEST HOLE AT 2.5 m IN CLAY				

1) No seepage or sloughing observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #490 Sprague St, 1.5 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-08
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5527013, E-630666 (Sprague St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		ASPHALT - 89 mm thick		
		CONCRETE - 114 mm thick		PC22-08
		CLAY - silty, trace sand - dark grey - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)		
0.5				G85
		- brown, intermediate to high plasticity below 0.8 m depth		G86
1.0				G87
		SILT - some clay, trace sand - light brown - moist, soft - low plasticity - AASHTO: A-4 (3)		G88
1.5				G89
		CLAY - silty, trace silt inclusions (5-15 mm dia.) - brown - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G90
2.0				
2.5		END OF TEST HOLE AT 2.5 m IN CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 40 80 120 160 200

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #469 Sprague St, 2.0 m West of East curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
Sprague Street - Portage Ave to Wolseley Ave

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-05	UTM : 14U 5527205 N, 630652 E Located in front of #429 Sprague St., Southbound lane, 2.0 m East of West curb.	Asphalt	63	Concrete	102	Clay; AASHTO: A-7-6 (I)	0.4	0.5	30							
						Clay; AASHTO: A-7-6 (I)	0.7	0.9	29							
						Clay; AASHTO: A-7-6 (I)	1.0	1.2	27							
						Silt; AASHTO: A-4 (I)	1.3	1.5	23							
						Clay; AASHTO: A-7-6 (44)	1.7	1.8	23	46	49	5	0	17	59	43
						Clay; AASHTO: A-7-6 (44)	2.1	2.3	43							
TH22-06	UTM : 14U 5527148 N, 630672 E Located in front of #501 Sprague St., Northbound lane, 2.0 m West of East curb.	Asphalt	63	Concrete	102	Clay; AASHTO: A-7-6 (I)	0.4	0.5	30							
						Clay; AASHTO: A-7-6 (I)	0.7	0.9	23							
						Clay; AASHTO: A-7-6 (I)	1.0	1.2	27							
						Silt and clay; AASHTO: A-6 (16)	1.3	1.5	28							
						Silt and clay; AASHTO: A-6 (16)	1.7	1.8	25	28	63	9	0	14	34	19
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	25							
TH22-07	UTM : 14U 5527083 N, 630664 E Located in front of #460 Sprague St., Southbound lane, 1.5 m East of West curb.	Asphalt	13	Concrete	127	Clay; AASHTO: A-7-6 (I)	0.4	0.5	27							
						Clay; AASHTO: A-7-6 (I)	0.7	0.8	23							
						Clay; AASHTO: A-7-6 (I)	1.0	1.1	25							
						Silt; AASHTO: A-4 (I)	1.3	1.4	23							
						Silt; AASHTO: A-4 (I)	1.7	1.8	25							
						Clay; AASHTO: A-7-6 (I)	2.1	2.3	42							
TH22-08	UTM : 14U 5527013 N, 630666 E Located in front of #469 Sprague St, Northbound lane, 2.0 m West of East curb.	Asphalt	89	Concrete	114	Clay; AASHTO: A-7-6 (I)	0.4	0.6	27							
						Clay; AASHTO: A-7-6 (I)	0.7	0.9	24							
						Clay; AASHTO: A-7-6 (I)	1.0	1.2	24							
						Silt; AASHTO: A-4 (3)	1.3	1.5	22							
						Silt; AASHTO: A-4 (3)	1.7	1.9	10	12	79	9	0	17	23	5
						Clay; AASHTO: A-7-6 (I)	2.2	2.3	36							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Sprague Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-05	TH22-05	TH22-05	TH22-05	TH22-05	TH22-05
Depth (m)	0.4 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.8	2.1 - 2.3
Sample #	G103	G104	G105	G106	G107	G108
Tare ID	E102	G69	G38	W101	W101	AB13
Mass of tare	8.8	8.6	8.6	8.5	8.5	6.8
Mass wet + tare	216.8	208.4	205.6	216.7	216.7	295.0
Mass dry + tare	169.2	163.9	163.8	178.0	178.0	207.9
Mass water	47.6	44.5	41.8	38.7	38.7	87.1
Mass dry soil	160.4	155.3	155.2	169.5	169.5	201.1
Moisture %	29.7%	28.7%	26.9%	22.8%	22.8%	43.3%

Test Hole	TH22-06	TH22-06	TH22-06	TH22-06	TH22-06	TH22-06
Depth (m)	0.4 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.8	2.1 - 2.3
Sample #	G97	G98	G99	G100	G101	G102
Tare ID	E22	F133	N47	E25	F100	N35
Mass of tare	8.8	8.5	8.5	8.9	8.5	8.5
Mass wet + tare	200.9	201.0	201.1	206.8	444.3	444.3
Mass dry + tare	157.0	165.2	160.3	164.1	358.2	358.2
Mass water	43.9	35.8	40.8	42.7	86.1	86.1
Mass dry soil	148.2	156.7	151.8	155.2	349.7	349.7
Moisture %	29.6%	22.8%	26.9%	27.5%	24.6%	24.6%

Test Hole	TH22-07	TH22-07	TH22-07	TH22-07	TH22-07	TH22-07
Depth (m)	0.4 - 0.5	0.7 - 0.8	1.0 - 1.1	1.3 - 1.4	1.7 - 1.8	2.1 - 2.3
Sample #	G91	G92	G93	G94	G95	G96
Tare ID	F42	K2	C2	W80	F124	W102
Mass of tare	8.5	8.4	8.5	8.6	8.6	8.5
Mass wet + tare	228.8	201.3	214.4	222.0	267.6	245.2
Mass dry + tare	182.7	165.2	172.9	181.5	216.0	175.3
Mass water	46.1	36.1	41.5	40.5	51.6	69.9
Mass dry soil	174.2	156.8	164.4	172.9	207.4	166.8
Moisture %	26.5%	23.0%	25.2%	23.4%	24.9%	41.9%

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Sprague Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-08	TH22-08	TH22-08	TH22-08	TH22-08	TH22-08
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G85	G86	G87	G88	G89	G90
Tare ID	Z29	AA13	N01	W22	D35	AC37
Mass of tare	8.6	6.6	8.5	8.5	8.5	6.8
Mass wet + tare	210.6	220.7	200.5	205.0	405.9	203.3
Mass dry + tare	167.2	178.8	163.3	169.6	370.6	151.5
Mass water	43.4	41.9	37.2	35.4	35.3	51.8
Mass dry soil	158.6	172.2	154.8	161.1	362.1	144.7
Moisture %	27.4%	24.3%	24.0%	22.0%	9.7%	35.8%

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Atterberg Limits
ASTM D4318-10e1

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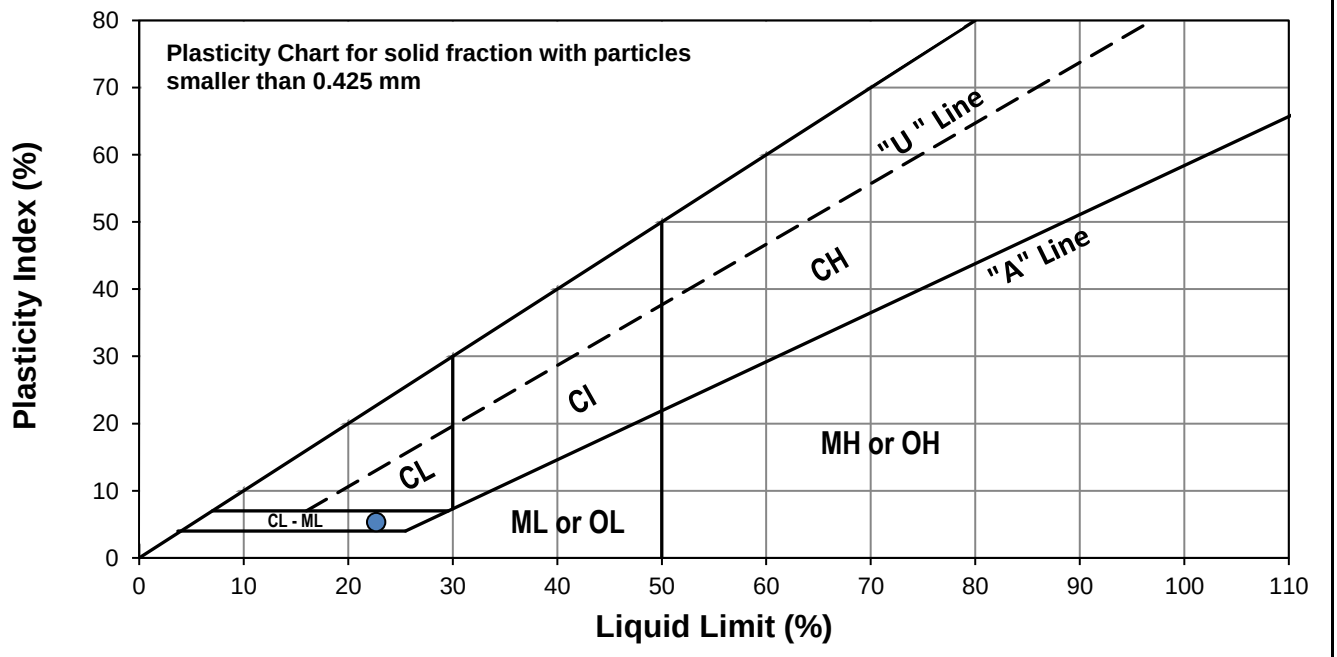
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Sprague St.
Test Hole	TH22-08
Sample #	G89
Depth (m)	1.7 - 1.9
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	23
Plastic Limit	17
Plasticity Index	5

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	17	24	28		
Mass Tare (g)	14.099	14.097	13.971		
Mass Wet Soil + Tare (g)	27.591	24.423	25.310		
Mass Dry Soil + Tare (g)	25.049	22.517	23.223		
Mass Water (g)	2.542	1.906	2.087		
Mass Dry Soil (g)	10.950	8.420	9.252		
Moisture Content (%)	23.215	22.637	22.557		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.950	14.049			
Mass Wet Soil + Tare (g)	22.987	22.702			
Mass Dry Soil + Tare (g)	21.640	21.432			
Mass Water (g)	1.347	1.270			
Mass Dry Soil (g)	7.690	7.383			
Moisture Content (%)	17.516	17.202			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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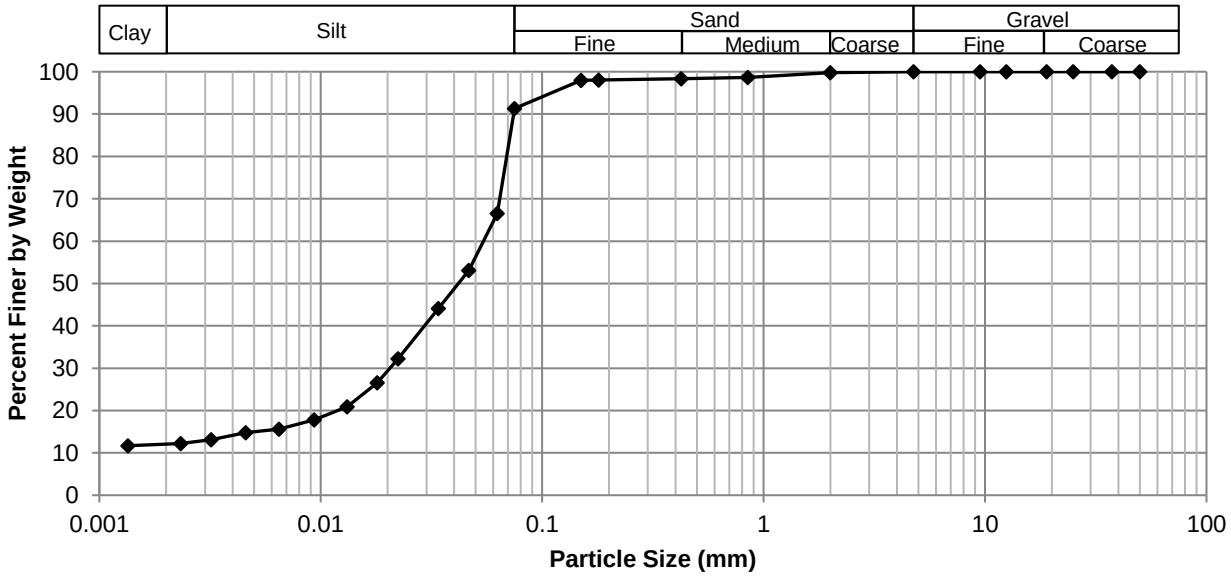
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Sprague Street
Test Hole	TH22-08
Sample #	G89
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	8.7%
Silt	79.3%
Clay	12.0%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	91.33
37.5	100.00	2.00	99.76	0.0626	66.53
25.0	100.00	0.850	98.63	0.0466	53.11
19.0	100.00	0.425	98.38	0.0340	44.07
12.5	100.00	0.180	98.08	0.0223	32.22
9.50	100.00	0.150	97.99	0.0180	26.55
4.75	100.00	0.075	91.33	0.0132	20.88
				0.0093	17.77
				0.0065	15.64
				0.0046	14.80
				0.0032	13.14
				0.0023	12.20
				0.0013	11.68

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Atterberg Limits
ASTM D4318-10e1

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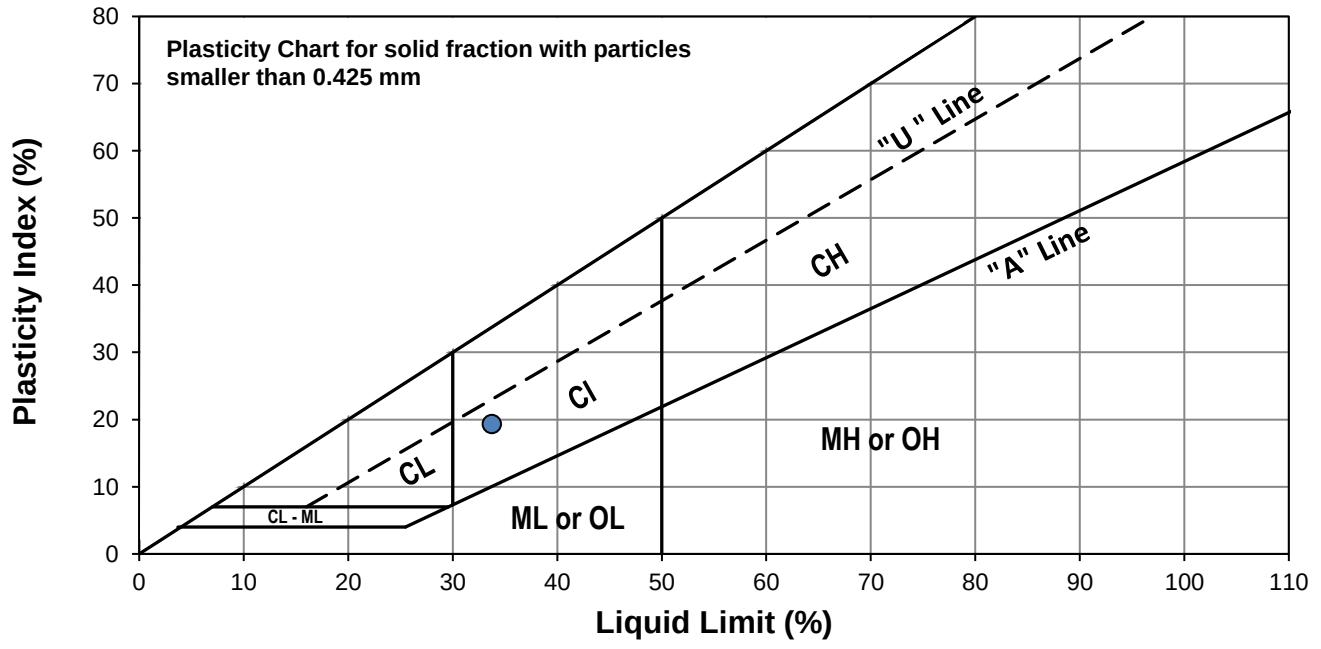
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Sprague St.
Test Hole	TH22-06
Sample #	G101
Depth (m)	1.7 - 1.8
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	34
Plastic Limit	14
Plasticity Index	19

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	26	31		
Mass Tare (g)	13.907	14.069	13.860		
Mass Wet Soil + Tare (g)	26.101	25.830	22.508		
Mass Dry Soil + Tare (g)	22.943	22.877	20.362		
Mass Water (g)	3.158	2.953	2.146		
Mass Dry Soil (g)	9.036	8.808	6.502		
Moisture Content (%)	34.949	33.526	33.005		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.967	14.067			
Mass Wet Soil + Tare (g)	23.045	21.968			
Mass Dry Soil + Tare (g)	21.909	20.963			
Mass Water (g)	1.136	1.005			
Mass Dry Soil (g)	7.942	6.896			
Moisture Content (%)	14.304	14.574			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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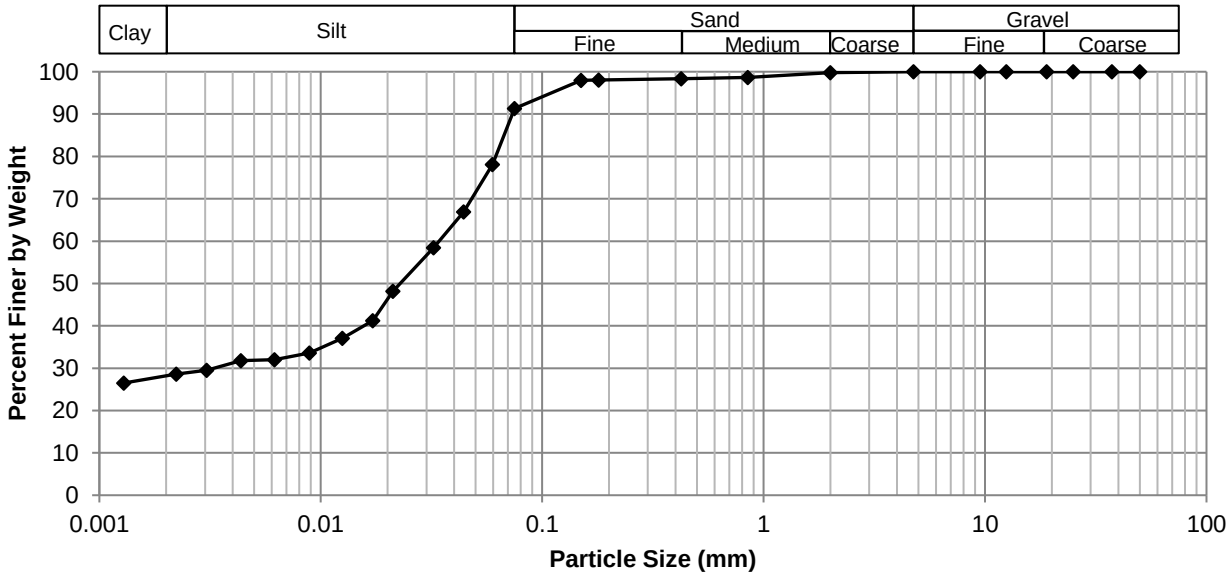
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Sprague Street
Test Hole	TH22-06
Sample #	G101
Depth (m)	1.7 - 1.8
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	8.7%
Silt	63.2%
Clay	28.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	91.33
37.5	100.00	2.00	99.76	0.0596	78.11
25.0	100.00	0.850	98.63	0.0442	66.88
19.0	100.00	0.425	98.38	0.0323	58.46
12.5	100.00	0.180	98.08	0.0212	48.16
9.50	100.00	0.150	97.99	0.0172	41.26
4.75	100.00	0.075	91.33	0.0125	37.08
				0.0089	33.61
				0.0062	31.97
				0.0044	31.75
				0.0031	29.48
				0.0022	28.58
				0.0013	26.49

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Atterberg Limits
ASTM D4318-10e1

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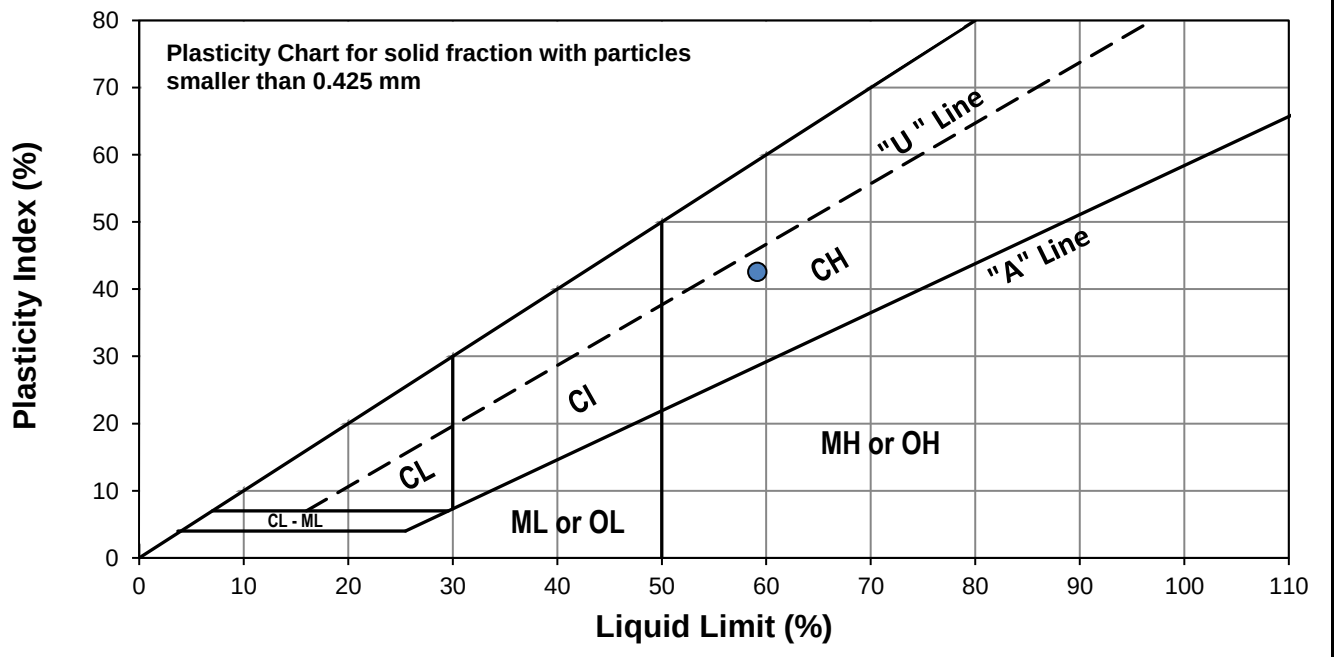
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Sprague St.
Test Hole	TH22-05
Sample #	G107
Depth (m)	1.7 - 1.8
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	59
Plastic Limit	17
Plasticity Index	43

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	23	31		
Mass Tare (g)	13.804	13.931	14.216		
Mass Wet Soil + Tare (g)	23.528	23.448	24.336		
Mass Dry Soil + Tare (g)	19.833	19.888	20.635		
Mass Water (g)	3.695	3.560	3.701		
Mass Dry Soil (g)	6.029	5.957	6.419		
Moisture Content (%)	61.287	59.762	57.657		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.142	14.056			
Mass Wet Soil + Tare (g)	22.125	22.270			
Mass Dry Soil + Tare (g)	20.978	21.117			
Mass Water (g)	1.147	1.153			
Mass Dry Soil (g)	6.836	7.061			
Moisture Content (%)	16.779	16.329			

Note: Additional information recorded/measured for this test is available upon request.

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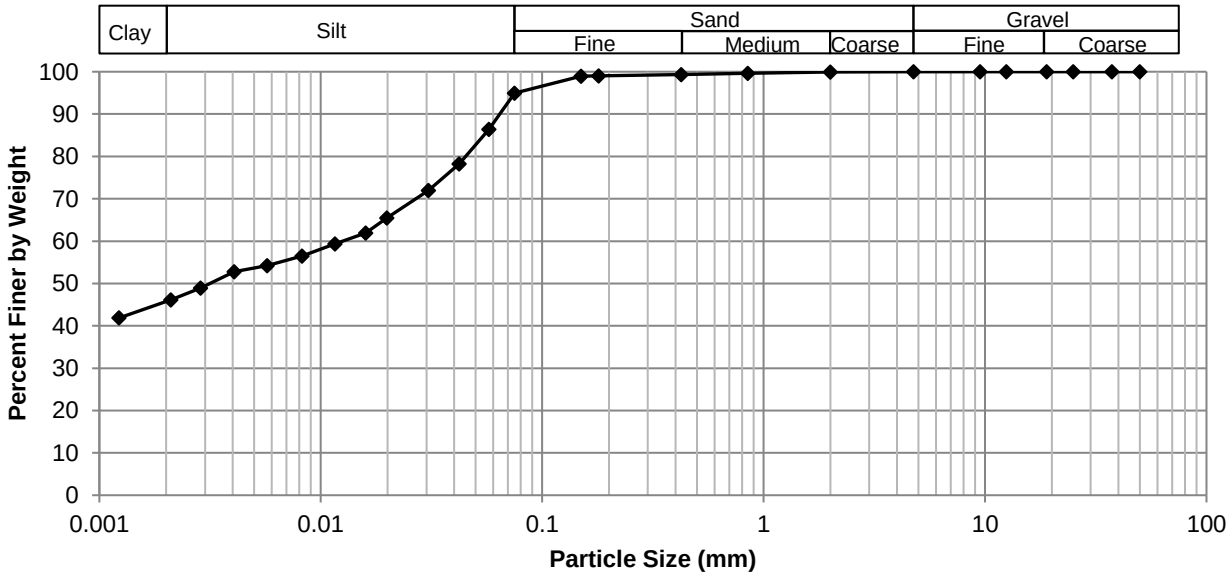
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Sprague Street
Test Hole	TH22-05
Sample #	G107
Depth (m)	1.7 - 1.8
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	5.1%
Silt	49.3%
Clay	45.7%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	94.93
37.5	100.00	2.00	99.91	0.0575	86.37
25.0	100.00	0.850	99.60	0.0422	78.25
19.0	100.00	0.425	99.36	0.0306	72.00
12.5	100.00	0.180	99.06	0.0199	65.44
9.50	100.00	0.150	98.97	0.0160	61.96
4.75	100.00	0.075	94.93	0.0116	59.34
				0.0082	56.49
				0.0057	54.23
				0.0041	52.76
				0.0029	48.92
				0.0021	46.15
				0.0012	41.87

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Atterberg Limits
ASTM D4318-10e1

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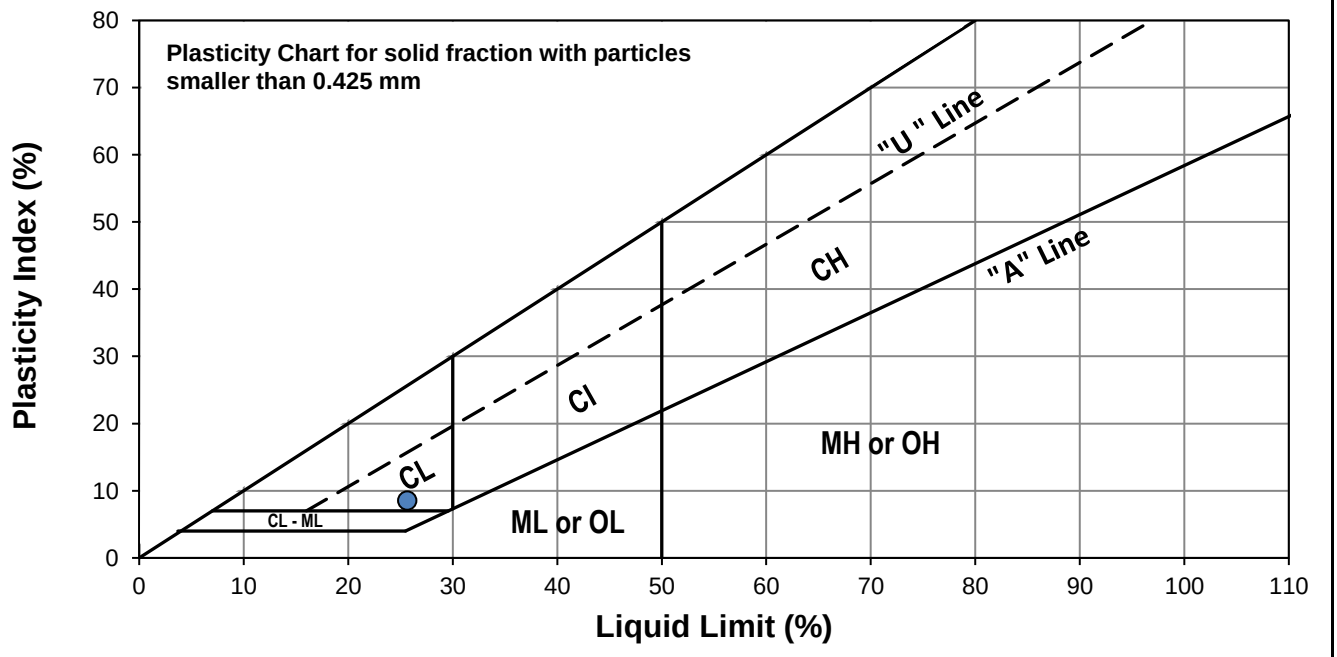
Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal -Sprague Street
Test Hole	TH22-06 & TH22-07
Sample #	BULK
Depth (m)	0.8 - 1.7
Sample Date	27-Sep-22
Test Date	24-Oct-22
Technician	DS

Liquid Limit	26
Plastic Limit	17
Plasticity Index	9

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	22	32		
Mass Tare (g)	14.287	14.180	14.068		
Mass Wet Soil + Tare (g)	26.625	26.948	25.456		
Mass Dry Soil + Tare (g)	24.009	24.319	23.178		
Mass Water (g)	2.616	2.629	2.278		
Mass Dry Soil (g)	9.722	10.139	9.110		
Moisture Content (%)	26.908	25.930	25.005		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.210	14.093			
Mass Wet Soil + Tare (g)	22.869	25.537			
Mass Dry Soil + Tare (g)	21.613	23.849			
Mass Water (g)	1.256	1.688			
Mass Dry Soil (g)	7.403	9.756			
Moisture Content (%)	16.966	17.302			

Note: Additional information recorded/measured for this test is available upon request.

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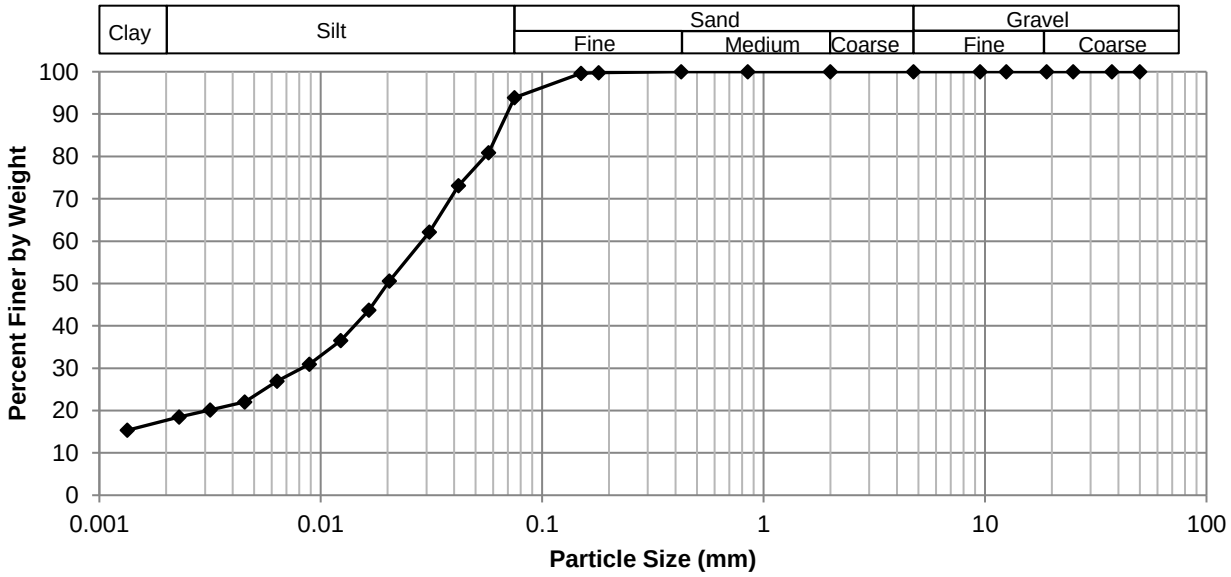
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Sprague Street
Test Hole	TH22-06 and 07 Bulk
Sample #	Bulk from Proctor
Depth (m)	0.8 - 1.7
Sample Date	7-Sep-22
Test Date	23-Oct-22
Technician	NM

Gravel	0.0%
Sand	6.1%
Silt	76.4%
Clay	17.5%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	93.89
37.5	100.00	2.00	100.00	0.0572	80.92
25.0	100.00	0.850	100.00	0.0418	73.10
19.0	100.00	0.425	99.98	0.0309	62.16
12.5	100.00	0.180	99.75	0.0204	50.59
9.50	100.00	0.150	99.66	0.0165	43.71
4.75	100.00	0.075	93.89	0.0123	36.56
				0.0089	30.94
				0.0063	26.91
				0.0045	22.00
				0.0032	20.12
				0.0023	18.52
				0.0013	15.35

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Standard Proctor Compaction Test

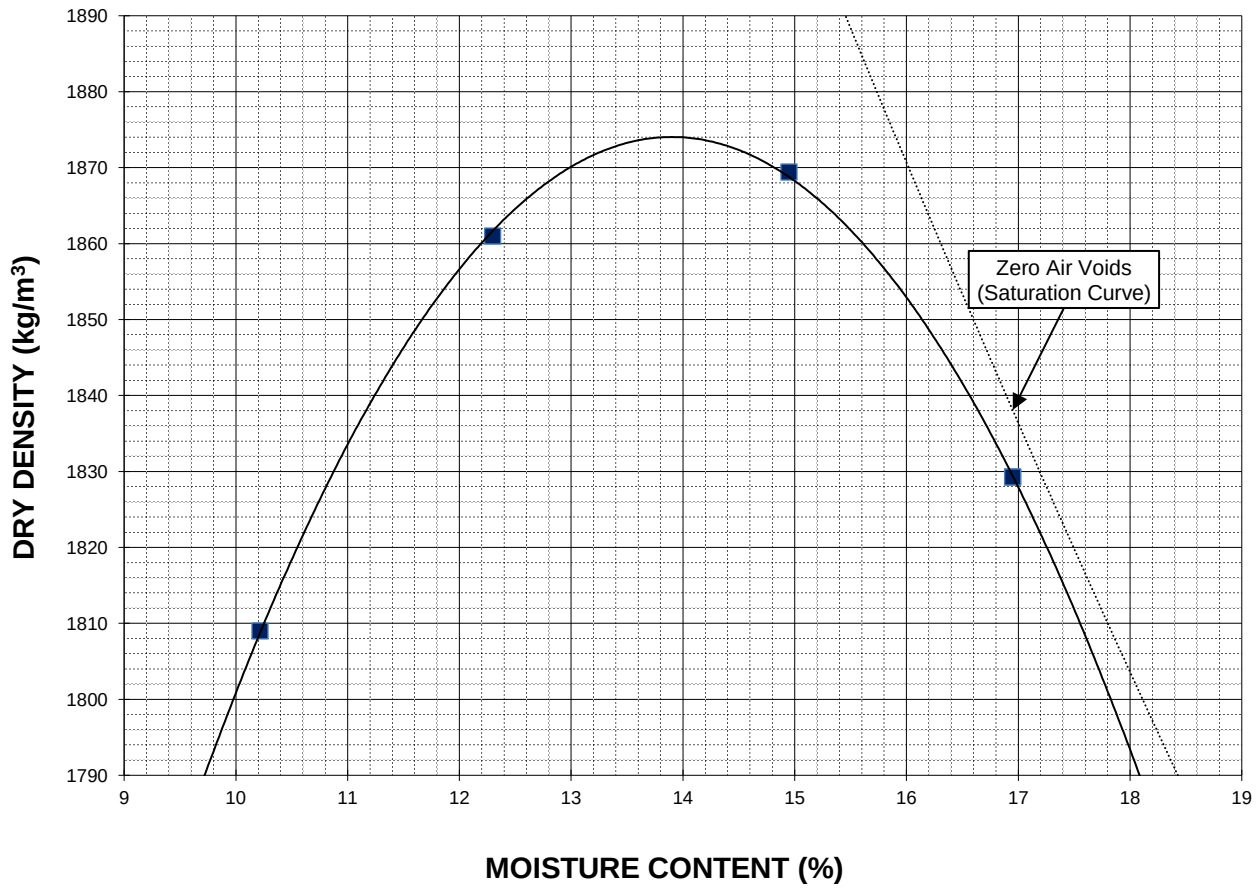
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Sprague Street
Sample #	TH22-05
Source	Sprague Street
Material	Silt
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1874
Optimum Moisture (%)	13.9

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1994	2090	2149	2139	
Dry Density (kg/m^3)	1809	1861	1869	1829	
Moisture Content (%)	10.2	12.3	14.9	17.0	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Sprague Street
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-07
Sample #	TH22-05	**Test Date**	2022-10-22
		Technician	DS

Proctor Results (ASTM D698)

Maximum Dry Density	1874	kg/m3
Optimum Moisture Content	13.9	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1790	kg/m3
Initial Moisture Content	14.3	%
Relative Density	95.5	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.3	%
Moisture Content in top 25 mm	16.6	%
Immersion Period	96	h

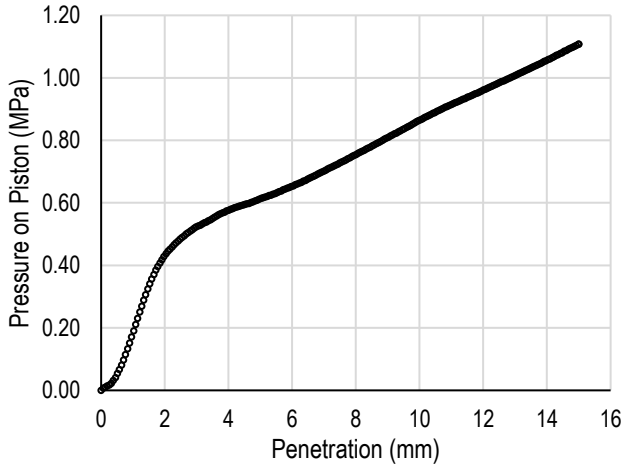
CBR Results

CBR at 2.54 mm	7.1	%
CBR at 5.08 mm	6.0	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.08	0.08
1.27	0.27	0.27
1.91	0.42	0.42
2.54	0.49	0.49
3.18	0.53	0.53
3.81	0.57	0.57
4.45	0.59	0.59
5.08	0.62	0.62
7.62	0.74	0.74
10.16	0.87	0.87
12.70	0.99	0.99

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

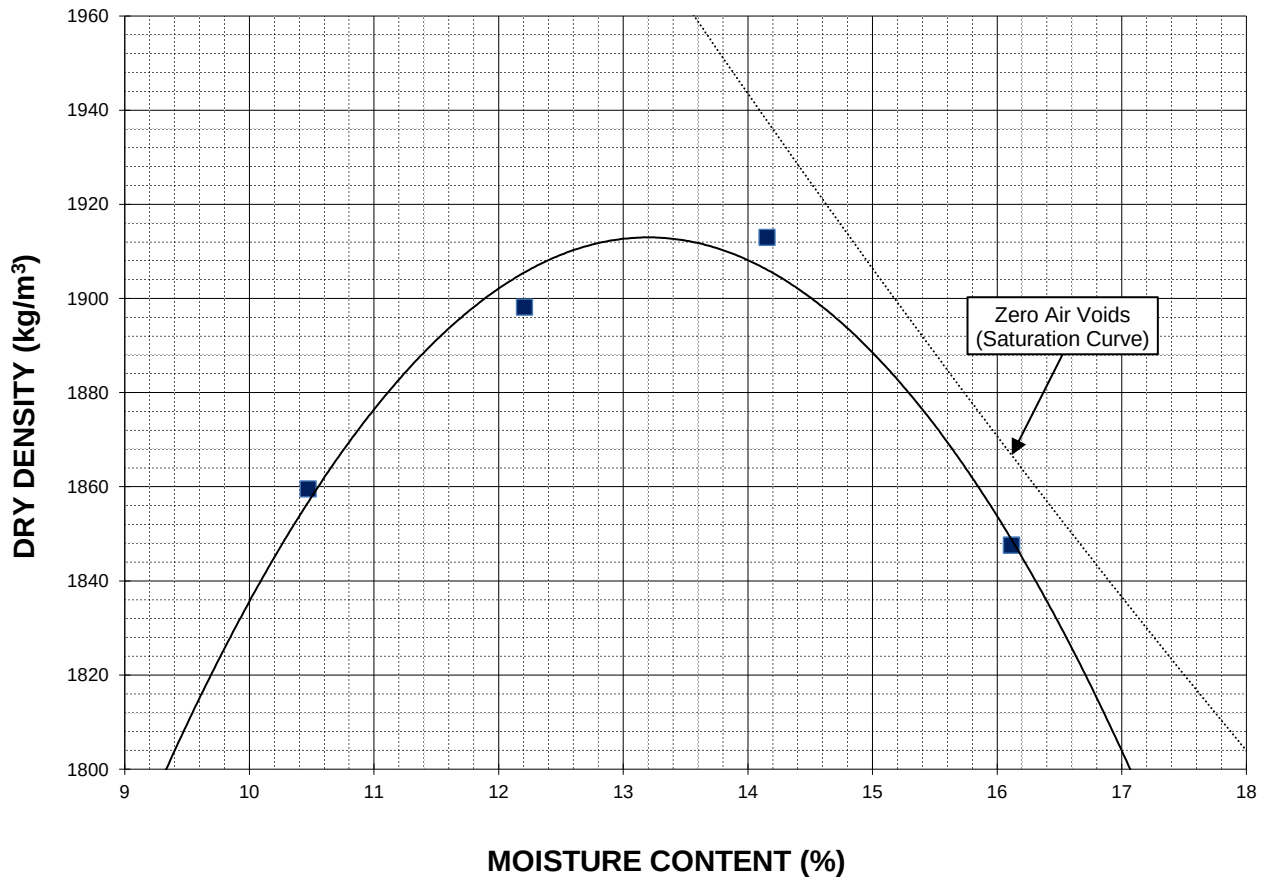
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Sprague Street
Sample #	TH22-06
Source	Sprague Street
Material	Silt
Sample Date	08-Sep-22
Test Date	19-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1913
Optimum Moisture (%)	13.2

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2054	2130	2184	2145	
Dry Density (kg/m^3)	1860	1898	1913	1848	
Moisture Content (%)	10.5	12.2	14.2	16.1	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Sprague Street
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-06	**Test Date**	2022-10-22
		Technician	DS

Proctor Results (ASTM D698)

Maximum Dry Density	1913	kg/m3
Optimum Moisture Content	13.2	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1820	kg/m3
Initial Moisture Content	13.5	%
Relative Density	95.1	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.2	%
Moisture Content in top 25 mm	13.5	%
Immersion Period	96	h

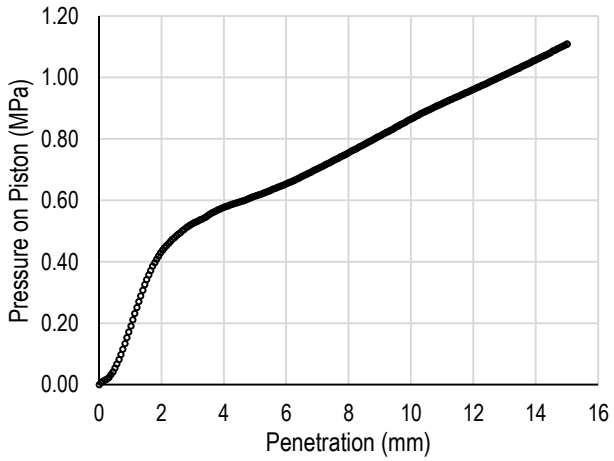
CBR Results

CBR at 2.54 mm	7.1	%
CBR at 5.08 mm	6.0	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.08	0.08
1.27	0.27	0.27
1.91	0.42	0.42
2.54	0.49	0.49
3.18	0.53	0.53
3.81	0.57	0.57
4.45	0.59	0.59
5.08	0.62	0.62
7.62	0.74	0.74
10.16	0.87	0.87
12.70	0.99	0.99

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

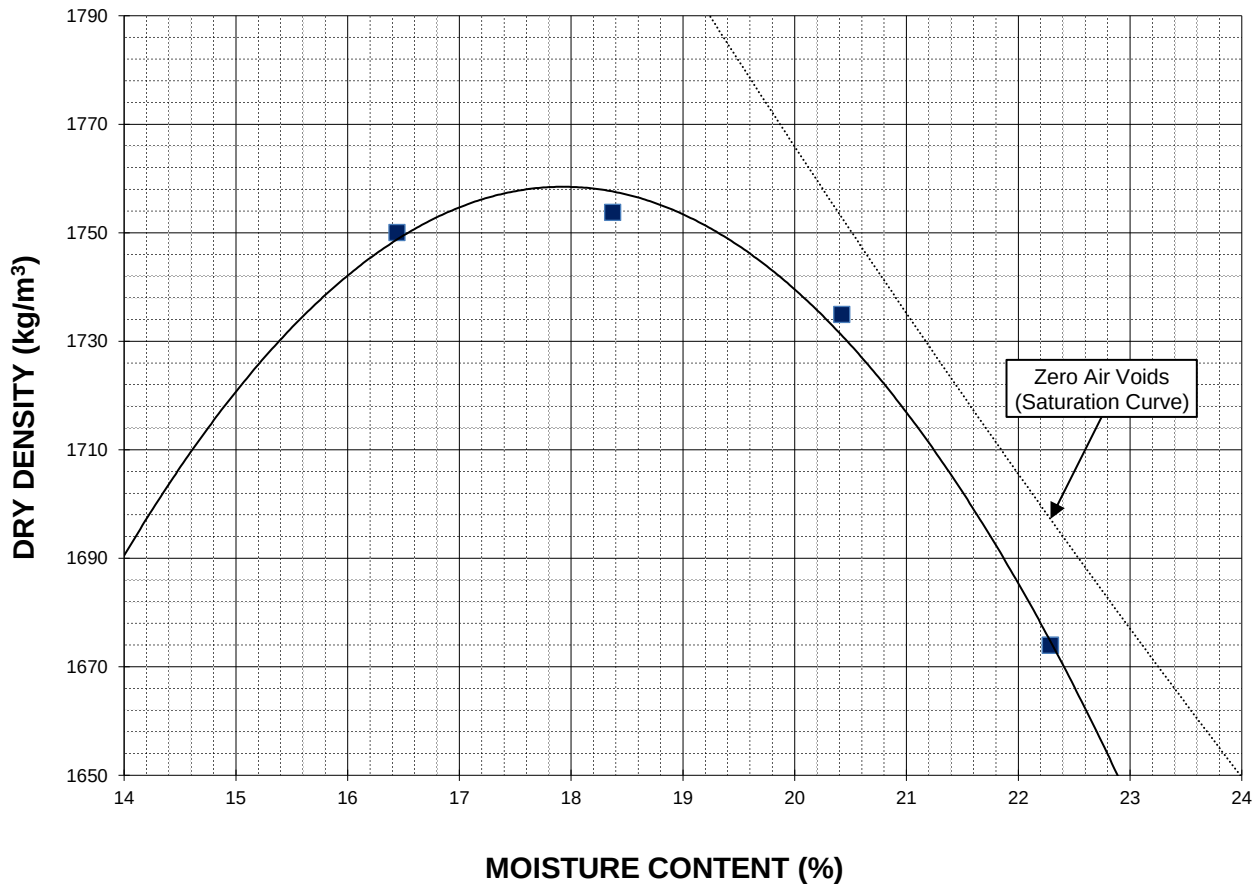
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Sprague Street
Sample #	TH22-08
Source	Sprague Street
Material	Silt
Sample Date	07-Sep-22
Test Date	06-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1758
Optimum Moisture (%)	17.9

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2038	2076	2089	2047	
Dry Density (kg/m^3)	1750	1754	1735	1674	
Moisture Content (%)	16.4	18.4	20.4	22.3	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Sprague Street
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-07
Sample #	TH22-08	**Test Date**	2022-10-11
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1758	kg/m3
Optimum Moisture Content	17.9	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1671	kg/m3
Initial Moisture Content	17.9	%
Relative Density	95.1	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.5	%
Moisture Content in top 25 mm	22.0	%
Immersion Period	96	h

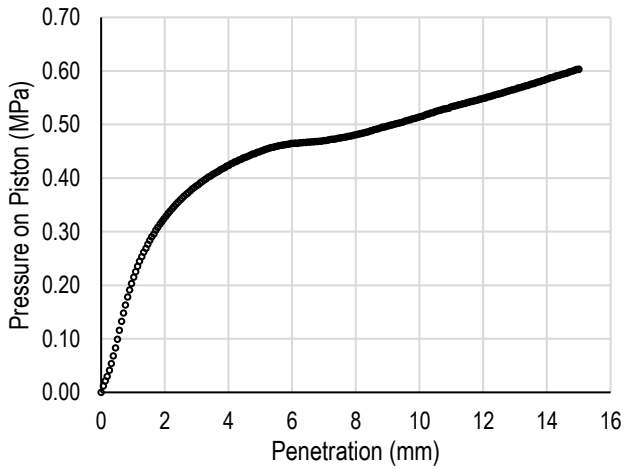
CBR Results

CBR at 2.54 mm	5.3	%
CBR at 5.08 mm	4.4	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.13	0.13
1.27	0.25	0.25
1.91	0.32	0.32
2.54	0.36	0.36
3.18	0.39	0.39
3.81	0.42	0.42
4.45	0.44	0.44
5.08	0.45	0.45
7.62	0.48	0.48
10.16	0.52	0.52
12.70	0.56	0.56

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-05

Photo 2: Pavement Core Sample at Test Hole TH22-06

Photo 3: Pavement Core Sample at Test Hole TH22-07

Photo 4: Pavement Core Sample at Test Hole TH22-08

Appendix C

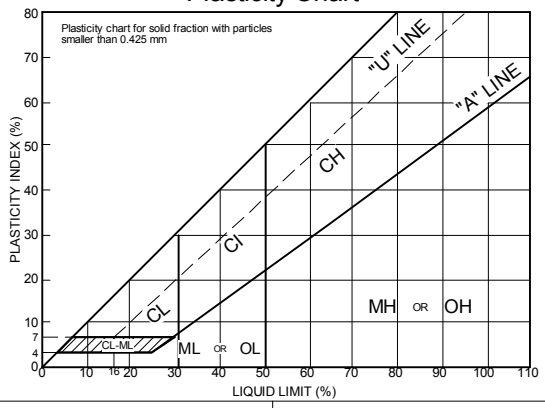
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Langside Street

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH22-09
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5529012, E-632452 (Langside St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21	Particle Size (%) 0 20 40 60 80 100 PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200
	ASPHALT - 38 mm thick CONCRETE - 191 mm thick		PC22-09			
0.5	CLAY - silty, trace gravel, trace sand - black - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G19			
	SILT - clayey, light brown, moist, soft, low to intermediate plasticity -AASHTO: A-4 (I)		G20			
1.0	CLAY - silty, trace silt inclusions (5-10 mm dia.) - grey - moist, very stiff - high plasticity - AASHTO: A-7-6 (I)		G21			
1.5			G22			
	- brown, stiff below 1.8 m depth		G23			
2.0			G24			

END OF TEST HOLE AT 2.4 m IN CLAY

1) Seepage or sloughing not observed.
2) Test hole open to 2.4 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #680 Langside St, 1.7 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-10
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528932, E-632446 (Langside St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 40 80 120 160 200
		ASPHALT - 152 mm thick				
		CONCRETE - 127 mm thick		PC22-10		
		CLAY - silty, trace gravel, trace sand - black - moist, very stiff - high plasticity - AASHTO: A-7-6 (I)				
0.5				G13	●	△ ✤
		SILT - some clay, trace sand - light brown - moist, soft - low plasticity - AASHTO: A-4 (3)		G14	●	
1.0				G15	●	
1.5				G16	●	
		CLAY - silty, trace sand - grey - moist, stiff - high plasticity - AASHTO: A-7-6 (I)		G17	●	△ ✤
2.0		SILT - trace clay, some sand - brown - moist, soft - low plasticity - AASHTO: A-4 (I)		G18	●	
2.5						

END OF TEST HOLE AT 2.6 m IN SILT
1) No seepage or sloughing observed.
2) Test hole open to 2.6 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #656 Langside St, 2.3 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-11

TREK GEOTECHNICAL

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528871, E-632446 (Langside St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○ — 0 40 80 120 160 200
0.0		ASPHALT - 127 mm thick				
		CONCRETE - 127 mm thick		PC22-11		
		CLAY - silty, trace sand - black - moist, stiff to very stiff - high plasticity - AASHTO: A-7-6 (I)				
0.5				G7		
				G8		
1.0						
		SILT - some clay, trace sand - light brown - moist, soft to firm - intermediate plasticity - AASHTO: A-4 (4)		G9		
1.5				G10		
				G11		
2.0						
				G12		
2.5		END OF TEST HOLE AT 2.5 m IN SILT				

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #638 Langside St, 2.5 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH22-12

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528796, E-632446 (Langside St)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 40 80 120 160 200
		ASPHALT - 140 mm thick				
		CONCRETE - 165 mm thick		PC22-12		
		CLAY - silty, trace sand - grey - moist, stiff - high plasticity - AASHTO: A-7-6 (54)				
0.5				G01	●	✤
				G02	●	✤
1.0		- brown below 1.2 m depth		G03	●	✤
1.5				G04	●	△✤
				G05	●	✤ △
2.0				G06	●	✤
2.5						

END OF TEST HOLE AT 2.6 m IN CLAY

1) Seepage or sloughing not observed.
2) Test hole open to 2.6 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located in front of #612 Langside St, 3.8 m East of West curb.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
Langside Street - Cumberland Ave to Sargent Ave

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-09	UTM : 14U 5529012 N, 632452 E Located in front of #680 Langside St., Southbound lane, 1.7 m East of West curb.	Asphalt	38	Concrete	191	Clay; AASHTO: A-7-6 (I)	0.5	0.6	30							
						Silt; AASHTO: A-4 (I)	0.8	0.9	26							
						Clay; AASHTO: A-7-6 (I)	1.1	1.2	28							
						Clay; AASHTO: A-7-6 (I)	1.4	1.5	36							
						Clay; AASHTO: A-7-6 (I)	1.8	1.9	37							
						Clay; AASHTO: A-7-6 (I)	2.2	2.4	46							
TH22-10	UTM : 14U 5528932 N, 632446 E Located in front of #656 Langside St., Southbound lane, 2.3 m East of West curb.	Asphalt	152	Concrete	127	Clay; AASHTO: A-7-6 (I)	0.5	0.7	29							
						Silt; AASHTO: A-4 (3)	0.8	1.0	23							
						Silt; AASHTO: A-4 (3)	1.1	1.3	21							
						Silt; AASHTO: A-4 (3)	1.4	1.6	22	12	73	15	0	18	23	6
						Clay; AASHTO: A-7-6 (I)	1.8	2.0	28							
						Silt; AASHTO: A-4 (I)	2.3	2.4	23							
TH22-11	UTM : 14U 5528871 N, 632446 E Located in front of #638 Langside St., Southbound lane, 2.5 m East of West curb.	Asphalt	127	Concrete	127	Clay; AASHTO: A-7-6 (I)	0.5	0.6	25							
						Clay; AASHTO: A-7-6 (I)	0.8	0.9	29							
						Silt; AASHTO: A-4 (4)	1.1	1.2	22							
						Silt; AASHTO: A-4 (4)	1.4	1.6	20	14	81	5	0	18	24	6
						Silt; AASHTO: A-4 (4)	1.8	1.9	17							
						Silt; AASHTO: A-4 (4)	2.2	2.4	23							
TH22-12	UTM : 14U 5528796 N, 632446 E Located in front of #612 Langside St, Southbound lane, 3.8 m East of West curb.	Asphalt	140	Concrete	165	Clay; AASHTO: A-7-6 (54)	0.5	0.7	25							
						Clay; AASHTO: A-7-6 (54)	0.9	1.0	24							
						Clay; AASHTO: A-7-6 (54)	1.2	1.3	24							
						Clay; AASHTO: A-7-6 (54)	1.5	1.6	28	66	29	5	0	22	73	51
						Clay; AASHTO: A-7-6 (54)	1.8	2.0	32							
						Clay; AASHTO: A-7-6 (54)	2.3	2.4	40							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Langside Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-09	TH22-09	TH22-09	TH22-09	TH22-09	TH22-09
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.8 - 1.9	2.2 - 2.4
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	Z01	E87	Z40	W89	H60	E99
Mass of tare	8.5	8.7	8.4	8.7	6.7	8.7
Mass wet + tare	204.0	208.2	264.3	203.7	224.5	200.4
Mass dry + tare	158.7	167.4	208.9	152.0	165.6	140.3
Mass water	45.3	40.8	55.4	51.7	58.9	60.1
Mass dry soil	150.2	158.7	200.5	143.3	158.9	131.6
Moisture %	30.2%	25.7%	27.6%	36.1%	37.1%	45.7%

Test Hole	TH22-10	TH22-10	TH22-10	TH22-10	TH22-10	TH22-10
Depth (m)	0.5 - 0.7	0.8 - 1.0	1.1 - 1.3	1.4 - 1.6	1.8 - 2.0	2.3 - 2.4
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	F110	F129	F22	Z03	D42	N75
Mass of tare	8.3	8.6	8.6	8.5	8.7	8.7
Mass wet + tare	213.4	235.6	249.6	468.5	207.8	251.6
Mass dry + tare	167.9	193.9	208.1	386.0	164.7	206.0
Mass water	45.5	41.7	41.5	82.5	43.1	45.6
Mass dry soil	159.6	185.3	199.5	377.5	156.0	197.3
Moisture %	28.5%	22.5%	20.8%	21.9%	27.6%	23.1%

Test Hole	TH22-11	TH22-11	TH22-11	TH22-11	TH22-11	TH22-11
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.6	1.8 - 1.9	2.2 - 2.4
Sample #	G7	G8	G9	G10	G11	G12
Tare ID	W25	Z91	W20	H17	F146	E105
Mass of tare	8.5	8.6	8.5	8.9	8.3	8.6
Mass wet + tare	235.5	205.6	257.2	453.2	265.7	242.7
Mass dry + tare	190.2	161.7	212.3	378.4	227.6	198.5
Mass water	45.3	43.9	44.9	74.8	38.1	44.2
Mass dry soil	181.7	153.1	203.8	369.5	219.3	189.9
Moisture %	24.9%	28.7%	22.0%	20.2%	17.4%	23.3%

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Langside Street

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-12	TH22-12	TH22-12	TH22-12	TH22-12	TH22-12
Depth (m)	0.5 - 0.7	0.9 - 1.0	1.2 - 1.3	1.5 - 1.6	1.8 - 2.0	2.3 - 2.4
Sample #	G1	G2	G3	G4	G5	G6
Tare ID	W25	C11	M40	E59	E2	F29
Mass of tare	8.5	8.3	8.5	8.6	8.5	8.5
Mass wet + tare	235.5	234.0	222.5	425.4	266.0	247.2
Mass dry + tare	190.2	190.2	180.7	334.5	203.0	179.3
Mass water	45.3	43.8	41.8	90.9	63.0	67.9
Mass dry soil	181.7	181.9	172.2	325.9	194.5	170.8
Moisture %	24.9%	24.1%	24.3%	27.9%	32.4%	39.8%

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Atterberg Limits
ASTM D4318-10e1

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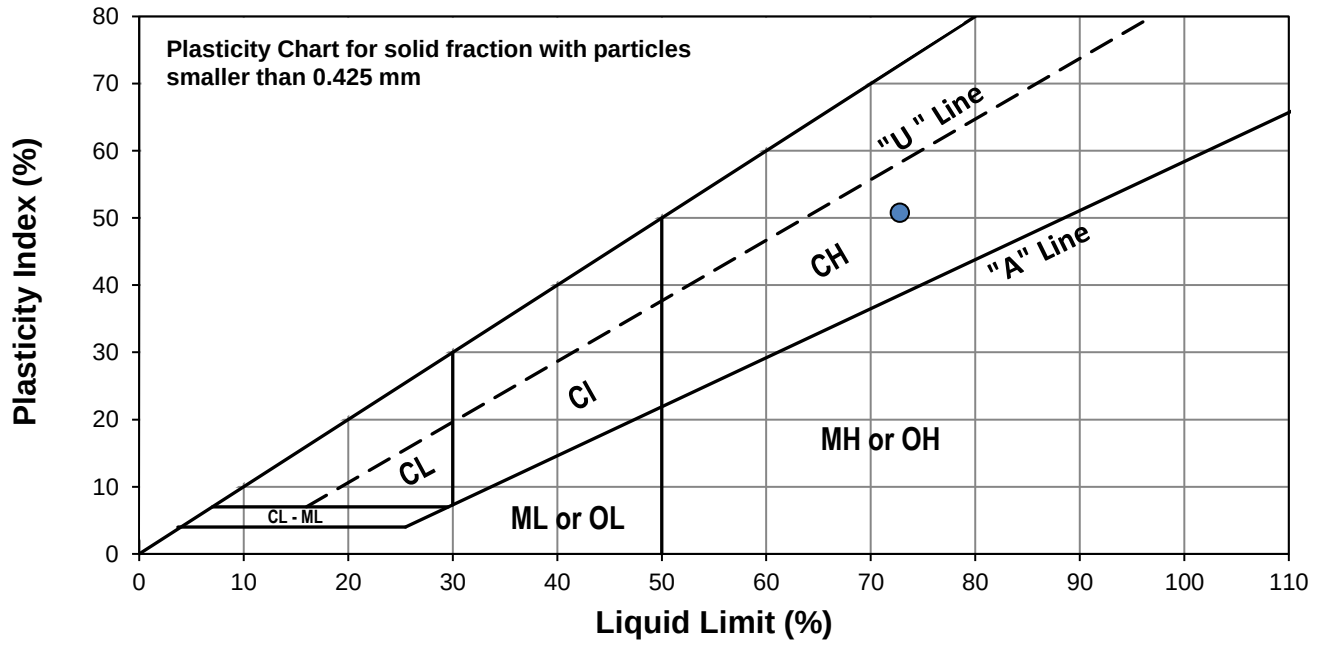
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Langside St.
Test Hole	TH22-12
Sample #	G04
Depth (m)	1.5 - 1.6
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	73
Plastic Limit	22
Plasticity Index	51

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	20	23	34		
Mass Tare (g)	14.086	14.197	13.952		
Mass Wet Soil + Tare (g)	21.930	23.314	23.185		
Mass Dry Soil + Tare (g)	18.594	19.462	19.345		
Mass Water (g)	3.336	3.852	3.840		
Mass Dry Soil (g)	4.508	5.265	5.393		
Moisture Content (%)	74.002	73.162	71.203		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.981	13.887			
Mass Wet Soil + Tare (g)	22.544	22.859			
Mass Dry Soil + Tare (g)	21.019	21.220			
Mass Water (g)	1.525	1.639			
Mass Dry Soil (g)	7.038	7.333			
Moisture Content (%)	21.668	22.351			

Note: Additional information recorded/measured for this test is available upon request.

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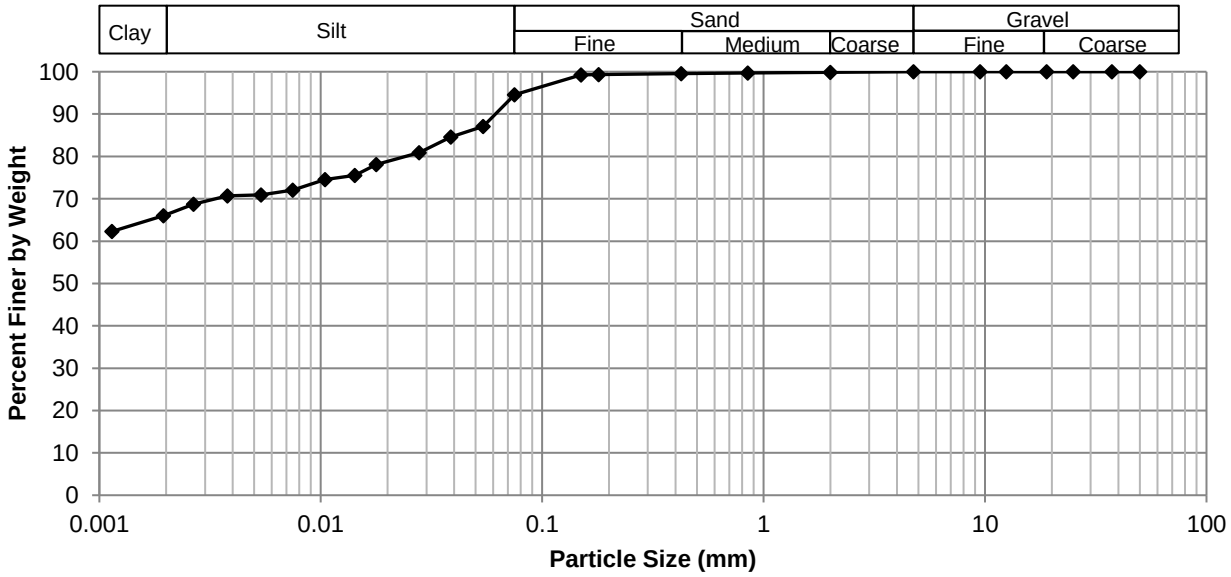
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Langside Street
Test Hole	TH22-12
Sample #	G4
Depth (m)	1.5 - 1.6
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	5.4%
Silt	28.4%
Clay	66.2%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	94.58
37.5	100.00	2.00	99.89	0.0541	87.13
25.0	100.00	0.850	99.73	0.0387	84.63
19.0	100.00	0.425	99.58	0.0279	80.88
12.5	100.00	0.180	99.36	0.0178	78.07
9.50	100.00	0.150	99.28	0.0143	75.52
4.75	100.00	0.075	94.58	0.0105	74.58
				0.0075	72.08
				0.0054	70.94
				0.0038	70.73
				0.0027	68.70
				0.0020	65.99
				0.0011	62.30

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Atterberg Limits
ASTM D4318-10e1

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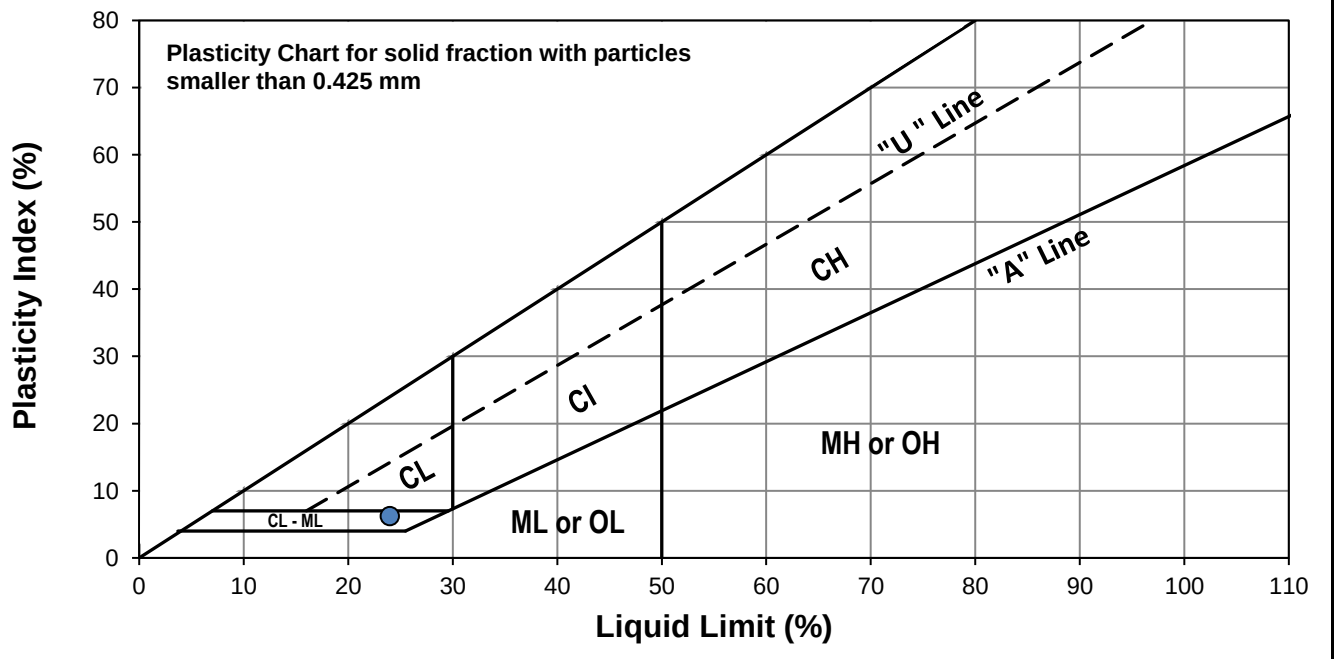
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Langside St.
Test Hole	TH22-11
Sample #	G10
Depth (m)	1.4 - 1.6
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	24
Plastic Limit	18
Plasticity Index	6

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	17	28	33		
Mass Tare (g)	14.307	13.830	14.020		
Mass Wet Soil + Tare (g)	22.589	25.944	25.730		
Mass Dry Soil + Tare (g)	20.925	23.629	23.527		
Mass Water (g)	1.664	2.315	2.203		
Mass Dry Soil (g)	6.618	9.799	9.507		
Moisture Content (%)	25.144	23.625	23.172		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.969	13.610			
Mass Wet Soil + Tare (g)	23.419	23.163			
Mass Dry Soil + Tare (g)	21.992	21.720			
Mass Water (g)	1.427	1.443			
Mass Dry Soil (g)	8.023	8.110			
Moisture Content (%)	17.786	17.793			

Note: Additional information recorded/measured for this test is available upon request.

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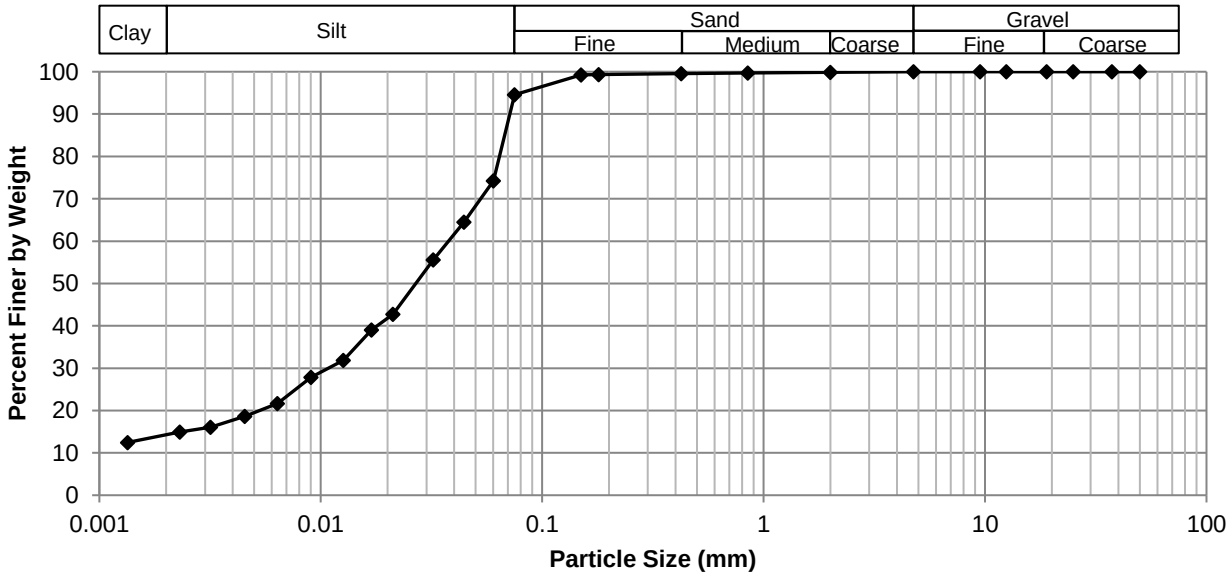
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -Langside Street
Test Hole	TH22-11
Sample #	G10
Depth (m)	1.4 - 1.6
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.0%
Sand	5.4%
Silt	80.5%
Clay	14.1%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	94.58
37.5	100.00	2.00	99.89	0.0602	74.21
25.0	100.00	0.850	99.73	0.0443	64.53
19.0	100.00	0.425	99.58	0.0323	55.59
12.5	100.00	0.180	99.36	0.0212	42.76
9.50	100.00	0.150	99.28	0.0169	39.02
4.75	100.00	0.075	94.58	0.0126	31.87
				0.0091	27.81
				0.0064	21.69
				0.0045	18.65
				0.0032	16.03
				0.0023	14.92
				0.0013	12.47

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Atterberg Limits
ASTM D4318-10e1

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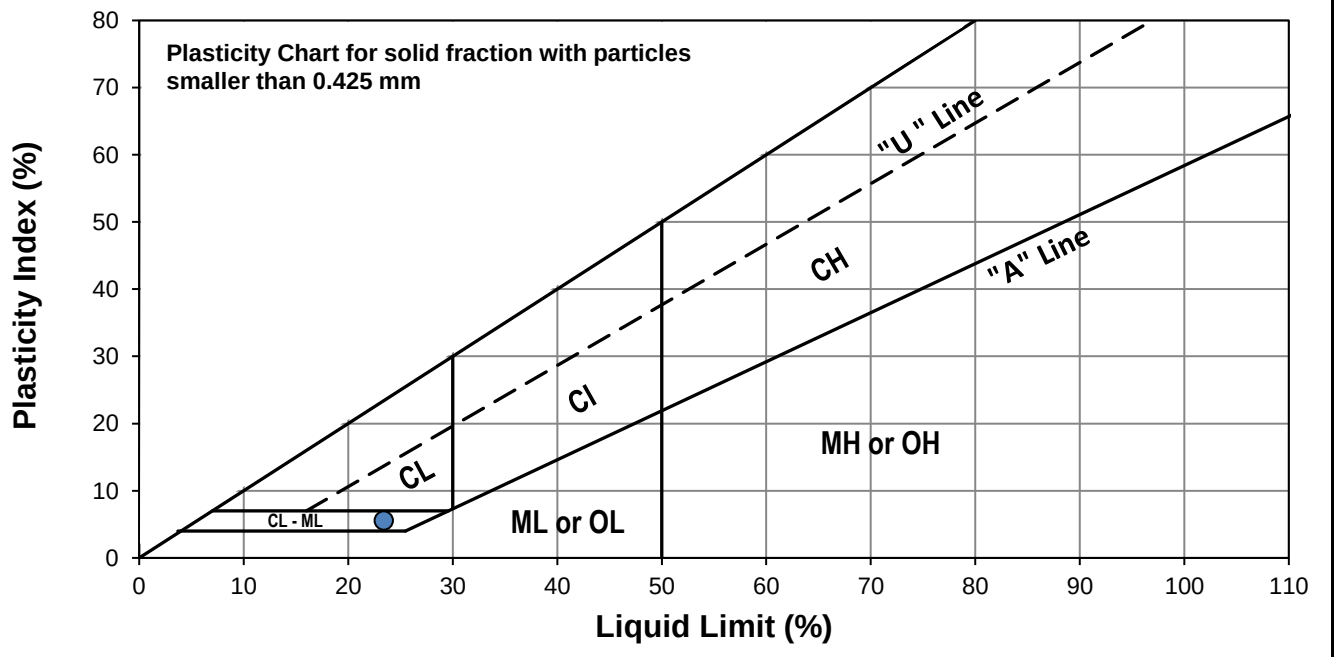
Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Langside St.
Test Hole	TH22-10
Sample #	G16
Depth (m)	1.4 - 1.6
Sample Date	07-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	23
Plastic Limit	18
Plasticity Index	6

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	19	26	34		
Mass Tare (g)	14.175	14.099	13.887		
Mass Wet Soil + Tare (g)	23.495	26.099	25.608		
Mass Dry Soil + Tare (g)	21.700	23.823	23.432		
Mass Water (g)	1.795	2.276	2.176		
Mass Dry Soil (g)	7.525	9.724	9.545		
Moisture Content (%)	23.854	23.406	22.797		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.113	13.942			
Mass Wet Soil + Tare (g)	23.555	23.214			
Mass Dry Soil + Tare (g)	22.129	21.806			
Mass Water (g)	1.426	1.408			
Mass Dry Soil (g)	8.016	7.864			
Moisture Content (%)	17.789	17.904			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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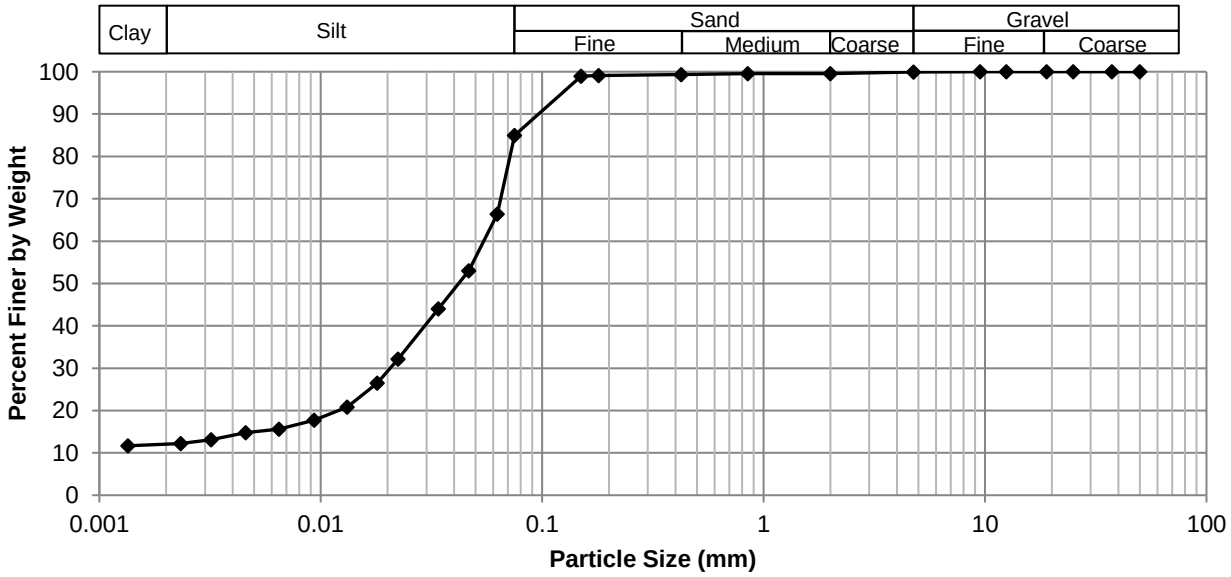
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal -SLangside Street
Test Hole	TH22-10
Sample #	G16
Depth (m)	1.4 - 1.6
Sample Date	7-Sep-22
Test Date	29-Sep-22
Technician	NM

Gravel	0.1%
Sand	14.9%
Silt	73.0%
Clay	12.0%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.95	0.0750	85.01
37.5	100.00	2.00	99.59	0.0626	66.41
25.0	100.00	0.850	99.55	0.0466	53.02
19.0	100.00	0.425	99.33	0.0340	43.99
12.5	100.00	0.180	99.08	0.0223	32.16
9.50	100.00	0.150	98.99	0.0180	26.50
4.75	99.95	0.075	85.01	0.0132	20.85
				0.0093	17.73
				0.0065	15.61
				0.0046	14.78
				0.0032	13.12
				0.0023	12.18
				0.0013	11.66

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Standard Proctor Compaction Test

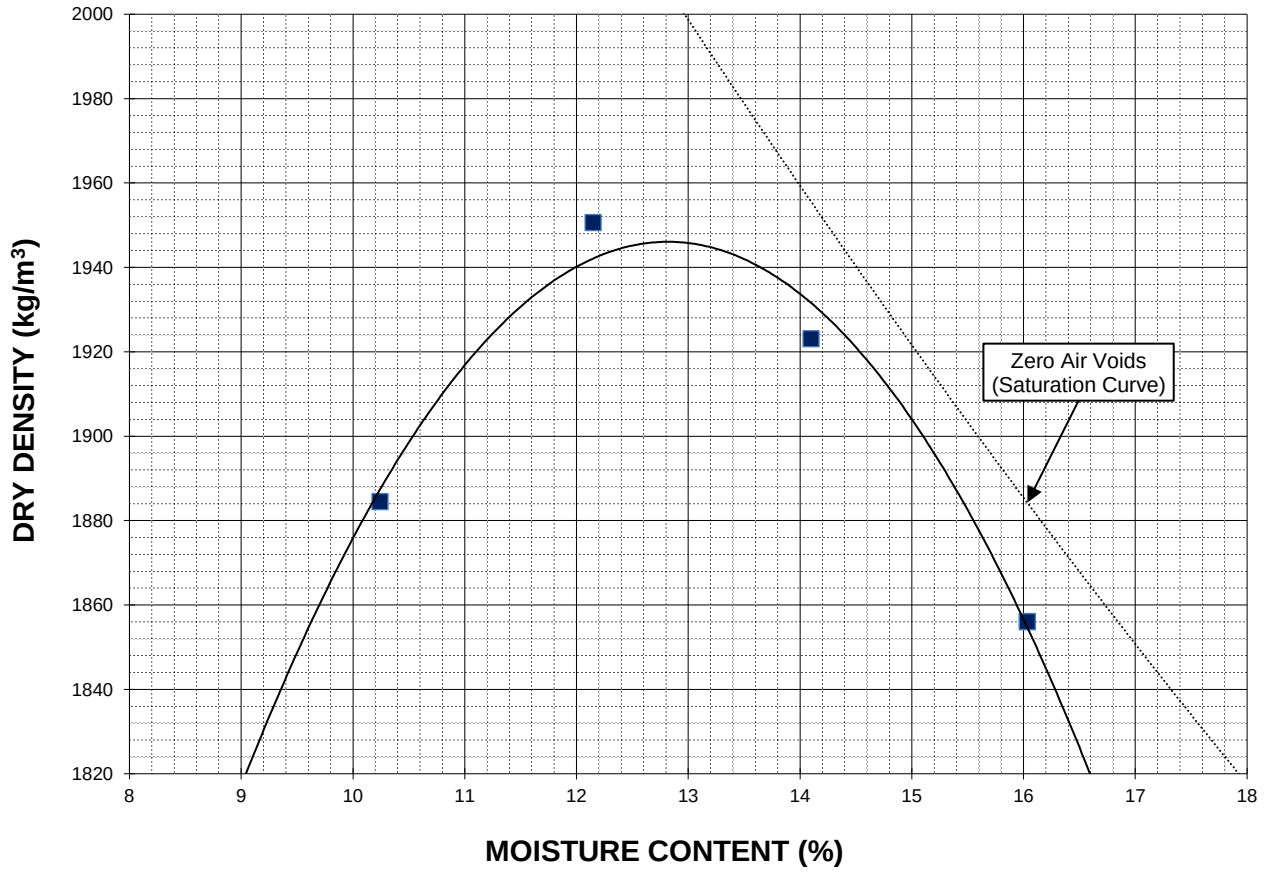
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Langside Street
Sample #	TH22-10
Source	Langside Street
Material	Silt
Sample Date	07-Sep-22
Test Date	16-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1946
Optimum Moisture (%)	12.8

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2078	2188	2194	2154	
Dry Density (kg/m^3)	1885	1951	1923	1856	
Moisture Content (%)	10.2	12.1	14.1	16.0	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Langside Street
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-10	**Test Date**	2022-10-18
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1946	kg/m3
Optimum Moisture Content	12.8	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1858	kg/m3
Initial Moisture Content	12.2	%
Relative Density	95.5	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.2	%
Moisture Content in top 25 mm	16.7	%
Immersion Period	96	h

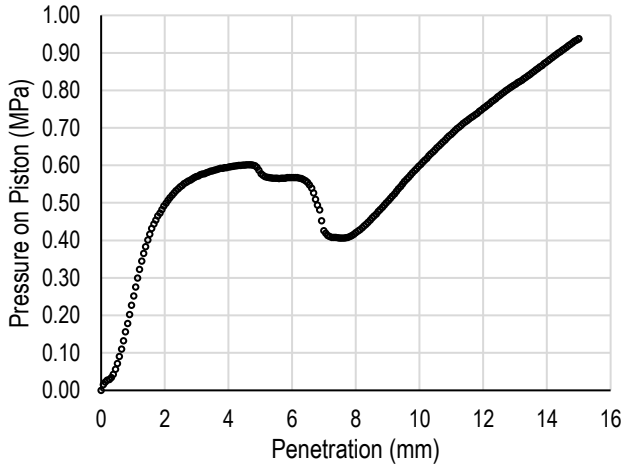
CBR Results

CBR at 2.54 mm	7.9	%
CBR at 5.08 mm	5.6	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.11	0.11
1.27	0.34	0.34
1.91	0.48	0.48
2.54	0.55	0.55
3.18	0.58	0.58
3.81	0.59	0.59
4.45	0.60	0.60
5.08	0.57	0.57
7.62	0.41	0.41
10.16	0.61	0.61
12.70	0.80	0.80

Load/Penetration Curve



Comments:

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Tel: 204.975.9433 Fax: 204.975.9435

Standard Proctor Compaction Test

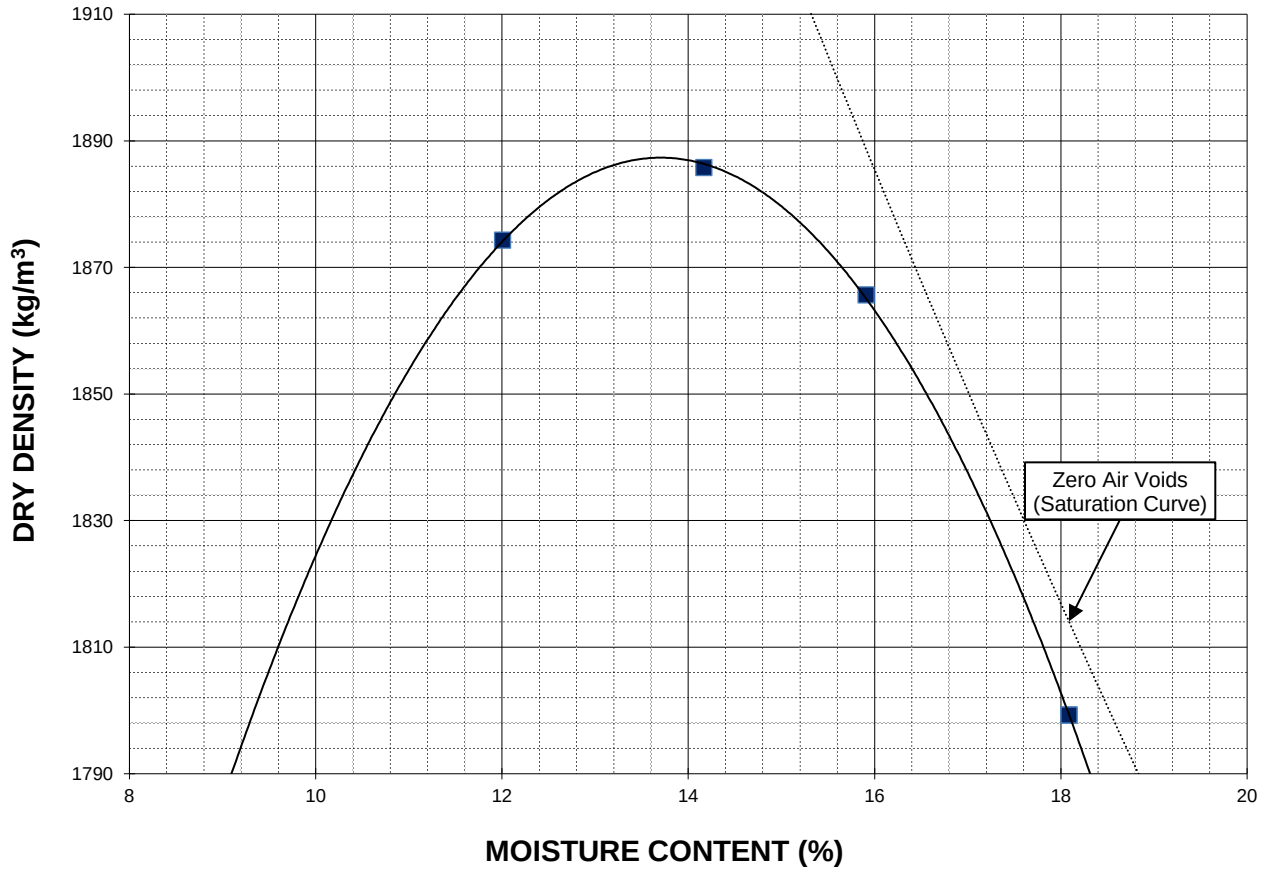
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Langside Street
Sample #	TH22-11
Source	Langside Street
Material	Clay and Silt
Sample Date	07-Sep-22
Test Date	14-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1887
Optimum Moisture (%)	13.7

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2099	2153	2162	2125	
Dry Density (kg/m^3)	1874	1886	1866	1799	
Moisture Content (%)	12.0	14.2	15.9	18.1	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Langside Street
Client	Dillon Consulting Ltd.	**Material**	Clay and Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-11	**Test Date**	2022-10-17
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1887	kg/m3
Optimum Moisture Content	13.7	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1799	kg/m3
Initial Moisture Content	13.6	%
Relative Density	95.3	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.2	%
Moisture Content in top 25 mm	15.9	%
Immersion Period	96	h

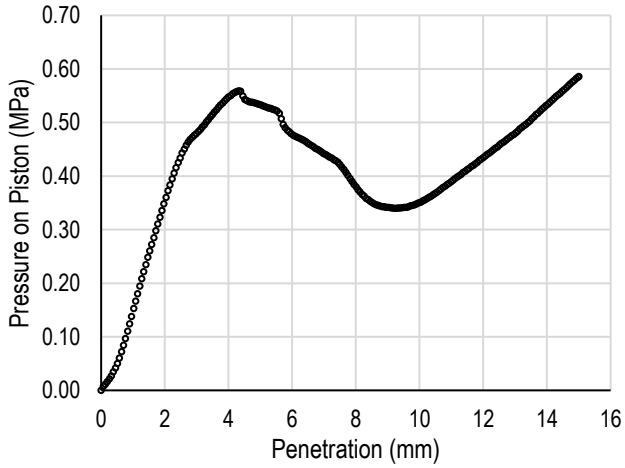
CBR Results

CBR at 2.54 mm	6.4	%
CBR at 5.08 mm	5.2	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.07	0.07
1.27	0.21	0.21
1.91	0.34	0.34
2.54	0.44	0.44
3.18	0.49	0.49
3.81	0.54	0.54
4.45	0.55	0.55
5.08	0.53	0.53
7.62	0.41	0.41
10.16	0.36	0.36
12.70	0.47	0.47

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

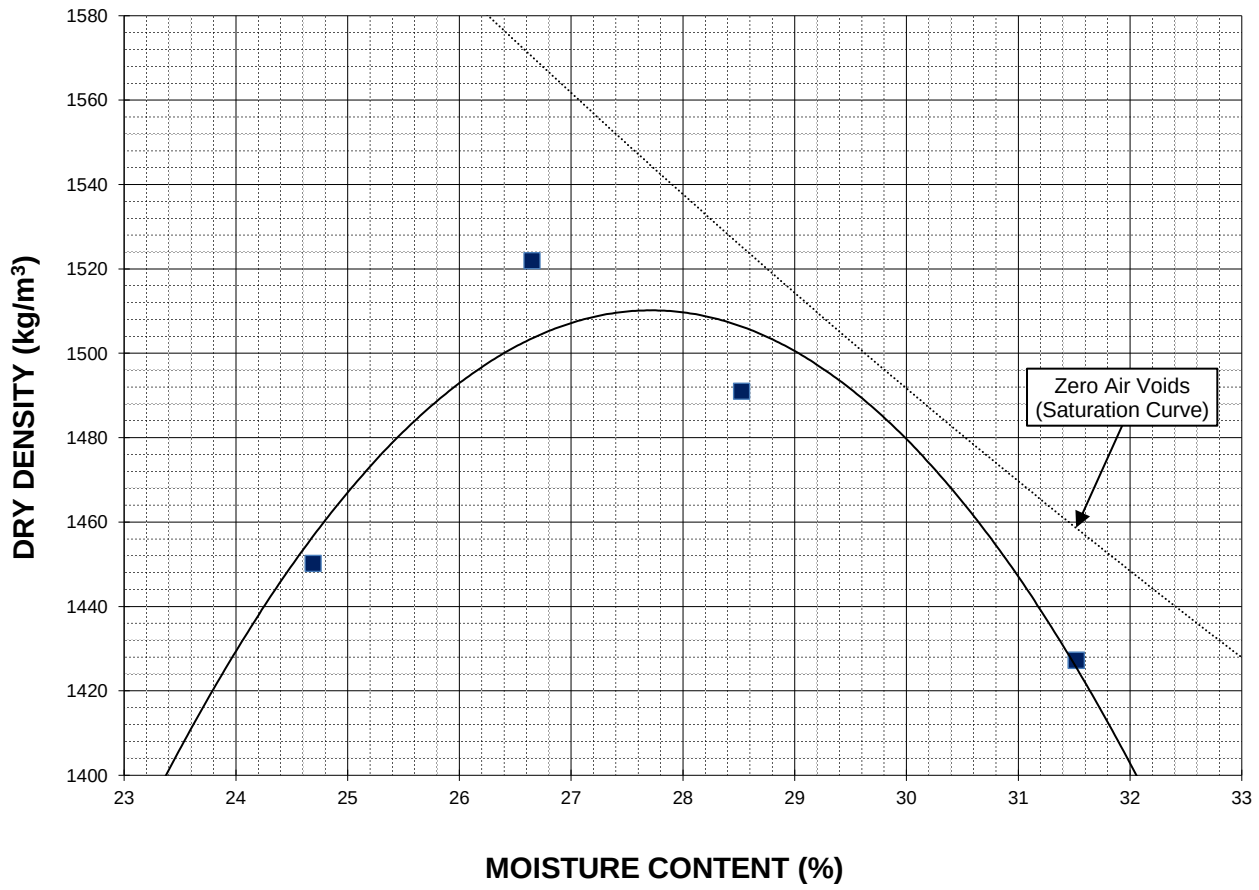
ASTM D698-12 (2021)

CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal - Langside Street
Sample #	TH22-12
Source	Langside Street
Material	Clay
Sample Date	07-Sep-22
Test Date	07-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1510
Optimum Moisture (%)	27.7

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1808	1928	1916	1877	
Dry Density (kg/m^3)	1450	1522	1491	1427	
Moisture Content (%)	24.7	26.6	28.5	31.5	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Langside Street
Client	Dillon Consulting Ltd.	**Material**	Clay
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-12	**Test Date**	2022-10-11
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1510	kg/m3
Optimum Moisture Content	27.7	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1436	kg/m3
Initial Moisture Content	27.5	%
Relative Density	95.1	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	2.0	%
Moisture Content in top 25 mm	33.9	%
Immersion Period	96	h

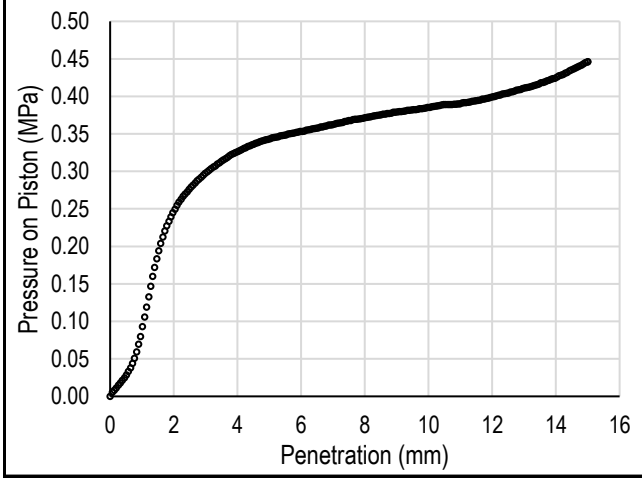
CBR Results

CBR at 2.54 mm	4.0	%
CBR at 5.08 mm	3.3	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.04	0.04
1.27	0.15	0.15
1.91	0.24	0.24
2.54	0.28	0.28
3.18	0.30	0.30
3.81	0.32	0.32
4.45	0.34	0.34
5.08	0.34	0.34
7.62	0.37	0.37
10.16	0.39	0.39
12.70	0.41	0.41

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-09

Photo 2: Pavement Core Sample at Test Hole TH22-10

Photo 3: Pavement Core Sample at Test Hole TH22-11

Photo 4: Pavement Core Sample at Test Hole TH22-12

Appendix D

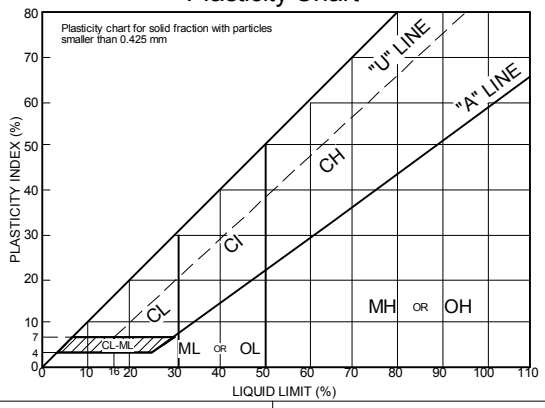
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Alley – (Sherbrooks St./Cumberland Ave/Sargent Ave/Furby St.)

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH22-13
1 of 1

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5529058, E-632311 (Alley: Sargent & Cumberland)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number
		CONCRETE - 178 mm thick		PC22-13
		ORGANIC CLAY (TOPSOIL) - silty, trace sand, trace rootlets, - black - dry to moist, firm to stiff - intermediate plasticity - AASHTO: A-7 (I)		
0.5		CLAY - silty, trace sand - grey - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (I)		G61
				G62
1.0		SILT - some clay, trace sand - light brown - moist, soft - low to intermediate plasticity - AASHTO: A-4 (I)		G63
		CLAY - silty - brown - moist, stiff - high plasticity - AASHTO: A-7-6 (I)		G64
1.5		- trace silt inclusions (5-10 mm dia.) below 1.8 m depth		G65
2.0		- firm below 2.0 m depth		G66

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa) — Test Type: △ Torvane △, ✿ Pocket Pen. ✿, ☒ Qu ☒, ○ Field Vane ○: 0 40 80 120 160 200

END OF TEST HOLE AT 2.4 m IN CLAY
1) Seepage or sloughing not observed.
2) Test hole open to 2.4 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located behind #696 Furby St, 2.0 m West of East road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-14

TREK GEOTECHNICAL

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528913, E-632309 (Alley: Sargent & Cumberland)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) 0 40 80 120 160 200
	ASPHALT - 25 mm thick				
	CONCRETE - 165 mm thick		PC22-14		
	SAND - some gravel, some clay, trace silt - brown - dry to moist, loose - rounded to sub-angular - AASHTO: A-1-b (I)				
0.5	CLAY - silty - grey - moist, firm - high plasticity - AASHTO: A-7-5 (76)		G55	●	
			G56	●	✿△
1.0	- brown below 0.9 m depth		G57	●	✿△
	- stiff below 1.3 m depth		G58	●	✿△
1.5			G59	●	✿△
2.0			G60	●	✿△
2.5	END OF TEST HOLE AT 2.5 m IN CLAY				

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located behind #650 Furby St, 1.5 m West of East road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-15

TREK GEOTECHNICAL

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528792, E-632310 (Alley: Sargent & Cumberland)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 7, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △, ✤ Pocket Pen. ✤, ☒ Qu ☒, ○ Field Vane ○ — 0 40 80 120 160 200
		CONCRETE - 203 mm thick		PC22-15		
		CLAY - silty, trace gravel, trace sand - black - moist, stiff - high plasticity - AASHTO: A-7-6 (I)				
0.5				G49		
		SILT - some clay, trace sand - light brown - moist, soft - low plasticity - AASHTO: A-4 (5)		G50		
1.0				G51		
				G52		
1.5		CLAY - silty, trace sand - brown - moist, stiff - high plasticity - AASHTO: A-7-6 (I)		G53		
2.0				G54		
2.5		END OF TEST HOLE AT 2.5 m IN CLAY				

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located at the corner of #612 Furby St, 5.0 m east from corner, 0.5 m South of North road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
Alley (Sherbrook St./Cumberland Ave/Sargent Ave/ Furby St.)

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-13	UTM: 14U 55229058 N 632311 E Located behind #696 Furby St. , 2.0 m West of East road edge.	Asphalt	-	Concrete	178	Organic Clay; AASHTO: A-7 (I)	0.4	0.5	40							
						Clay; AASHTO: A-7-6 (I)	0.7	0.9	31							
						Silt; AASHTO: A-4 (I)	1.0	1.2	28							
						Clay; AASHTO: A-7-6 (I)	1.3	1.5	29							
						Clay; AASHTO: A-7-6 (I)	1.7	1.9	29							
						Clay; AASHTO: A-7-6 (I)	2.2	2.3	42							
TH22-14	UTM: 14U 5528913N, 632309 E Located behind #650 Furby St. 1.5 m West of East road edge.	Asphalt	25	Concrete	165	Sand; AASHTO: A-1-b (I)	0.4	0.6	9							
						Clay; AASHTO: A-7-5 (76)	0.7	0.9	26							
						Clay; AASHTO: A-7-5 (76)	1.0	1.2	28							
						Clay; AASHTO: A-7-5 (76)	1.3	1.5	30							
						Clay; AASHTO: A-7-5 (76)	1.7	1.9	45	84	15	1	0	32	96	64
						Clay; AASHTO: A-7-5 (76)	2.2	2.3	48							
TH22-15	UTM : 14U 5528792 N, 632310 E Located at the corner of #612 Furby St., 5.0 m East from corner, 0.5 m South of North road edge.	Asphalt	-	Concrete	203	Clay; AASHTO: A-7-6 (I)	0.4	0.6	30							
						Silt; AASHTO: A-4 (5)	0.7	0.9	24							
						Silt; AASHTO: A-4 (5)	1.0	1.2	22							
						Silt; AASHTO: A-4 (5)	1.3	1.5	23	15	77	8	0	17	25	7
						Clay; AASHTO: A-7-6 (I)	1.7	1.9	29							
						Clay; AASHTO: A-7-6 (I)	2.2	2.3	44							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Alley (Sargent/Cumberland/Furby/Sherbrook)

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-13	TH22-13	TH22-13	TH22-13	TH22-13	TH22-13
Depth (m)	0.4 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G61	G62	G63	G64	G65	G66
Tare ID	H41	W30	H39	D12	D12	AB08
Mass of tare	8.7	8.5	8.4	8.4	8.4	6.9
Mass wet + tare	210.0	201.1	230.6	235.0	235.0	219.5
Mass dry + tare	152.5	155.4	181.7	184.0	184.0	157.0
Mass water	57.5	45.7	48.9	51.0	51.0	62.5
Mass dry soil	143.8	146.9	173.3	175.6	175.6	150.1
Moisture %	40.0%	31.1%	28.2%	29.0%	29.0%	41.6%

Test Hole	TH22-14	TH22-14	TH22-14	TH22-14	TH22-14	TH22-14
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G55	G56	G57	G58	G59	G60
Tare ID	W04	N04	W92	Z132	C28	C8
Mass of tare	8.5	8.7	8.5	8.7	8.4	8.4
Mass wet + tare	231.9	243.8	206.3	229.5	416.5	226.6
Mass dry + tare	213.1	196.0	162.9	178.5	290.7	155.7
Mass water	18.8	47.8	43.4	51.0	125.8	70.9
Mass dry soil	204.6	187.3	154.4	169.8	282.3	147.3
Moisture %	9.2%	25.5%	28.1%	30.0%	44.6%	48.1%

Test Hole	TH22-15	TH22-15	TH22-15	TH22-15	TH22-15	TH22-15
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G49	G50	G51	G52	G53	G54
Tare ID	H03	AB05	Z17	W70	E108	AB90
Mass of tare	8.6	6.7	8.6	8.5	8.6	6.9
Mass wet + tare	206.0	226.8	224.8	456.5	223.4	230.3
Mass dry + tare	160.4	184.6	185.4	373.5	175.6	162.5
Mass water	45.6	42.2	39.4	83.0	47.8	67.8
Mass dry soil	151.8	177.9	176.8	365.0	167.0	155.6
Moisture %	30.0%	23.7%	22.3%	22.7%	28.6%	43.6%

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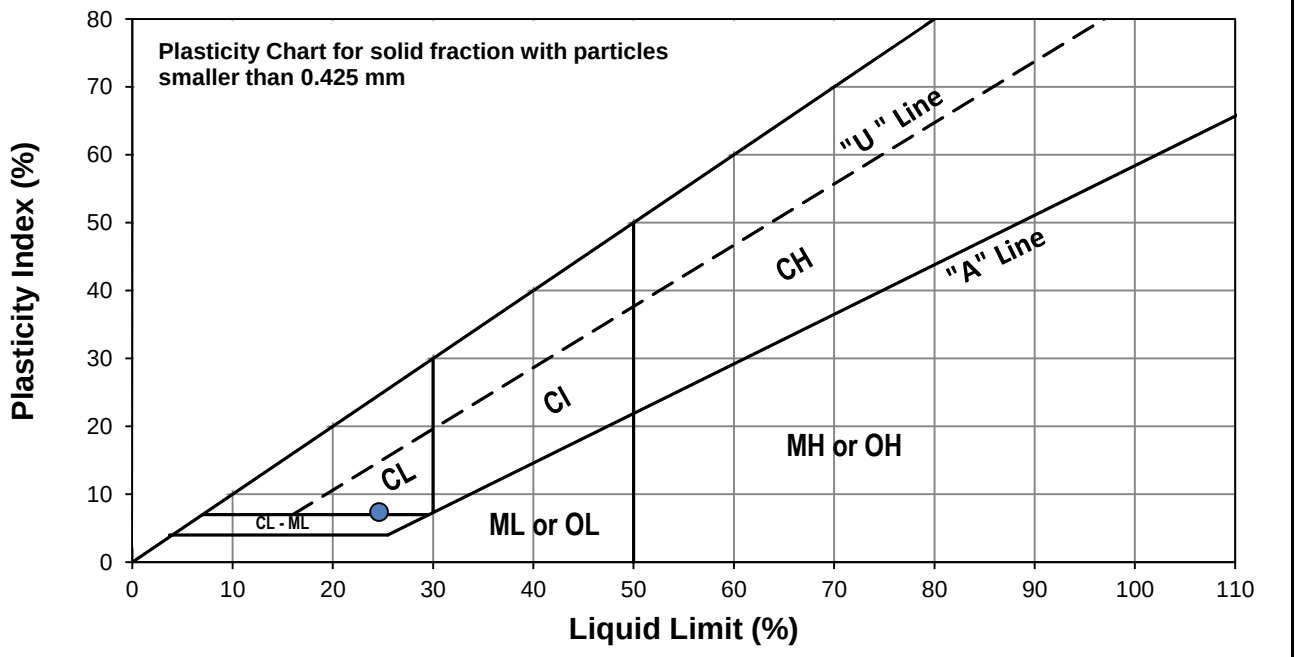
Atterberg Limits
ASTM D4318-10e1

Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Alley(Sargent/Furby/Cumberland/Sherbrook)
Test Hole	TH22-15
Sample #	G52
Depth (m)	1.3 - 1.5
Sample Date	7-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	25
Plastic Limit	17
Plasticity Index	7

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	26	34		
Mass Tare (g)	14.179	14.043	14.184		
Mass Wet Soil + Tare (g)	24.662	22.620	26.272		
Mass Dry Soil + Tare (g)	22.532	20.931	23.947		
Mass Water (g)	2.130	1.689	2.325		
Mass Dry Soil (g)	8.353	6.888	9.763		
Moisture Content (%)	25.500	24.521	23.814		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.048	14.311			
Mass Wet Soil + Tare (g)	21.911	23.364			
Mass Dry Soil + Tare (g)	20.749	22.040			
Mass Water (g)	1.162	1.324			
Mass Dry Soil (g)	6.701	7.729			
Moisture Content (%)	17.341	17.130			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Test Hole	TH22-15
Sample #	G52
Depth (m)	1.3 - 1.5
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

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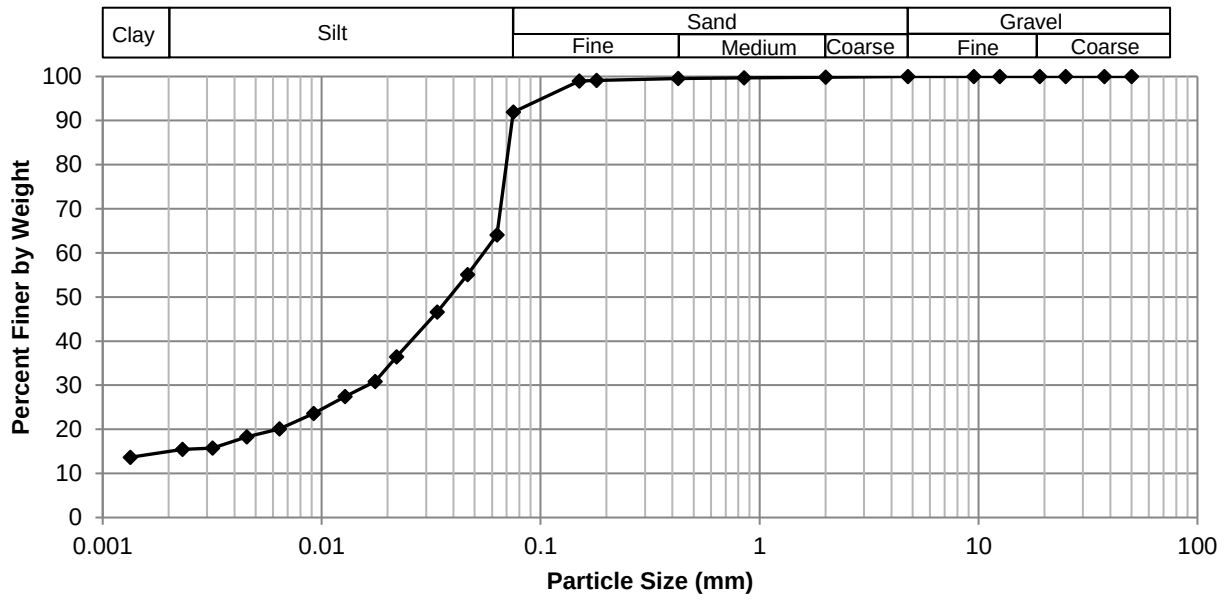
Gravel	0.0%
Sand	8.1%
Silt	77.0%
Clay	14.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	91.91
37.5	100.00	2.00	99.82	0.0633	64.08
25.0	100.00	0.850	99.67	0.0463	55.03
19.0	100.00	0.425	99.50	0.0337	46.60
12.5	100.00	0.180	99.12	0.0220	36.43
9.50	100.00	0.150	98.99	0.0175	30.85
4.75	100.00	0.075	91.91	0.0128	27.45
				0.0092	23.58
				0.0064	20.08
				0.0045	18.29
				0.0032	15.71
				0.0023	15.45
				0.0013	13.66

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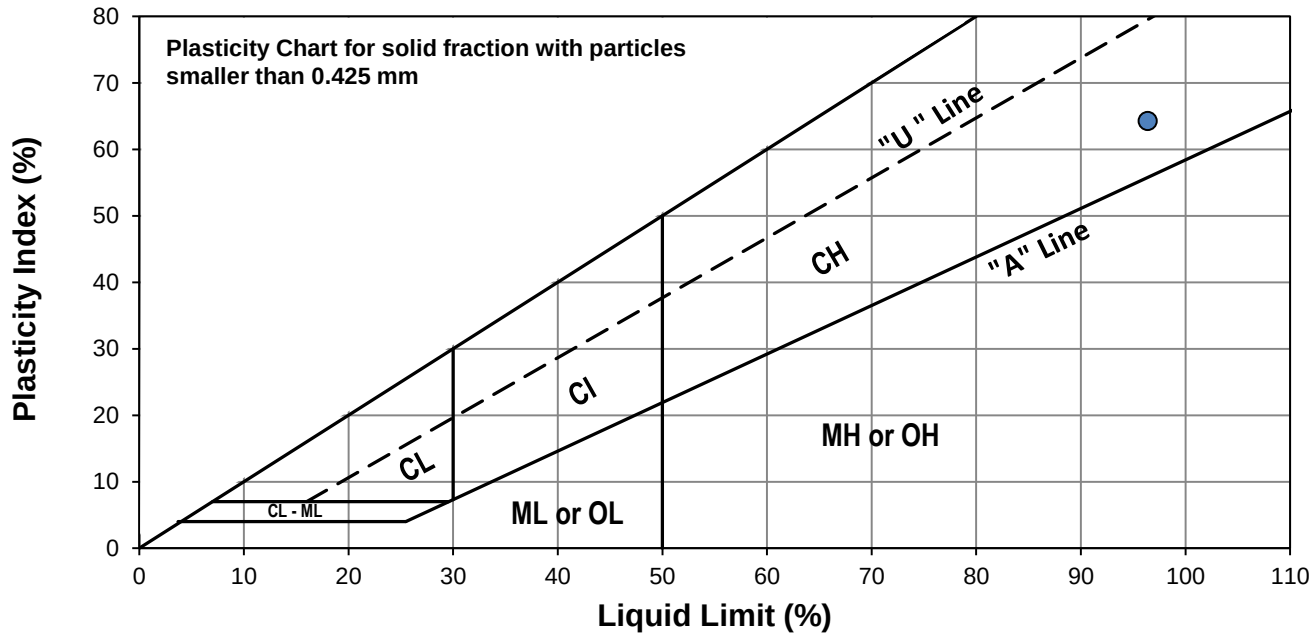
Atterberg Limits
ASTM D4318-10e1

Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal- Alley (Sargent/Cumberland/Furby/Sherbrook)
Test Hole	TH22-14
Sample #	G59
Depth (m)	1.7 - 1.9
Sample Date	07-Sep-22
Test Date	24-Oct-22
Technician	TN

Liquid Limit	96
Plastic Limit	32
Plasticity Index	64

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	22	30		
Mass Tare (g)	14.072	13.880	14.109		
Mass Wet Soil + Tare (g)	26.390	25.801	26.019		
Mass Dry Soil + Tare (g)	20.208	19.909	20.230		
Mass Water (g)	6.182	5.892	5.789		
Mass Dry Soil (g)	6.136	6.029	6.121		
Moisture Content (%)	100.750	97.728	94.576		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.940	14.323			
Mass Wet Soil + Tare (g)	24.384	24.329			
Mass Dry Soil + Tare (g)	21.855	21.885			
Mass Water (g)	2.529	2.444			
Mass Dry Soil (g)	7.915	7.562			
Moisture Content (%)	31.952	32.319			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Test Hole	TH22-14
Sample #	G59
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

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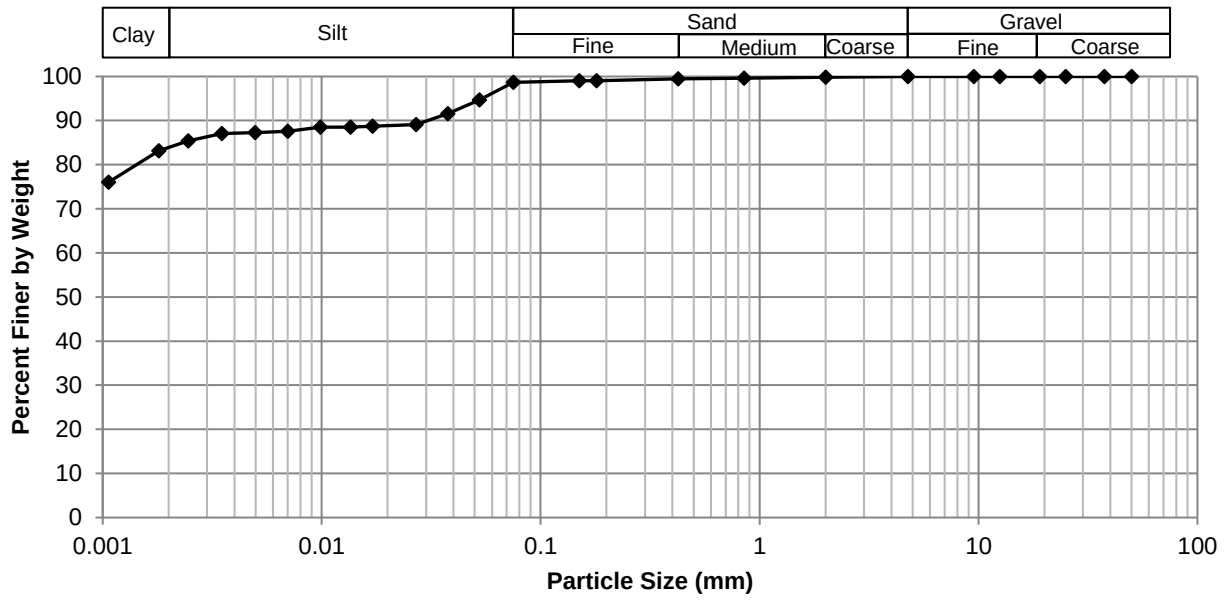
Gravel	0.0%
Sand	1.4%
Silt	14.8%
Clay	83.8%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	98.65
37.5	100.00	2.00	99.81	0.0525	94.67
25.0	100.00	0.850	99.60	0.0377	91.55
19.0	100.00	0.425	99.47	0.0270	89.05
12.5	100.00	0.180	99.06	0.0171	88.74
9.50	100.00	0.150	99.06	0.0135	88.48
4.75	100.00	0.075	98.65	0.0099	88.48
				0.0070	87.54
				0.0050	87.27
				0.0035	87.05
				0.0025	85.36
				0.0018	83.16
				0.0011	76.04

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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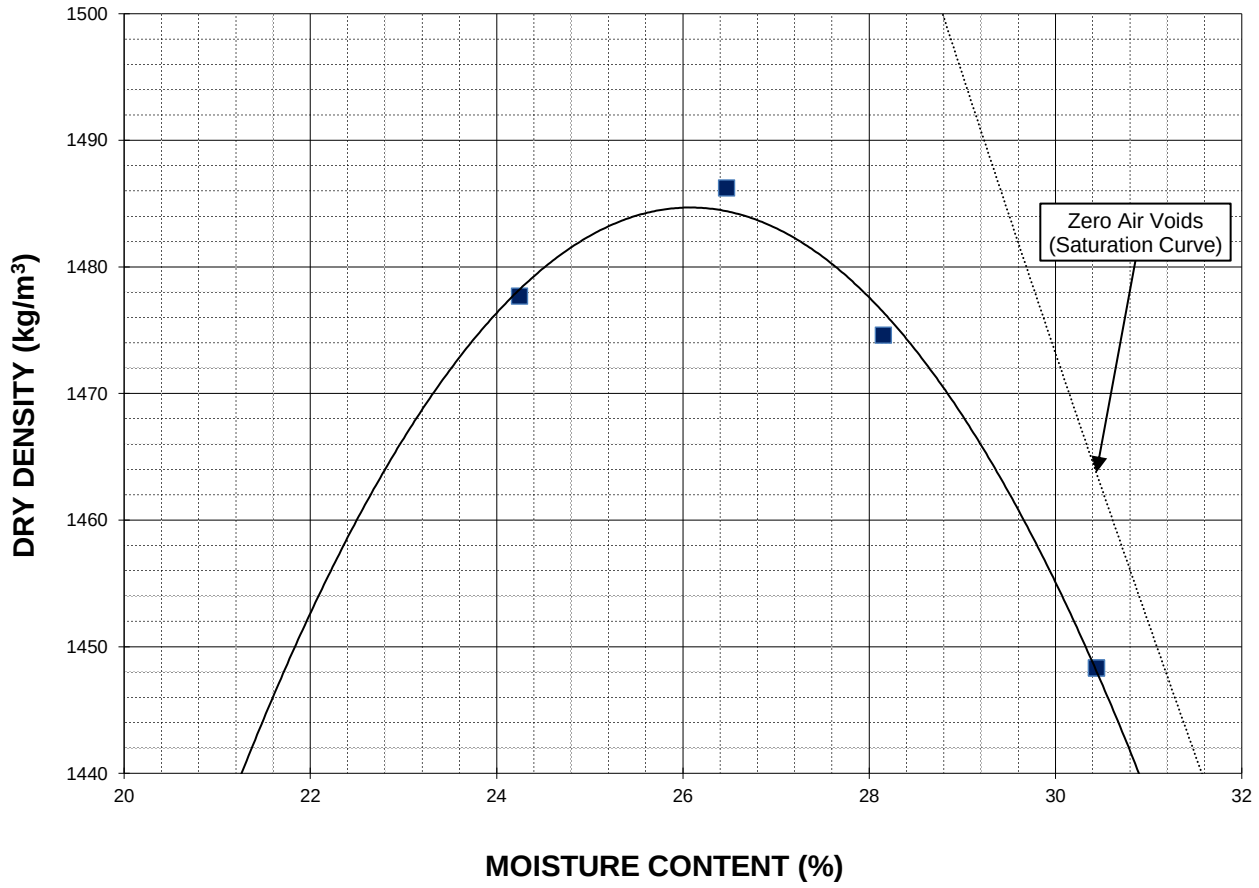
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-14
Source	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Material	Clay
Sample Date	08-Sep-22
Test Date	05-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1485
Optimum Moisture (%)	26.1

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1836	1880	1890	1889	
Dry Density (kg/m^3)	1478	1486	1475	1448	
Moisture Content (%)	24.2	26.5	28.2	30.4	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Client	Dillon Consulting Ltd.	**Material**	Clay
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-14	**Test Date**	2022-10-11
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1485	kg/m3
Optimum Moisture Content	26.1	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1419	kg/m3
Initial Moisture Content	25.8	%
Relative Density	95.6	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	1.4	%
Moisture Content in top 25 mm	38.1	%
Immersion Period	96	h

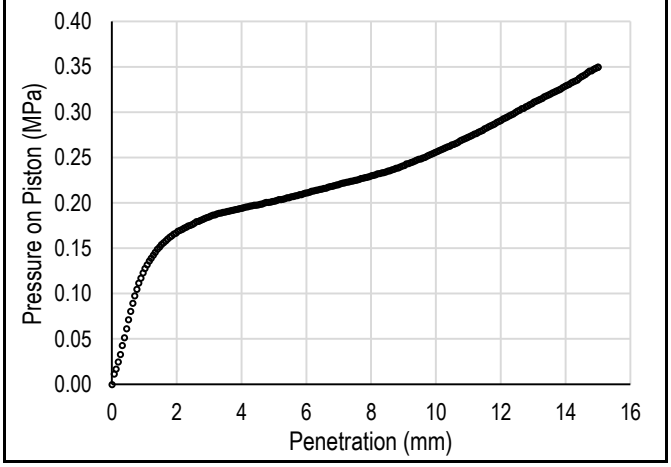
CBR Results

CBR at 2.54 mm	2.6	%
CBR at 5.08 mm	2.0	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.09	0.09
1.27	0.14	0.14
1.91	0.17	0.17
2.54	0.18	0.18
3.18	0.19	0.19
3.81	0.19	0.19
4.45	0.20	0.20
5.08	0.20	0.20
7.62	0.23	0.23
10.16	0.26	0.26
12.70	0.30	0.30

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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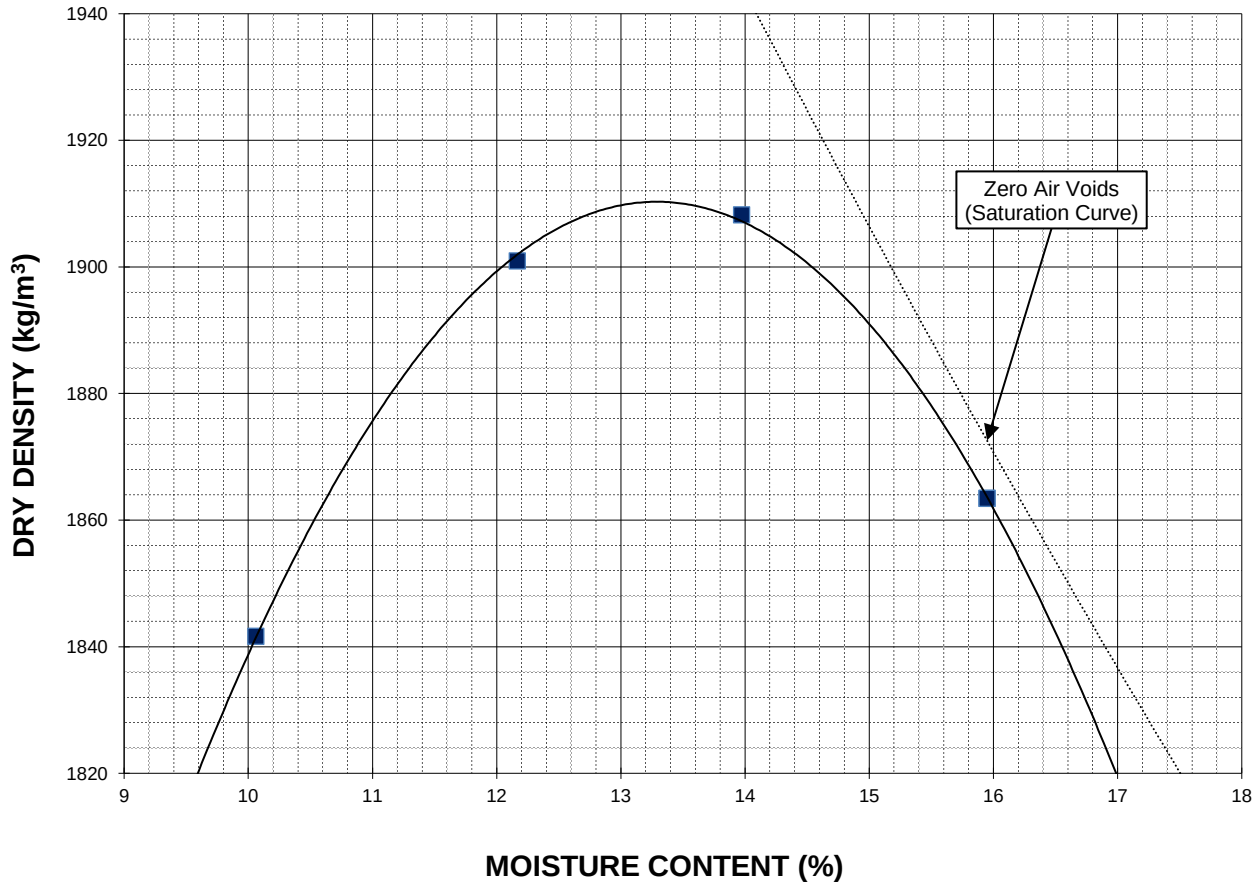
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-15
Source	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Material	Silt
Sample Date	08-Sep-22
Test Date	13-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1910
Optimum Moisture (%)	13.3

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2027	2132	2175	2161	
Dry Density (kg/m^3)	1842	1901	1908	1863	
Moisture Content (%)	10.1	12.2	14.0	15.9	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Sargent/Cumberland/Furby/Sherbrook)
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-15	**Test Date**	2022-10-16
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1910	kg/m3
Optimum Moisture Content	13.3	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1822	kg/m3
Initial Moisture Content	13.4	%
Relative Density	95.4	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.2	%
Moisture Content in top 25 mm	17.2	%
Immersion Period	96	h

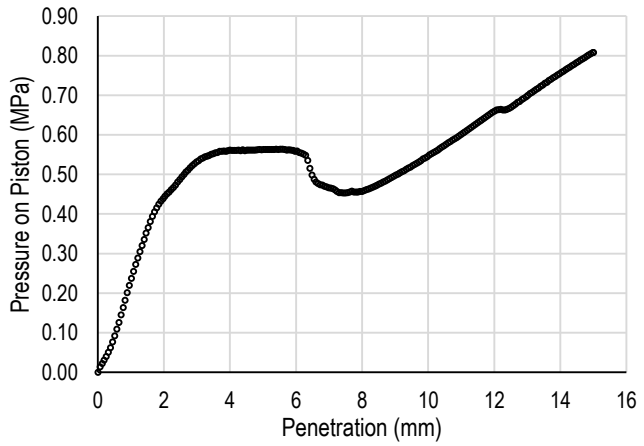
CBR Results

CBR at 2.54 mm	7.2	%
CBR at 5.08 mm	5.5	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.13	0.13
1.27	0.30	0.30
1.91	0.43	0.43
2.54	0.49	0.49
3.18	0.54	0.54
3.81	0.56	0.56
4.45	0.56	0.56
5.08	0.56	0.56
7.62	0.46	0.46
10.16	0.56	0.56
12.70	0.68	0.68

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-13

Photo 2: Pavement Core Sample at Test Hole TH22-14

Photo 3: Pavement Core Sample at Test Hole TH22-15

Appendix E

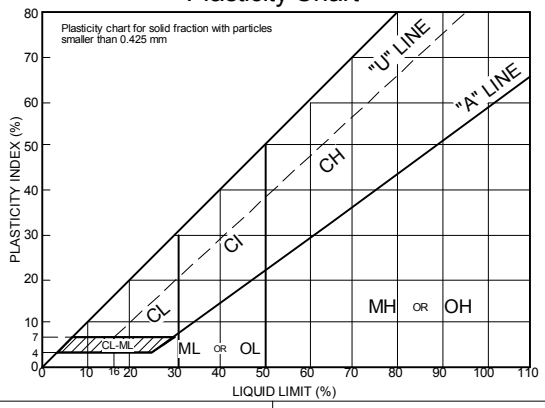
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Alley – (Sherbrook St./Furby Ave/Sargent Ave/Ellice Ave)

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

Sub-Surface Log

Test Hole TH22-16
1 of 1

TREK GEOTECHNICAL

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528670, E-632304 (Alley: Sargent & Ellice)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number
	CONCRETE - 191 mm thick		PC22-16
	CLAY - silty, trace gravel, trace sand, trace rootlets - black - moist, stiff - high plasticity - AASHTO: A-7-6 (I)		G67
0.5	SILT - some clay, trace sand - light brown - moist, soft to firm - low plasticity - AASHTO: A-4 (I)		G68
1.0			G69
	CLAY - silty - brown - moist, very stiff - high plasticity - AASHTO: A-7-6 (I)		G70
1.5			G71
	- trace silt inclusions (5-10 mm dia.), stiff below 1.9 depth		
2.0	- mottled reddish brown, firm below 2.2 m depth		G72
2.5	END OF TEST HOLE AT 2.5 m IN CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL
Undrained Shear Strength (kPa): 0 40 80 120 160 200
Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located behind #573 Sherbrook St, 1.5 m West of East road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-17

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528565, E-632301 (Alley: Sargent & Ellice)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Material Description	Sample Type	Sample Number
0	CONCRETE - 222 mm thick	PC	PC22-17
	CLAY - silty, trace gravel, trace sand - dark grey - moist, stiff - high plasticity - AASHTO: A-7-6 (I)	G	G73
0.5	SILT - some clay, trace sand - light brown - moist, soft to firm - low plasticity - AASHTO: A-4 (I)	G	G74
1.0	SILT AND CLAY - brown - moist, very stiff - high plasticity - AASHTO: A-7-6 (45)	G	G75
		G	G76
1.5	- firm to stiff below 1.4 m depth	G	G77
2.0	- trace silt inclusions (5-10 mm dia.) below 1.7 m depth	G	G78
2.5	END OF TEST HOLE AT 2.5 m IN SILT AND CLAY		

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21

Particle Size (%): 0 20 40 60 80 100 — PL MC LL

Undrained Shear Strength (kPa): 0 40 80 120 160 200

Test Type: △ Torvane △ | ✤ Pocket Pen. ✤ | ☒ Qu ☒ | ○ Field Vane ○

1) Seepage or sloughing not observed.
2) Test hole open to 2.5 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located behind #537 Sherbrook St, 2.0 m West of East road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2022-09-12 LOCAL STREET RENEWAL 23-R-03 0_C_TC 1000 166 01.GPJ TREK.GDT 10/26/22

Sub-Surface Log

Test Hole TH22-18

Client:	Dillion Consulting	**Project Number:**	1000-166-01
Project Name:	2023 Local Street Renewal	**Location:**	UTM N-5528450, E-632295 (Alley: Sargent & Ellice)
Contractor:	Maple Leaf Drilling Ltd.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	September 8, 2022

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) / SPT | Split Barrel (SB) / LPT | Core (C)

Particle Size Legend: Fines | Clay | Silt | Sand | Gravel | Cobbles | Boulders

Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	Bulk Unit Wt (kN/m³) 16 17 18 19 20 21 / Particle Size (%) 0 20 40 60 80 100 / PL MC LL	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 40 80 120 160 200
		CONCRETE - 254 mm thick		PC22-18		
		CLAY - some gravel, some sand, black, moist, stiff, high plasticity - AASHTO: A-7-6 (I)				
0.5		SILT - some clay, trace sand - light brown - moist, soft to firm - low plasticity - AASHTO: A-4 (I)		G79		
				G80		
1.0				G81		
				G82		
1.5		CLAY - silty, trace silt inclusions (5-10 mm dia.) - brown - moist, firm to stiff - high plasticity - AASHTO: A-7-6 (29)				
				G83		
2.0						
				G84		
2.5						

END OF TEST HOLE AT 2.6 m IN CLAY

1) Seepage or sloughing not observed.
2) Test hole open to 2.6 m depth immediately after drilling.
3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
4) Test hole located behind #501 Sherbrook St, 1.5 m West of East road edge.
5) The bulk sample was collected between 0.3 m and 2.0 m depth.

Logged By: Tyler Chapko **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
Alley (Sherbrook St./Furby Ave/Sargent Ave/Ellice Ave)

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-16	UTM: 14U 5528670 N 632304E Located behind #573 Sherbrook St. 1.5 m West of East road edge.	Asphalt	-	Concrete	191	Clay; AASHTO: A-7-6 (I)	0.4	0.6	30							
						Silt; AASHTO: A-4 (I)	0.7	0.9	20							
						Silt; AASHTO: A-4 (I)	1.0	1.2	22							
						Clay; AASHTO: A-7-6 (I)	1.3	1.5	30							
						Clay; AASHTO: A-7-6 (I)	1.7	1.9	44							
						Clay; AASHTO: A-7-6 (I)	2.2	2.3	48							
TH22-17	UTM: 14U 5528565N, 632301 E Located behind #537 Sherbrook St, 2.0 m West of East road edge	Asphalt	-	Concrete	222	Clay; AASHTO: A-7-6 (I)	0.5	0.6	28							
						Silt; AASHTO: A-4 (I)	0.8	0.9	22							
						Silt and Clay; AASHTO: A-7-6 (45)	1.1	1.2	28							
						Silt and Clay; AASHTO: A-7-6 (45)	1.4	1.5	38							
						Silt and Clay; AASHTO: A-7-6 (45)	1.7	1.9	38	37	63	0	0	21	61	40
						Silt and Clay; AASHTO: A-7-6 (45)	2.2	2.3	54							
TH22-18	UTM : 14U 5528450 N, 632295 E Located behind #501 Sherbrook St, 1.5 m West of East road edge.	Asphalt	-	Concrete	254	Silt; AASHTO: A-4 (I)	0.5	0.6	17							
						Silt; AASHTO: A-4 (I)	0.8	0.9	20							
						Silt; AASHTO: A-4 (I)	1.1	1.2	24							
						Clay; AASHTO: A-7-6 (29)	1.4	1.6	29	45	52	3	0	17	45	28
						Clay; AASHTO: A-7-6 (29)	1.8	1.9	39							
						Clay; AASHTO: A-7-6 (29)	2.2	2.4	46							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Alley (Sargent/Ellice/Furby/Sherbrook)

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-16	TH22-16	TH22-16	TH22-16	TH22-16	TH22-16
Depth (m)	0.4 - 0.6	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G67	G68	G69	G70	G71	G72
Tare ID	AB16	N12	N58	E4	E41	Z63
Mass of tare	6.7	8.7	8.5	8.5	8.5	8.5
Mass wet + tare	216.2	201.6	230.7	205.1	204.2	208.5
Mass dry + tare	167.7	169.8	190.1	159.9	144.0	143.3
Mass water	48.5	31.8	40.6	45.2	60.2	65.2
Mass dry soil	161.0	161.1	181.6	151.4	135.5	134.8
Moisture %	30.1%	19.7%	22.4%	29.9%	44.4%	48.4%

Test Hole	TH22-17	TH22-17	TH22-17	TH22-17	TH22-17	TH22-17
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.9	2.2 - 2.3
Sample #	G73	G74	G75	G76	G77	G78
Tare ID	F31	A107	AB23	W111	P153	E8
Mass of tare	8.6	8.7	6.7	8.6	8.5	8.5
Mass wet + tare	206.1	210.0	200.5	203.1	437.4	265.2
Mass dry + tare	162.8	174.0	157.8	149.3	319.2	174.8
Mass water	43.3	36.0	42.7	53.8	118.2	90.4
Mass dry soil	154.2	165.3	151.1	140.7	310.7	166.3
Moisture %	28.1%	21.8%	28.3%	38.2%	38.0%	54.4%

Test Hole	TH22-18	TH22-18	TH22-18	TH22-18	TH22-18	TH22-18
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.6	1.8 - 1.9	2.2 - 2.4
Sample #	G79	G80	G81	G82	G83	G84
Tare ID	AC03	W07	AB32	H66	N18	Z93
Mass of tare	6.8	8.6	7.1	8.6	8.6	8.5
Mass wet + tare	250.0	234.8	287.2	432.7	245.9	244.0
Mass dry + tare	214.3	197.0	233.9	338.2	178.3	169.9
Mass water	35.7	37.8	53.3	94.5	67.6	74.1
Mass dry soil	207.5	188.4	226.8	329.6	169.7	161.4
Moisture %	17.2%	20.1%	23.5%	28.7%	39.8%	45.9%

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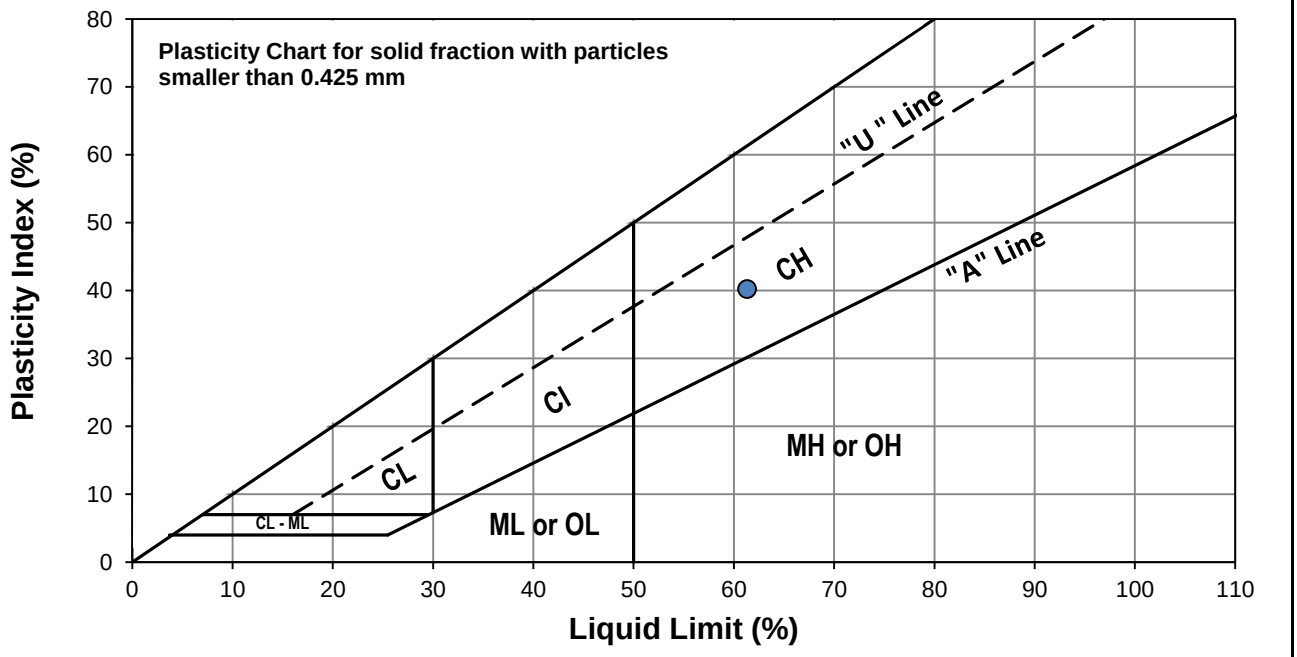
Atterberg Limits
ASTM D4318-10e1

Project No.	1000-166-01
Client	Dillon Consulting
Project	2023 Local Streets Renewal - Alley(Sargent/Ellice/Furby/Sherbrook)
Test Hole	TH22-17
Sample #	G77
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	61
Plastic Limit	21
Plasticity Index	40

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	24	34		
Mass Tare (g)	14.056	14.066	14.081		
Mass Wet Soil + Tare (g)	24.264	23.398	24.398		
Mass Dry Soil + Tare (g)	20.277	19.838	20.556		
Mass Water (g)	3.987	3.560	3.842		
Mass Dry Soil (g)	6.221	5.772	6.475		
Moisture Content (%)	64.089	61.677	59.336		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.119	13.922			
Mass Wet Soil + Tare (g)	21.613	22.088			
Mass Dry Soil + Tare (g)	20.322	20.650			
Mass Water (g)	1.291	1.438			
Mass Dry Soil (g)	6.203	6.728			
Moisture Content (%)	20.813	21.373			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
	Alley - (Sargent/Ellice/Furby/Sherbrook)
Test Hole	TH22-17
Sample #	G77
Depth (m)	1.7 - 1.9
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

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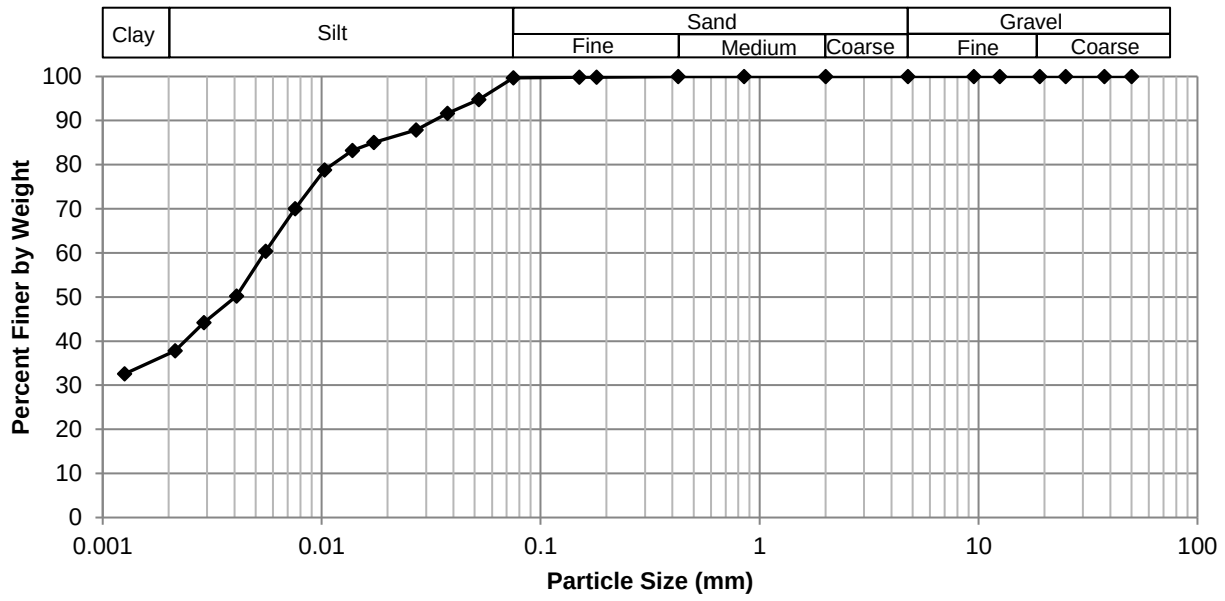
Gravel	0.0%
Sand	0.4%
Silt	62.7%
Clay	37.0%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	99.65
37.5	100.00	2.00	99.99	0.0522	94.75
25.0	100.00	0.850	99.99	0.0375	91.63
19.0	100.00	0.425	99.94	0.0270	87.87
12.5	100.00	0.180	99.85	0.0173	85.06
9.50	100.00	0.150	99.85	0.0138	83.18
4.75	100.00	0.075	99.65	0.0103	78.77
				0.0075	70.02
				0.0055	60.33
				0.0041	50.22
				0.0029	44.18
				0.0021	37.83
				0.0013	32.55

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Atterberg Limits
ASTM D4318-10e1

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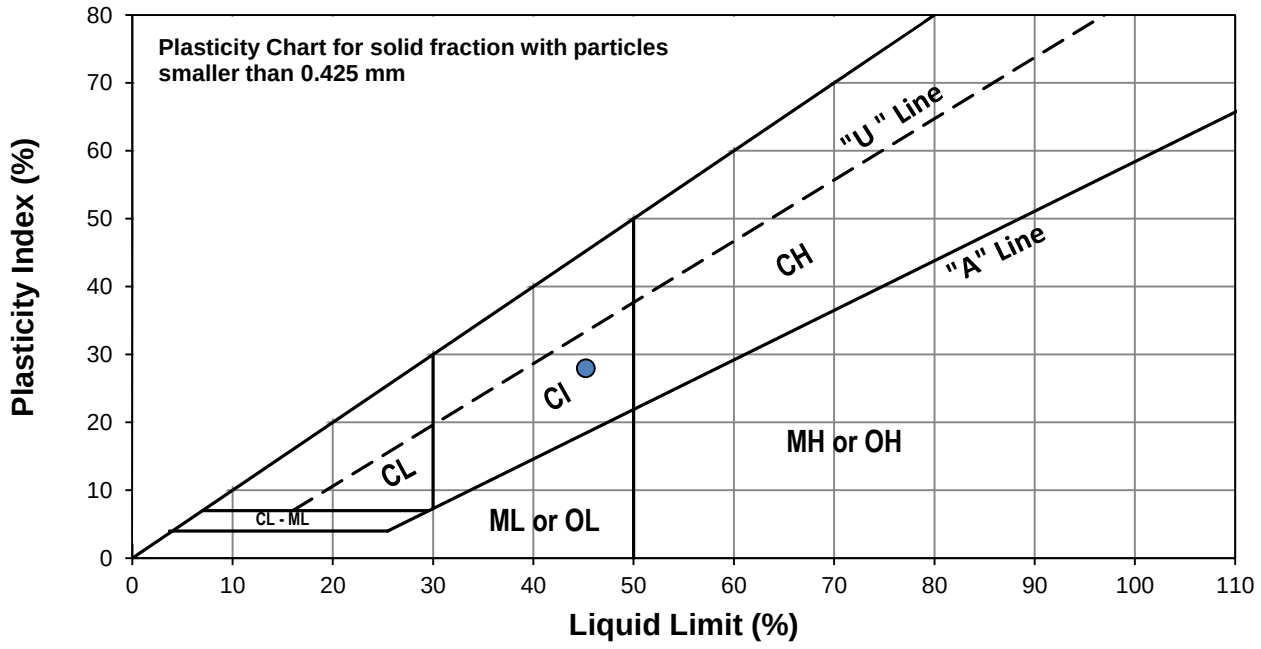
Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal - Alley(Sargent/Ellice/Furby/Sherbrook)
Test Hole	TH22-18
Sample #	G82
Depth (m)	1.4 - 1.6
Sample Date	7-Sep-22
Test Date	24-Oct-22
Technician	TN

Liquid Limit	45
Plastic Limit	17
Plasticity Index	28

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	15	25	31		
Mass Tare (g)	14.159	14.191	14.115		
Mass Wet Soil + Tare (g)	32.318	27.948	28.418		
Mass Dry Soil + Tare (g)	26.483	23.651	24.032		
Mass Water (g)	5.835	4.297	4.386		
Mass Dry Soil (g)	12.324	9.460	9.917		
Moisture Content (%)	47.347	45.423	44.227		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.974	14.063			
Mass Wet Soil + Tare (g)	31.206	28.203			
Mass Dry Soil + Tare (g)	28.670	26.120			
Mass Water (g)	2.536	2.083			
Mass Dry Soil (g)	14.696	12.057			
Moisture Content (%)	17.256	17.276			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
	Alley - (Sargent/Ellice/Furby/Sherbrook)
Test Hole	TH22-18
Sample #	G82
Depth (m)	1.4 - 1.6
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

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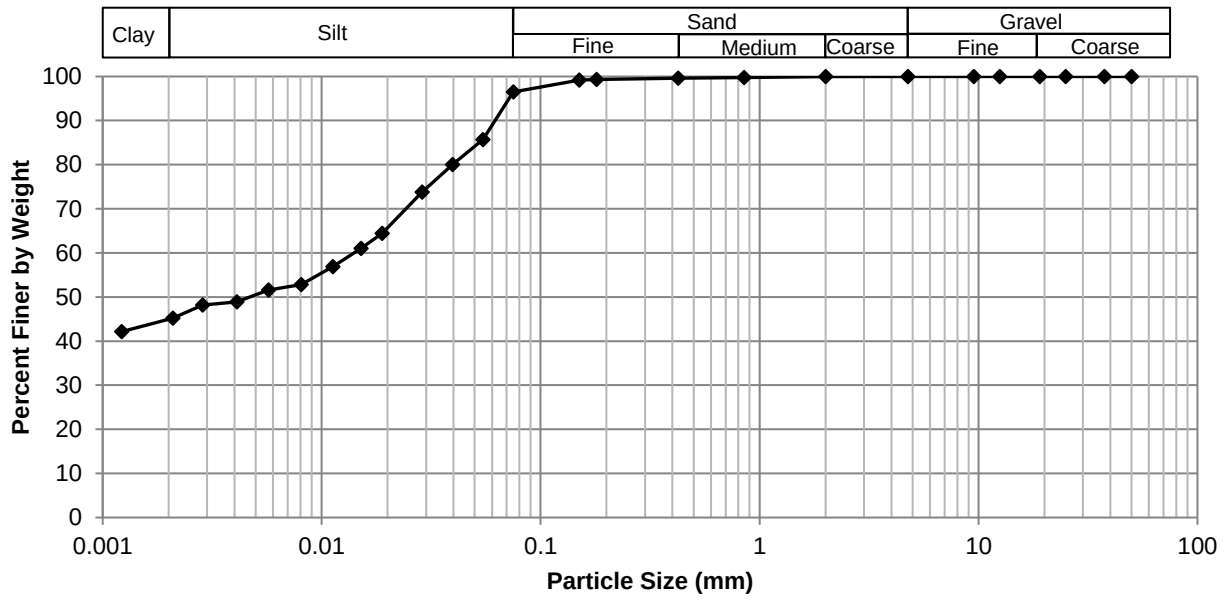
Gravel	0.0%
Sand	3.5%
Silt	51.6%
Clay	44.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	96.48
37.5	100.00	2.00	99.97	0.0545	85.68
25.0	100.00	0.850	99.74	0.0396	80.05
19.0	100.00	0.425	99.62	0.0287	73.80
12.5	100.00	0.180	99.29	0.0189	64.42
9.50	100.00	0.150	99.19	0.0151	60.98
4.75	100.00	0.075	96.48	0.0112	56.88
				0.0081	52.81
				0.0057	51.56
				0.0041	48.92
				0.0029	48.16
				0.0021	45.21
				0.0012	42.13

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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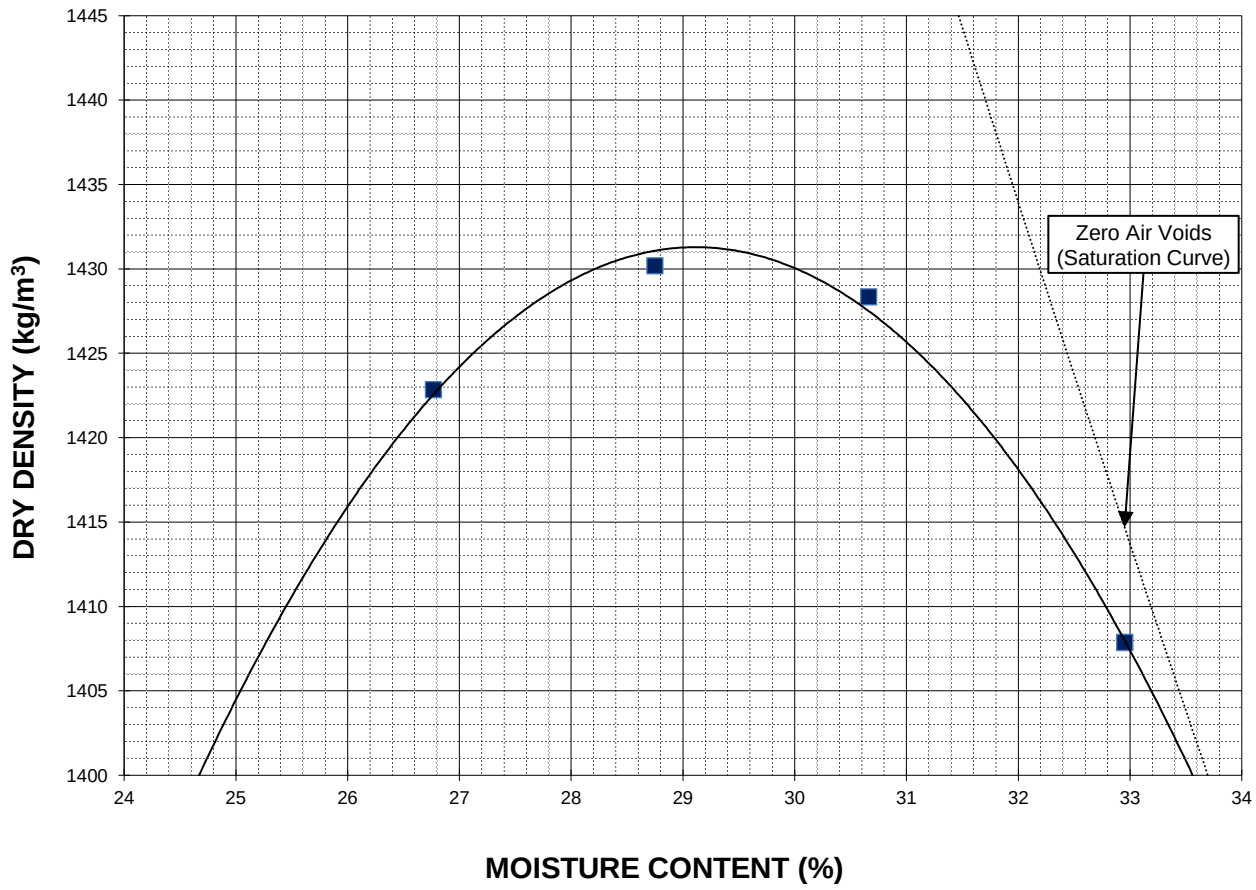
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-17
Source	Alley - (Sargent/Ellice/Furby/Sherbrook)
Material	Clay
Sample Date	08-Sep-22
Test Date	05-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1431
Optimum Moisture (%)	29.1

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1804	1841	1866	1872	
Dry Density (kg/m^3)	1423	1430	1428	1408	
Moisture Content (%)	26.8	28.7	30.7	33.0	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Sargent/Ellice/Furby/Sherbrook)
Client	Dillon Consulting Ltd.	**Material**	Clay
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-17	**Test Date**	2022-10-11
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1431	kg/m3
Optimum Moisture Content	29.1	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1367	kg/m3
Initial Moisture Content	28.9	%
Relative Density	95.6	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.7	%
Moisture Content in top 25 mm	42.2	%
Immersion Period	96	h

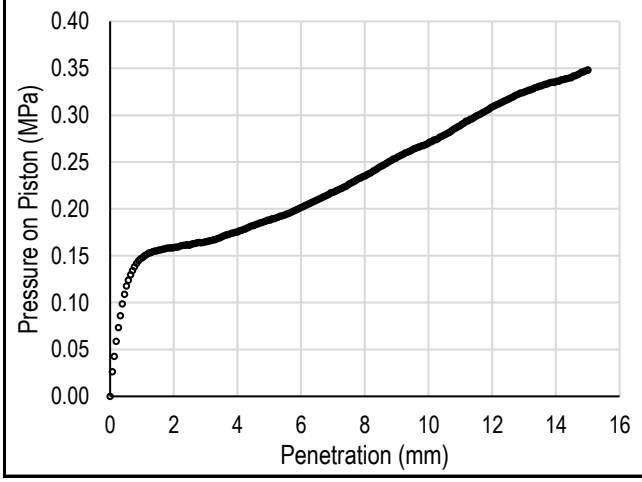
CBR Results

CBR at 2.54 mm	2.4	%
CBR at 5.08 mm	1.8	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.13	0.13
1.27	0.15	0.15
1.91	0.16	0.16
2.54	0.16	0.16
3.18	0.17	0.17
3.81	0.17	0.17
4.45	0.18	0.18
5.08	0.19	0.19
7.62	0.23	0.23
10.16	0.27	0.27
12.70	0.32	0.32

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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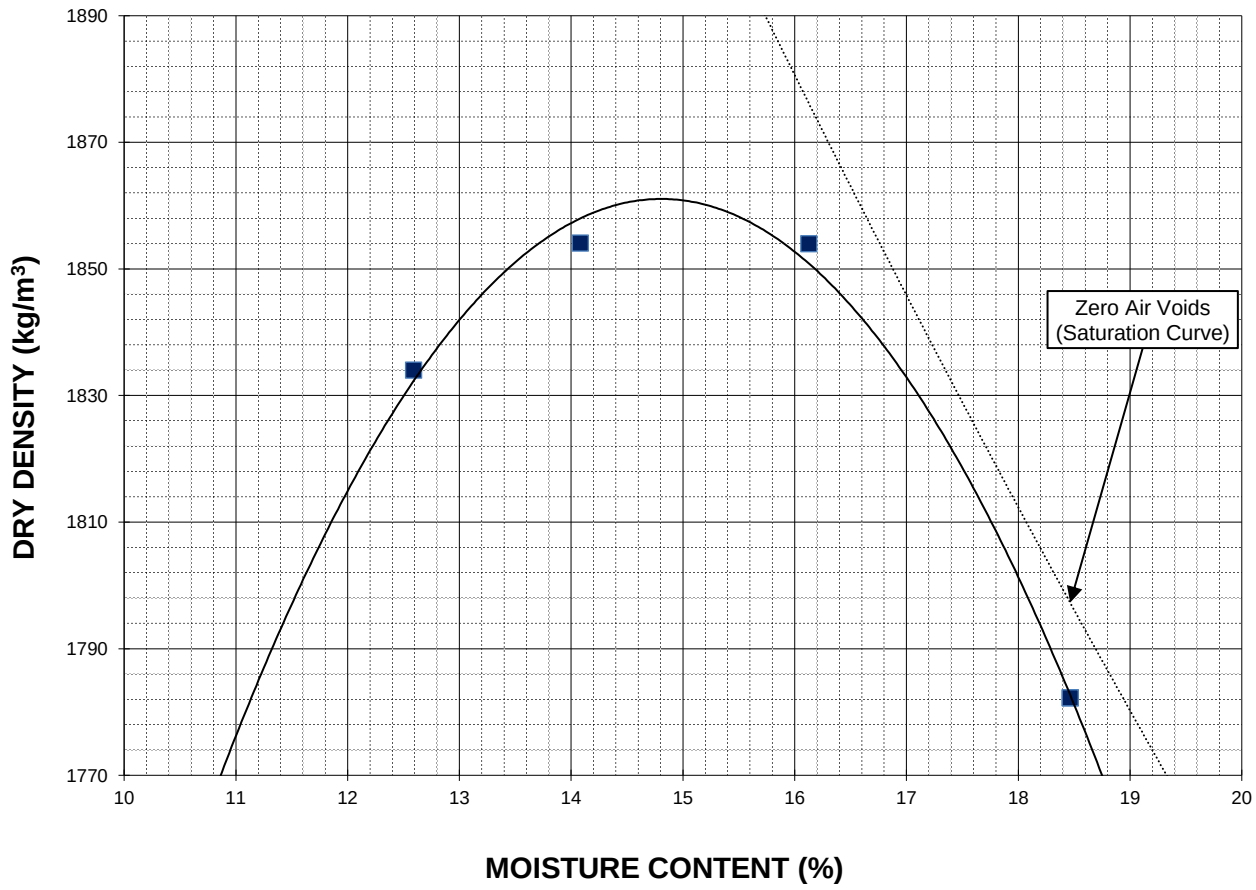
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-18
Source	Alley - (Sargent/Ellice/Furby/Sherbrook)
Material	Silt
Sample Date	08-Sep-22
Test Date	15-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1861
Optimum Moisture (%)	14.8

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	2065	2115	2153	2111	
Dry Density (kg/m^3)	1834	1854	1854	1782	
Moisture Content (%)	12.6	14.1	16.1	18.5	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Sargent/Ellice/Furby/Sherbrook)
Client	Dillon Consulting Ltd.	**Material**	Silt
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-18	**Test Date**	2022-10-17
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1861	kg/m3
Optimum Moisture Content	14.8	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1777	kg/m3
Initial Moisture Content	14.8	%
Relative Density	95.5	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	0.3	%
Moisture Content in top 25 mm	17.9	%
Immersion Period	96	h

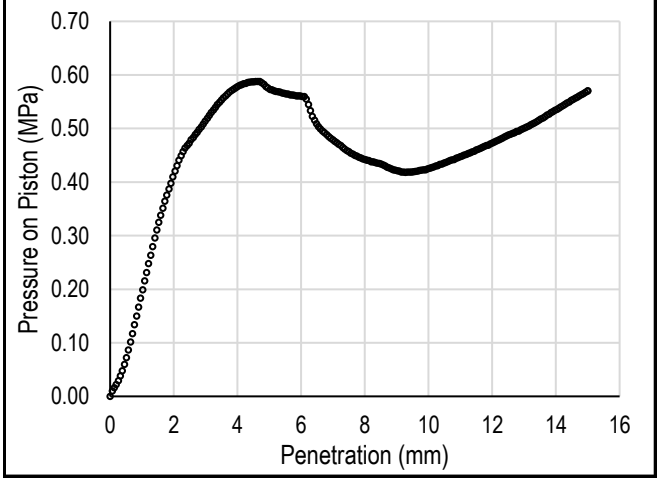
CBR Results

CBR at 2.54 mm	6.9	%
CBR at 5.08 mm	5.6	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.10	0.10
1.27	0.26	0.26
1.91	0.40	0.40
2.54	0.48	0.48
3.18	0.53	0.53
3.81	0.57	0.57
4.45	0.59	0.59
5.08	0.57	0.57
7.62	0.45	0.45
10.16	0.43	0.43
12.70	0.49	0.49

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-16

Photo 2: Pavement Core Sample at Test Hole TH22-17

Photo 3: Pavement Core Sample at Test Hole TH22-18

Appendix F

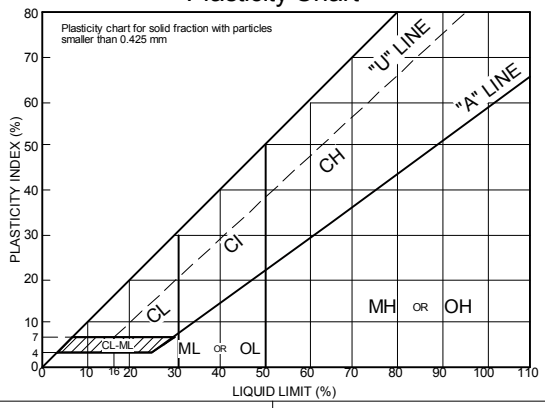
Test Hole Logs, Summary Table & Lab Testing Results and Pavement Core Photos – Alley – (Broadway Ave/Maryland St./Sherbrook St./Sara Ave)

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

1. Classifications are based on the United Soil Classification System and include consistency, moisture, and color. Field descriptions have been modified to reflect results of laboratory tests where deemed appropriate.
2. Descriptions on these test hole logs apply only at the specific test hole locations and at the time the test holes were drilled. Variability of soil and groundwater conditions may exist between test hole locations.
3. When the following classification terms are used in this report or test hole logs, the primary and secondary soil fractions may be visually estimated.

Major Divisions			USCS Classification	Symbols	Typical Names	Laboratory Classification Criteria
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows: Less than 5 percent..... GW, GP, SW, SP; More than 12 percent..... GM, GC, SM, SC; 6 to 12 percent..... Borderline case4s requiring dual symbols*
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures	Not meeting all gradation requirements for GW
			GC		Clayey gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines	$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4 / Atterberg limits above "A" line or P.I. greater than 7 / Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	Plasticity Chart
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL		Organic silts and organic silty clays of low plasticity	
	Silts and Clays (Liquid limit greater than 50)		MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts	
			CH		Inorganic clays of high plasticity, fat clays	
			OH		Organic clays of medium to high plasticity, organic silts	
	Highly Organic Soils		Pt		Peat and other highly organic soils	Von Post Classification Limit: Strong colour or odour, and often fibrous texture



Particle Size	Material	ASTM Sieve sizes	mm
	Sand		
	Coarse	#10 to #4	2.00 to 4.75
	Medium	#40 to #10	0.425 to 2.00
	Fine	#200 to #40	0.075 to 0.425
	Silt or Clay	< #200	< 0.075

Particle Size	Material	ASTM Sieve Sizes	mm
	Boulders	> 12 in.	> 300
	Cobbles	3 in. to 12 in.	75 to 300
	Gravel		
	Coarse	3/4 in. to 3 in.	19 to 75
	Fine	#4 to 3/4 in.	4.75 to 19

* Borderline classifications used for soils possessing characteristics of two groups are designated by combinations of groups symbols. For example; GW-GC, well-graded gravel-sand mixture with clay binder.

Other Symbol Types

	Asphalt		Bedrock (undifferentiated)		Cobbles
	Concrete		Limestone Bedrock		Boulders and Cobbles
	Fill		Cemented Shale		Silt Till
			Non-Cemented Shale		Clay Till

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)
PL - Plastic Limit (%)
PI - Plasticity Index (%)
MC - Moisture Content (%)
SPT - Standard Penetration Test
RQD - Rock Quality Designation
Qu - Unconfined Compression
Su - Undrained Shear Strength
VW - Vibrating Wire Piezometer
SI - Slope Inclinometer

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

TERM	EXAMPLES	PERCENTAGE
and	and CLAY	35 to 50 percent
"y" or "ey"	clayey, silty	20 to 35 percent
some	some silt	10 to 20 percent
trace	trace gravel	1 to 10 percent

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

The Standard Penetration Test blow count (N) of a non-cohesive soil can be related to compactness condition as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very loose	< 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	> 50

The Standard Penetration Test blow count (N) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	SPT (N) (Blows/300 mm)
Very soft	< 2
Soft	2 to 4
Firm	4 to 8
Stiff	8 to 15
Very stiff	15 to 30
Hard	> 30

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Descriptive Terms	Undrained Shear Strength (kPa)
Very soft	< 12
Soft	12 to 25
Firm	25 to 50
Stiff	50 to 100
Very stiff	100 to 200
Hard	> 200

2023 Local Street Renewal Project - 23-R-03
Sub-Surface Investigation
Alley Broadway Ave/Maryland St./Sherbrook St./Sara Ave)

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)		Moisture Content (%)	Grain Size Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Top (m)	Bottom (m)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH22-19	UTM: 14U 5527460 N 632169E Located behind #198 Sherbrook St. 1.5 m West of East road edge.	Asphalt	38	Concrete	114	Clay; AASHTO: A-7-6 (I)	0.4	0.5	39							
						Clay; AASHTO: A-7-6 (I)	0.7	0.9	39							
						Clay; AASHTO: A-7-6 (I)	1.0	1.2	35							
						Silt; AASHTO: A-6 (I)	1.3	1.5	28							
						Clay; AASHTO: A-7-6 (72)	1.7	1.8	41	45	52	3	0	26	90	64
						Clay; AASHTO: A-7-6 (72)	2.1	2.3	46							
TH22-20	UTM: 14U 5527460N, 632169 E Located behind #695 Sherbrook St, 1.0 North of South road edge.	Asphalt	64	Concrete	178	Clay; AASHTO: A-7-6 (88)	0.5	0.6	30							
						Clay; AASHTO: A-7-6 (88)	0.8	0.9	29							
						Clay; AASHTO: A-7-6 (88)	1.1	1.2	31							
						Clay; AASHTO: A-7-6 (88)	1.4	1.5	31							
						Clay; AASHTO: A-7-6 (88)	1.8	1.9	41	86	14	0	0	29	104	75
						Clay; AASHTO: A-7-6 (88)	2.2	2.4	45							

(I) - AASHTO classification was interpreted based on visual classification.

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Moisture Content Report
ASTM D2216-10

Project No. 1000-166-01
Client Dillon Consulting Ltd.
Project 2023 Local Street Renewal - Alley (Broadway/Sara/Maryland/Sherbrook)

Sample Date 7-Sep-22
Test Date 19-Sep-22
Technician JC

Test Hole	TH22-19	TH22-19	TH22-19	TH22-19	TH22-19	TH22-19
Depth (m)	0.4 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.7 - 1.8	2.1 - 2.3
Sample #	G115	G116	G117	G118	G119	G120
Tare ID	Z90	Z80	AB09	N53	W05	Z10
Mass of tare	8.6	8.6	6.8	8.6	8.5	8.4
Mass wet + tare	210.3	203.0	248.7	220.6	430.1	261.0
Mass dry + tare	153.5	148.5	186.5	174.8	308.1	181.2
Mass water	56.8	54.5	62.2	45.8	122.0	79.8
Mass dry soil	144.9	139.9	179.7	166.2	299.6	172.8
Moisture %	39.2%	39.0%	34.6%	27.6%	40.7%	46.2%

Test Hole	TH22-20	TH22-20	TH22-20	TH22-20	TH22-20	TH22-20
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.8 - 1.9	2.2 - 2.4
Sample #	G109	G110	G111	G112	G113	G114
Tare ID	W79	E470	H29	H19	N110	F141
Mass of tare	8.7	8.6	8.6	6.9	8.5	8.7
Mass wet + tare	213.1	272.4	241.4	263.9	416.9	253.1
Mass dry + tare	166.2	212.7	186.9	202.5	297.3	176.8
Mass water	46.9	59.7	54.5	61.4	119.6	76.3
Mass dry soil	157.5	204.1	178.3	195.6	288.8	168.1
Moisture %	29.8%	29.3%	30.6%	31.4%	41.4%	45.4%

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Atterberg Limits
ASTM D4318-10e1

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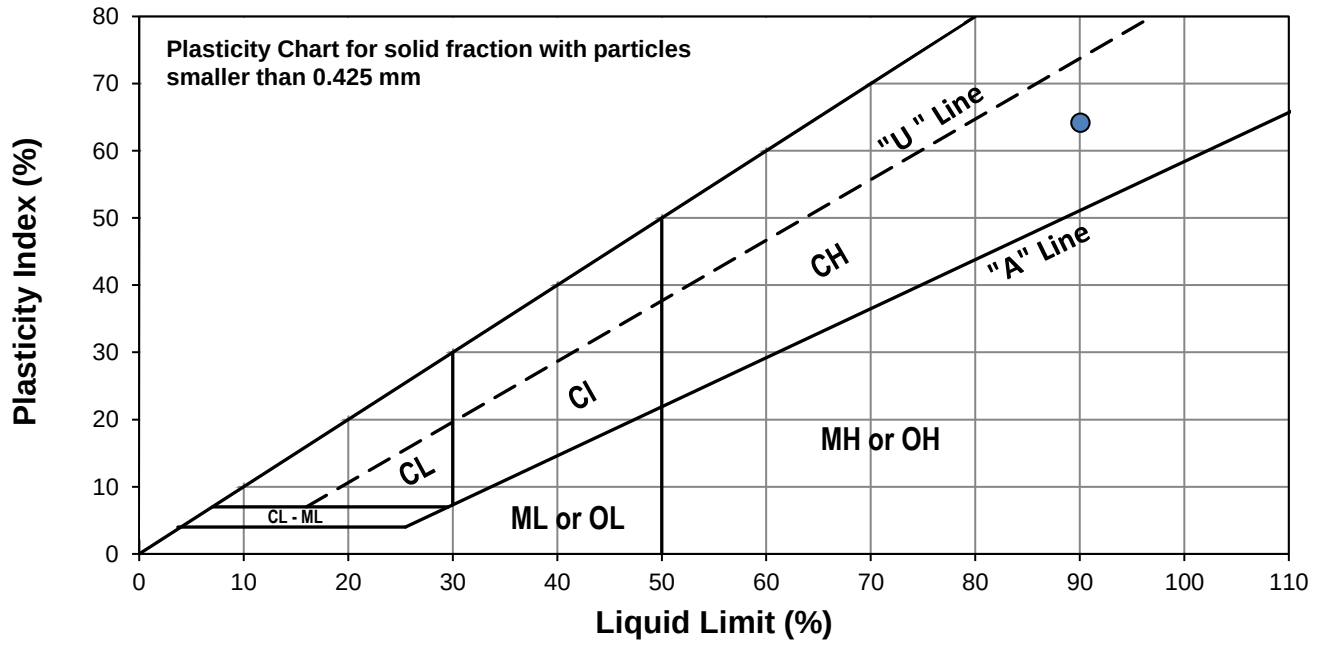
Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal- Alley (Broadway/Sherbrook/Maryland/Sara)
Test Hole	TH22-19
Sample #	G119
Depth (m)	1.7 - 1.8
Sample Date	27-Sep-22
Test Date	24-Oct-22
Technician	TN

Liquid Limit	90
Plastic Limit	26
Plasticity Index	64

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	20	31		
Mass Tare (g)	13.946	14.157	13.620		
Mass Wet Soil + Tare (g)	24.825	28.896	28.705		
Mass Dry Soil + Tare (g)	19.553	21.824	21.641		
Mass Water (g)	5.272	7.072	7.064		
Mass Dry Soil (g)	5.607	7.667	8.021		
Moisture Content (%)	94.025	92.239	88.069		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.077	14.193			
Mass Wet Soil + Tare (g)	21.331	22.722			
Mass Dry Soil + Tare (g)	19.828	20.977			
Mass Water (g)	1.503	1.745			
Mass Dry Soil (g)	5.751	6.784			
Moisture Content (%)	26.135	25.722			

Note: Additional information recorded/measured for this test is available upon request.

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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

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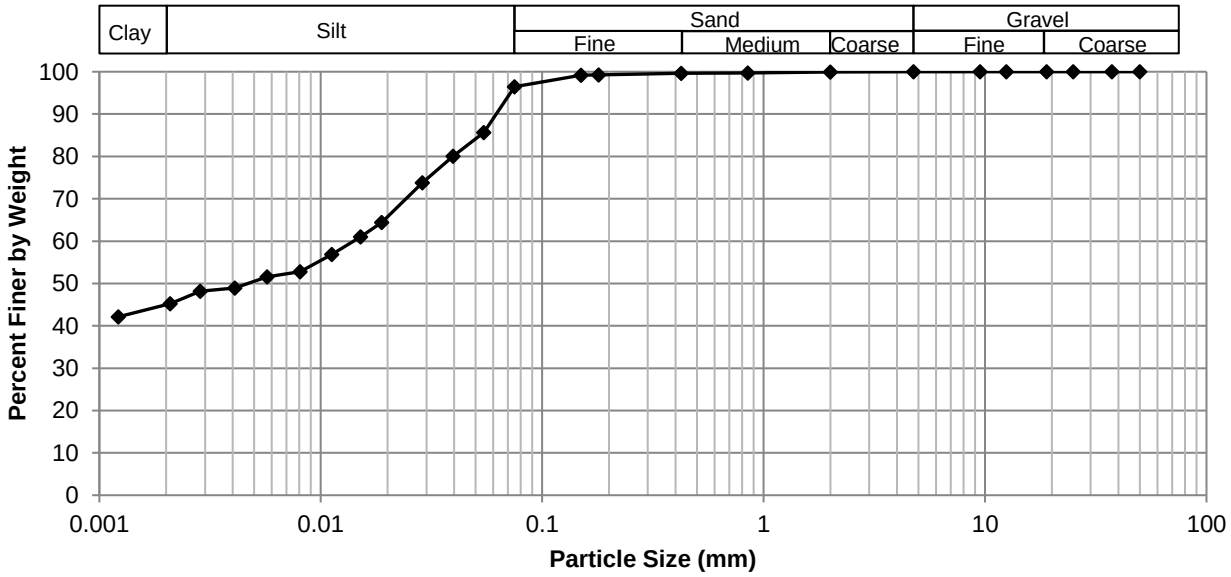
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal Alley - (Sargent/Ellice/Furby/Sherbrook)
Test Hole	TH22-19
Sample #	G119
Depth (m)	1.7 - 1.8
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

Gravel	0.0%
Sand	3.5%
Silt	51.6%
Clay	44.9%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	100.00	0.0750	96.48
37.5	100.00	2.00	99.97	0.0545	85.68
25.0	100.00	0.850	99.74	0.0396	80.05
19.0	100.00	0.425	99.62	0.0287	73.80
12.5	100.00	0.180	99.29	0.0189	64.42
9.50	100.00	0.150	99.19	0.0151	60.98
4.75	100.00	0.075	96.48	0.0112	56.88
				0.0081	52.81
				0.0057	51.56
				0.0041	48.92
				0.0029	48.16
				0.0021	45.21
				0.0012	42.13

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Atterberg Limits
ASTM D4318-10e1

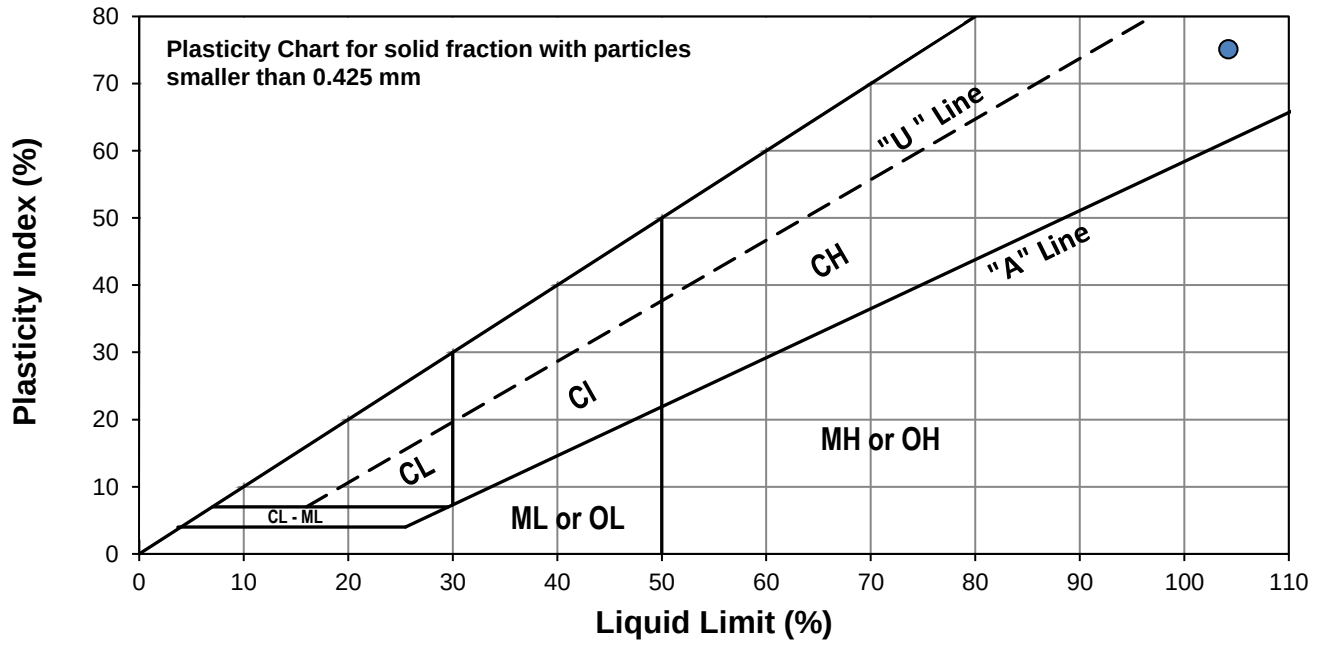
CERTIFIED BY CCIL Canadian Council of Independent Laboratories For specific tests as listed on www.ccil.com

Project No.	1000-166-01
Client	Dillion Consulting
Project	2023 Local Street Renewal- Alley (Broadway/Sherbrook/Maryland/Sara)
Test Hole	TH22-20
Sample #	G113
Depth (m)	1.8 - 1.9
Sample Date	27-Sep-22
Test Date	19-Oct-22
Technician	DS

Liquid Limit	104
Plastic Limit	29
Plasticity Index	75

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	19	29	35		
Mass Tare (g)	14.091	13.795	14.045		
Mass Wet Soil + Tare (g)	23.677	20.928	21.391		
Mass Dry Soil + Tare (g)	18.719	17.313	17.709		
Mass Water (g)	4.958	3.615	3.682		
Mass Dry Soil (g)	4.628	3.518	3.664		
Moisture Content (%)	107.131	102.757	100.491		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	13.919	13.923			
Mass Wet Soil + Tare (g)	22.847	21.637			
Mass Dry Soil + Tare (g)	20.818	19.913			
Mass Water (g)	2.029	1.724			
Mass Dry Soil (g)	6.899	5.990			
Moisture Content (%)	29.410	28.781			

Note: Additional information recorded/measured for this test is available upon request.

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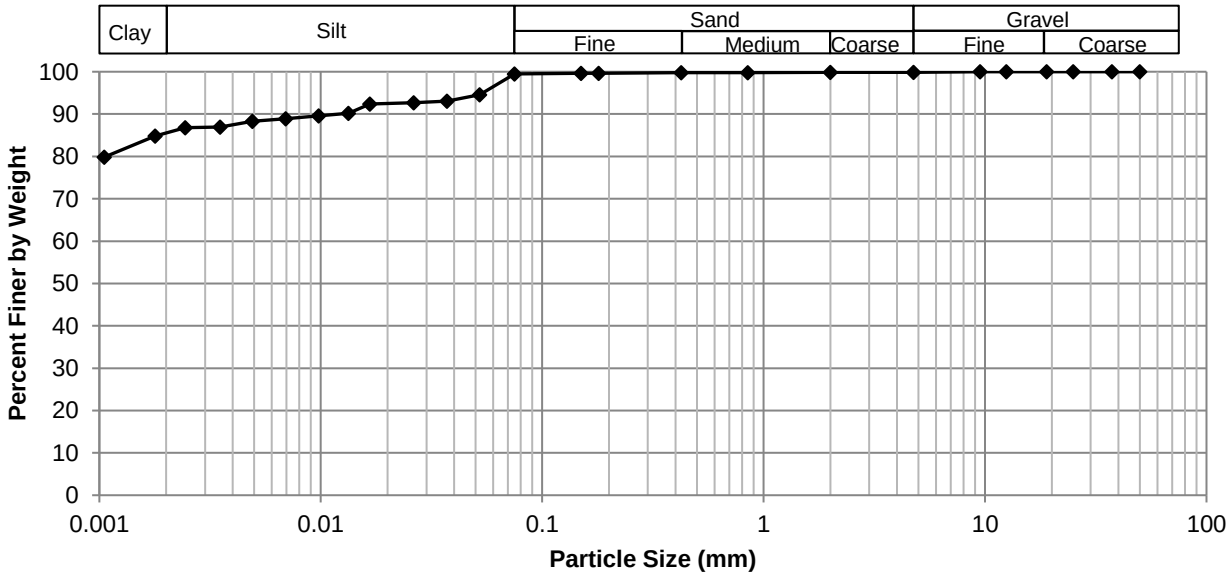
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal Alley - (Broadway/Sherbrook/Maryland/Sargent)
Test Hole	TH22-20
Sample #	G113
Depth (m)	1.8 - 1.9
Sample Date	7-Sep-22
Test Date	4-Oct-22
Technician	DS

Gravel	0.1%
Sand	0.4%
Silt	14.1%
Clay	85.5%

Particle Size Distribution Curve



Gravel		Sand		Silt and Clay	
Particle Size (mm)	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**	**Particle Size (mm)**	**Percent Passing**
50.0	100.00	4.75	99.89	0.0750	99.51
37.5	100.00	2.00	99.88	0.0522	94.59
25.0	100.00	0.850	99.79	0.0372	93.03
19.0	100.00	0.425	99.79	0.0263	92.72
12.5	100.00	0.180	99.66	0.0167	92.41
9.50	100.00	0.150	99.66	0.0133	90.22
4.75	99.89	0.075	99.51	0.0098	89.55
				0.0069	88.93
				0.0049	88.30
				0.0035	86.93
				0.0024	86.81
				0.0018	84.81
				0.0011	79.85

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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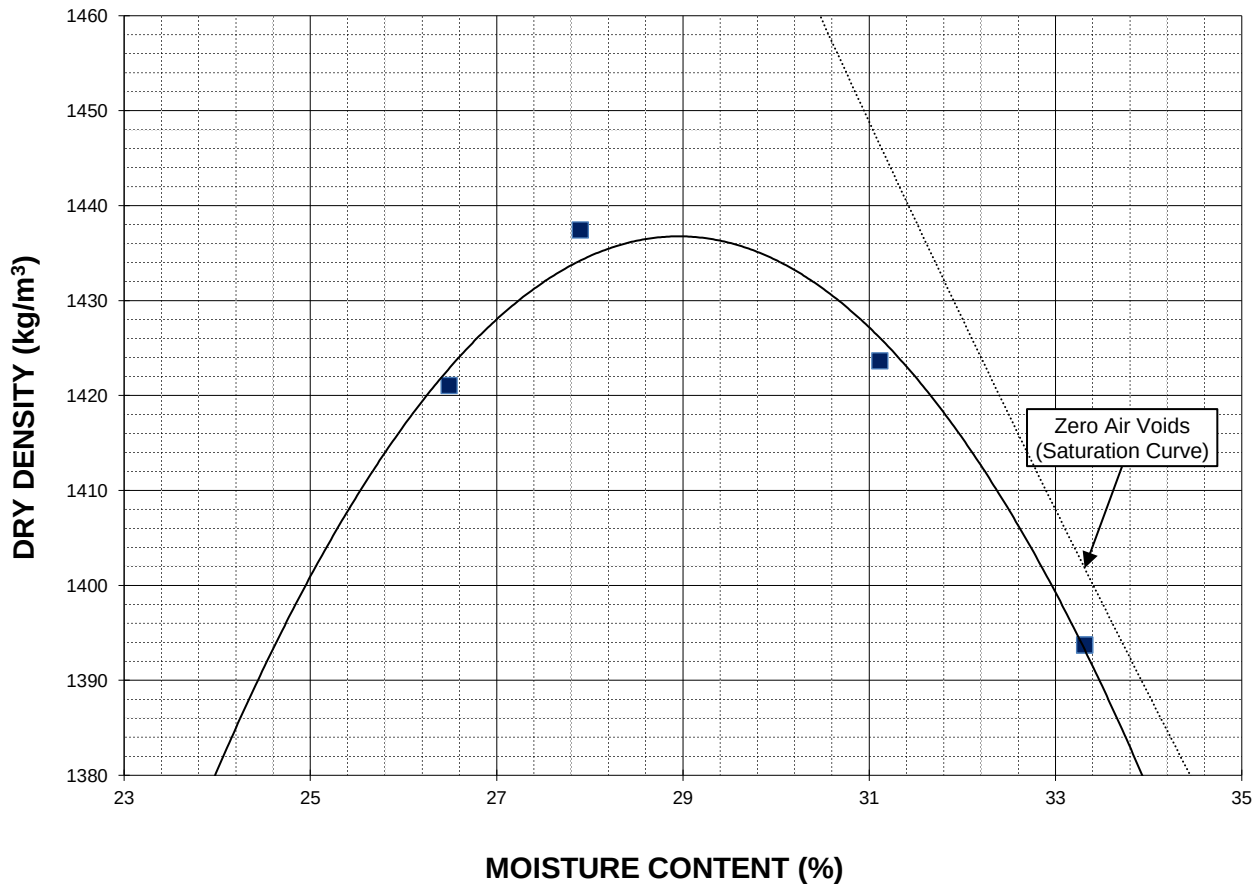
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-19
Source	Alley - (Broadway/Sherbrook/Maryland/Sargent)
Material	Clay
Sample Date	08-Sep-22
Test Date	06-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1437
Optimum Moisture (%)	29.0

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1797	1838	1867	1858	
Dry Density (kg/m^3)	1421	1437	1424	1394	
Moisture Content (%)	26.5	27.9	31.1	33.3	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Broadway/Sherbrook/Maryland/Sargent)
Client	Dillon Consulting Ltd.	**Material**	Clay
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-19	**Test Date**	2022-10-11
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1437	kg/m3
Optimum Moisture Content	29.0	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1375	kg/m3
Initial Moisture Content	28.5	%
Relative Density	95.7	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	1.9	%
Moisture Content in top 25 mm	44.4	%
Immersion Period	96	h

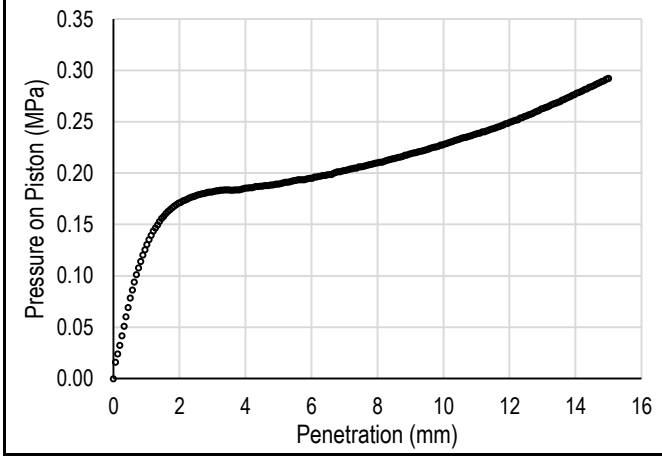
CBR Results

CBR at 2.54 mm	2.6	%
CBR at 5.08 mm	1.8	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.09	0.09
1.27	0.15	0.15
1.91	0.17	0.17
2.54	0.18	0.18
3.18	0.18	0.18
3.81	0.18	0.18
4.45	0.19	0.19
5.08	0.19	0.19
7.62	0.21	0.21
10.16	0.23	0.23
12.70	0.26	0.26

Load/Penetration Curve



Comments:

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Standard Proctor Compaction Test

ASTM D698-12 (2021)

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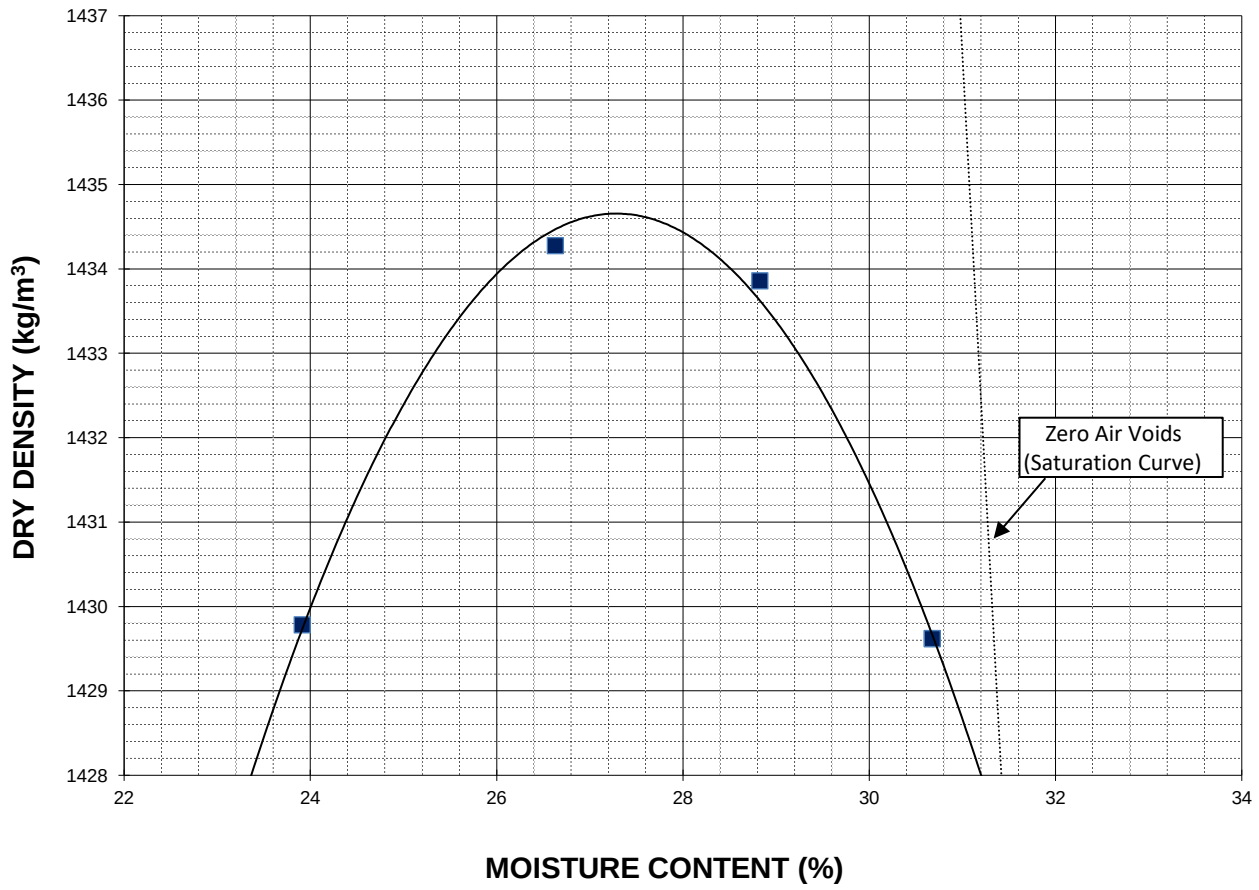
Project No.	1000-166-01
Client	Dillon Consulting Ltd.
Project	2023 Local Street Renewal
Sample #	TH22-20
Source	Alley - (Broadway/Sherbrook/Maryland/Sargent)
Material	Clay
Sample Date	08-Sep-22
Test Date	07-Oct-22
Technician	NM

Maximum Dry Density (kg/m3)	1435
Optimum Moisture (%)	27.3

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1772	1816	1847	1868	
Dry Density (kg/m^3)	1430	1434	1434	1430	
Moisture Content (%)	23.9	26.6	28.8	30.7	



Note: Additional information recorded/measured for this test is available upon request.

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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	1000-166-01	**Source**	Alley - (Broadway/Sherbrook/Maryland/Sargent)
Client	Dillon Consulting Ltd.	**Material**	Clay
Project	2023 Local Street Renewal	**Sample Date**	2022-09-08
Sample #	TH22-20	**Test Date**	2022-10-16
		Technician	NM

Proctor Results (ASTM D698)

Maximum Dry Density	1435	kg/m3
Optimum Moisture Content	27.3	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1371	kg/m3
Initial Moisture Content	27.4	%
Relative Density	95.5	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	1.7	%
Moisture Content in top 25 mm	42.5	%
Immersion Period	96	h

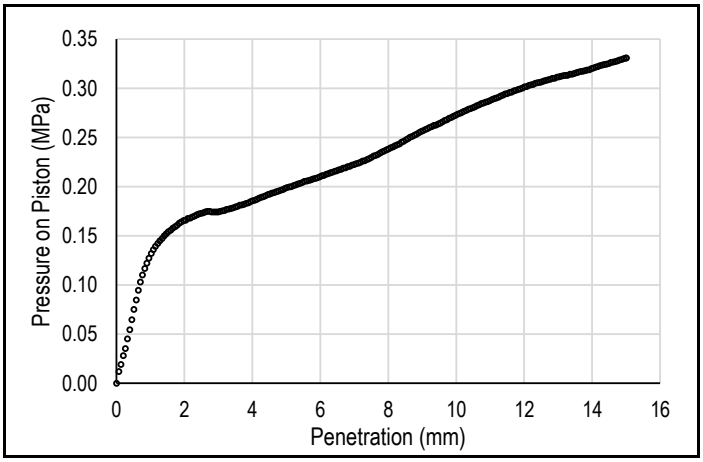
CBR Results

CBR at 2.54 mm	2.5	%
CBR at 5.08 mm	1.9	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.10	0.10
1.27	0.14	0.14
1.91	0.16	0.16
2.54	0.17	0.17
3.18	0.18	0.18
3.81	0.18	0.18
4.45	0.19	0.19
5.08	0.20	0.20
7.62	0.23	0.23
10.16	0.28	0.28
12.70	0.31	0.31

Load/Penetration Curve



Comments:

Photo 1: Pavement Core Sample at Test Hole TH22-19

Photo 2: Pavement Core Sample at Test Hole TH22-20

Appendix G

Summary Table, and Pavement Core Photos – Assiniboine Ave

2022 Local Street Renewal - 23-R-03

Assiniboine Ave - Navy Way to Hargrave Street

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC22-21	UTM : 55278498 m N, 633661 m E; Located in front of #340 Assiniboine Ave, 4.5m South of North curb.	Asphalt	55	Concrete	178	53.98
PC22-22	UTM : 5527557 m N, 633749 m E; Located in front of #300 Assiniboine Ave., 2.0m South of North curb.	Asphalt	45	Concrete	215	74.00

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Concrete Core Compressive Strength Report

CSA A23.2-14C

Project No. 1000-166-01 **Date** October 26, 2022

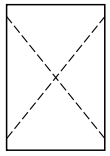
Project Local Street Renewal **Technician** IA

Client Dillon Consulting

Core Location	Core ID	Date Received	Date of Break	Age at Break	Diam. (mm)	Length (mm)	Moisture Conditioning	Compressive Strength (MPa)		Break Type
								Uncorrected f_{conc}	Corrected* f_c	
Assiniboine Ave. - (Navy Way / Hargrave)	PC21	2022-10-24	2022-10-26	-	144	147	Soaked 48 h	52.40	53.98	1
Assiniboine Ave. - (Navy Way / Hargrave)	PC22	2022-10-24	2022-10-26	-	144	193	Soaked 48 h	67.93	74.00	1

Comments

*Correction factors $F_{l/d}$, F_{dia}, F_{mc}, and F_D calculated as per ACI 214.4R-03, and correction factor F_{reinf} calculated as per Khoury et al. (2014): $f_c = f_{conc}F_{l/d}F_{dia}F_{mc}F_DF_{reinf}$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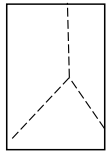
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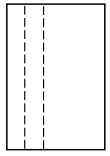
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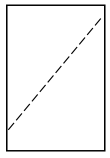
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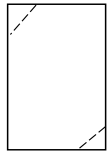
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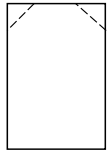
Type 6

Reviewed by (print): Angela Fidler-Kliewer, C. Tech. Signature: Angela Fidler-Kliewer

Table 1 Factors involved in interpretation of core results by different codes.

List	Code/standard	Edition	Factors Considered					
			Aspect ratio	Diameter	Reinforcing	Moisture	Damage	Direction
1	Egyptian Code/Standard Specification	2008	√		√			√
2	British Code/Standard Specification	2003	√		√			√
3	American Concrete Institute ACI	1998	√					
		2012	√	√		√	√	
4	European Standard Specification	1998	√	√	√		√	
		2009	√		√			
5	Japanese Standard	1998	√					
6	Concrete Society	1987	√		√		√	√

In addition, for core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of $(\Phi_r * d)$ is considered. If the bars are further apart, their combined effect should be assessed by replacing the term $(\Phi_r * d)$ by the term $(\sum \Phi_r * d)$.

It should be pointed out that above equations used to interpret the core concrete strength to the in-situ concrete cube strength have been developed based on a set of assumptions and through many converting process. It is also of interest to note that the damage effect is considered in the development of the formulas in indirect way. The subject derivation and detailed formulas may be seen elsewhere [14].

3.2. American Concrete Institute (ACI)

3.2.1. Former ACI Code (2002) & Current ASTM (2009)

The methodology of core interpretation given in the former ACI code was remained without changes for decades and up to Year (2003). The in-place strength of concrete cylinder at the location from which a core test specimen was extracted can be computed using the equation:

$$f_{cy} = F_{l/d} \cdot f_{core} \tag{4}$$

where f_{cy} is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, and $F_{l/d}$ is the strength correction factor for aspect ratio.

The former ACI code does not include any equation to calculate the correction factor ($F_{l/d}$); however, the code gives different values for this term that is associated with different aspect ratios (l/d) as given in Table 2. It should also be noted that the approach of current ASTM is similar to that mentioned above. The only considered variable is the aspect ratio (l/d). It should be noted that identical approach to that mentioned above is still effective in ASTM C42/C42M-03 [10].

3.2.2. Current ACI Code (2012) [15]

Starting from Year 2003, significant changes have been made to the relevant ACI Code provisions regarding the interpretation of core strength test results. New factors have been considered. These include core diameter, moisture content of core sample, core damage associated with drilling, in addition to the effect of aspect ratio that was previously considered in the former ACI edition (1998). According to the ACI 214.4R-03, the in-place concrete strength can be computed using the equation:

$$f_c = F_{l/d} \cdot F_{dia} \cdot F_{mc} \cdot F_D \cdot f_{core} \tag{5}$$

where f_c is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, $F_{l/d}$ is strength correction factor for aspect ratio, F_{dia} is strength correction factors for diameter, F_{mc} is strength correction factor for moisture condition of core sample, and F_D is the strength correction factor that accounts for effect of damage sustained during core drilling including micro-cracking and undulations at the drilled surface and cutting through coarse-aggregate particles that may subsequently pop out during testing.

The ACI committee considered the correction factors presented in Table 3 for converting core strengths into equivalent in-place strengths based on the work reported by Bartlett and MacGregor [6]. It should be noted that the magnitude of

Table 2 Mean values for factor $F_{l/d}$ according to ACI Code (1998) and ASTM.

	Specimen length-to-diameter ratio, l/d			
	1.00	1.25	1.50	1.75
$F_{l/d}$	0.87	0.93	0.96	0.98

Table 3 Strength correction factors according to ACI 214.4R-03.

List	Factors	Mean values
(1)[b]	$F_{l/d}$: l/d ratio	
	As-received	$1 - \{0.130 - \alpha f_{core}\}(2 - \frac{l}{d})^2$
	Soaked 48 h	$1 - \{0.117 - \alpha f_{core}\}(2 - \frac{l}{d})^2$
	Air dried[a]	$1 - \{0.144 - \alpha f_{core}\}(2 - \frac{l}{d})^2$
(2)	F_{dia}: core diameter	
	50 mm	1.06
	100 mm	1.00
	150 mm	0.98
(3)	F_{mc}: core moisture content	
	As-received	1.00
	Soaked 48 h	1.09
	Air dried[a]	0.96
(4)	F_D: damage due to drilling	1.06

[a] Standard treatment specified in ASTM C 42/C 42M.
[b] Constant α equals $4.3(10^{-4})$ 1/MPa for f_{core} in MPa.

Table 6 List of comparisons between tested cores to determine.

	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
A1	♦●	●	♦●	■●	■●		●				●			▲	▲	■	▲	
A2																		
A3						■●				■●								
A4																		
A5																		
A6								■▲●	■▲●			■▲						
A7								■▲●	■▲●									
A8		●	♦	●	●													
A9																		
A10								■▲●										
A11																		
A12		●		●	●													
A13																		
A14		●		●														
A15		●																
A16	●♦																	
A17	♦																	
A18																		

● Diameter of steel bar.
▲ Distance of steel bar from nearly end of core.
■ Number of steel bars and spacing between bars.
♦ Distance of steel bar from vertical axis of specimen.

This brief review indicated that the various proposed relationships for correction factors are all nonlinear. It should be noted that the equations given by the Egyptian Code takes into account most variables that may affect the interpretation of the results; however, the code ignores the deterioration of steel–concrete bond that may occur and also the position of the reinforcement from vertical axis of core specimens.

Weighted nonlinear regression analysis has been performed to determine the factor (F_{reinf}) with the use of the software "SAS" package and "Data Fit." This shows that the correction factor for reinforcement (F_{reinf}) is given by the following expression:

- For cores containing a single bar:

$$F_{reinf} = \left[1 + 1.5\frac{[\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L}\right] \times \frac{1.13}{f_{core}^{0.015}} \quad (12)$$

- For core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of ($\Phi_r * d$) is considered. If the bars are further apart, their combined effect is assessed by replacing the term ($\Phi_r * r$) by ($\sum \Phi_r * r$ as follows:

$$F_{reinf} = \left[1 + 1.5\frac{\sum[\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L}\right] \times \frac{1.13}{f_{core}^{0.015}} \quad (13)$$

where F_{reinf} is the correction factor for reinforcement, Φ_r is the diameter of the reinforcement, Φ_c is the diameter of the concrete specimen, r is the distance of axis of bar from nearer end of specimen, S is the distance of axis of bar from axis of core specimen, L is the length of the specimen after end preparation by grinding or capping, and f_{core} is the concrete core strength (kg/cm^2).

6.1.6. *Effect of moisture condition of core*

Results of about 100 cores indicate that the strength of cores left to dry in air for 7 days is on average 13% greater than that of cores soaked at least 40 h before testing. The strength of cores with negligible moisture gradient and tested after cutting is found to be 7–9% larger than that of soaked cores as shown in Fig. 20. The authors strongly recommend to use a correction factor accounting for moisture condition (F_m) equals to 1.09 and 0.96, respectively, for cores tested after 48 h soaked in water and for those tested after 7 days dry in air.

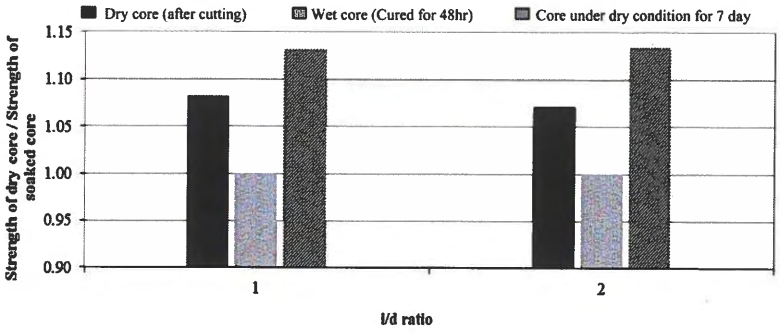

Figure 20 Effect of core moisture condition on core strength for different aspect ratios (l/d).

Photo 1: Pavement Core Sample PC-21

Photo 2: Pavement Core Sample PC-22

Appendix H

Summary Table, Pavement Core Photos, and Summary of Pavement Compressive Strength – Alley-(Cathedrale Ave/De La Morenie St/Des Meurons St /Hamel Ave)

2022 Local Street Renewal - 23-R-03

Alley (Cathedrale Ave/De La Morenie St./Des Meurons St./Hamel Ave)

Pavement Core No.	Pavement Core Location	Pavement Surface		Pavement Structure Material		
		Type	Thickness (mm)	Type	Thickness (mm)	Corrected Compressive Strength (Mpa)
PC22-23	UTM : 5527973 m N, 635575 m E; Located in front of the garage at #400 Des Meurons Ave, 0.5m West of East edge of road	Asphalt	64	Concrete	190	-
PC22-24	UTM : 5528047m N, 635571 m E; Located in front of the garage at #526 Morenie St., 1.0m West of East edge of road	Asphalt	203	Concrete	190	46.21
PC22-25	UTM : 5528143 m N, 635559 m E; Located at #552 Morenie St. parking, 0.2m East of West edge of road.	Asphalt	64	Concrete	228	-
PC22-26	UTM : 5528228 m N, 635551m E; Located between #578 Morenie St and #342 Cathedral fence, 1.5m West of East edge of road.	Asphalt	178	Concrete	242	44.92

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Concrete Core Compressive Strength Report

CSA A23.2-14C

Project No. 1000-166-01 **Date** October 26, 2022

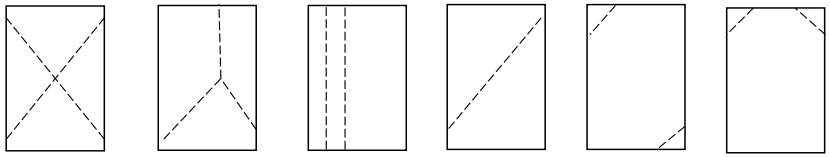
Project Local Street Renewal **Technician** IA

Client Dillon Consulting

Core Location	Core ID	Date Received	Date of Break	Age at Break	Diam. (mm)	Length (mm)	Moisture Conditioning	Compressive Strength (MPa)		Break Type
								Uncorrected f_{conc}	Corrected* f_c	
Alley - (Cathedrale/De La Morenie/DesMeurons/Hamel)	PC 24	2022-10-24	2022-10-26	-	144	152	Soaked 48 h	44.69	46.21	1
Alley - (Cathedrale/De La Morenie/DesMeurons/Hamel)	PC 26	2022-10-24	2022-10-26	-	144	156	Soaked 48 h	43.24	44.92	1

Comments

*Correction factors $F_{l/d}$, F_{dia}, F_{mc}, and F_D calculated as per ACI 214.4R-03, and correction factor F_{reinf} calculated as per Khoury et al. (2014): $f_c = f_{conc}F_{l/d}F_{dia}F_{mc}F_DF_{reinf}$



Type 1 Type 2 Type 3 Type 4 Type 5 Type 6

Reviewed by (print): Angela Fidler-Kliewer, C.Tech. Signature: Angela Fidler-Kliewer

Table 1 Factors involved in interpretation of core results by different codes.

List	Code/standard	Edition	Factors Considered					
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2	British Code/Standard Specification	2003	√		√			√
3	American Concrete Institute ACI	1998	√					
		2012	√	√		√	√	
4	European Standard Specification	1998	√	√	√		√	
		2009	√		√			
5	Japanese Standard	1998	√					
6	Concrete Society	1987	√		√		√	√

In addition, for core specimen containing two bars no further apart than the diameter of the larger bar, only the bar corresponding to the higher value of $(\Phi_r * d)$ is considered. If the bars are further apart, their combined effect should be assessed by replacing the term $(\Phi_r * d)$ by the term $(\sum \Phi_r * d)$.

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The former ACI code does not include any equation to calculate the correction factor ($F_{l/d}$); however, the code gives different values for this term that is associated with different aspect ratios (l/d) as given in Table 2. It should also be noted that the approach of current ASTM is similar to that mentioned above. The only considered variable is the aspect ratio (l/d). It should be noted that identical approach to that mentioned above is still effective in ASTM C42/C42M-03 [10].

3.2.2. Current ACI Code (2012) [15]

Starting from Year 2003, significant changes have been made to the relevant ACI Code provisions regarding the interpretation of core strength test results. New factors have been considered. These include core diameter, moisture content of core sample, core damage associated with drilling, in addition to the effect of aspect ratio that was previously considered in the former ACI edition (1998). According to the ACI 214.4R-03, the in-place concrete strength can be computed using the equation:

$$f_c = F_{l/d} \cdot F_{dia} \cdot F_{mc} \cdot F_D \cdot f_{core} \tag{5}$$

where f_c is the equivalent in-place concrete cylinder strength, f_{core} is concrete core strength, $F_{l/d}$ is strength correction factor for aspect ratio, F_{dia} is strength correction factors for diameter, F_{mc} is strength correction factor for moisture condition of core sample, and F_D is the strength correction factor that accounts for effect of damage sustained during core drilling including micro-cracking and undulations at the drilled surface and cutting through coarse-aggregate particles that may subsequently pop out during testing.

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	Soaked 48 h	$1 - \{0.117 - \alpha f_{core}\}(2 - \frac{l}{d})^2$
	Air dried[a]	$1 - \{0.144 - \alpha f_{core}\}(2 - \frac{l}{d})^2$
(2)	F_{dia}: core diameter	
	50 mm	1.06
	100 mm	1.00
	150 mm	0.98
(3)	F_{mc}: core moisture content	
	As-received	1.00
	Soaked 48 h	1.09
	Air dried[a]	0.96
(4)	F_D: damage due to drilling	1.06

[a] Standard treatment specified in ASTM C 42/C 42M.
[b] Constant α equals $4.3(10^{-4})$ 1/MPa for f_{core} in MPa.

Table 6 List of comparisons between tested cores to determine.

	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1
A1	♦●	●	♦●	■●	■●		●				●			▲	▲	■	▲	
A2																		
A3						■●				■●								
A4																		
A5																		
A6								■▲●	■▲●			■▲						
A7								■▲●	■▲●									
A8		●	♦	●	●													
A9																		
A10								■▲●										
A11																		
A12		●		●	●													
A13																		
A14		●		●														
A15		●																
A16	●♦																	
A17	♦																	
A18																		

● Diameter of steel bar.
▲ Distance of steel bar from nearly end of core.
■ Number of steel bars and spacing between bars.
♦ Distance of steel bar from vertical axis of specimen.

This brief review indicated that the various proposed relationships for correction factors are all nonlinear. It should be noted that the equations given by the Egyptian Code takes into account most variables that may affect the interpretation of the results; however, the code ignores the deterioration of steel–concrete bond that may occur and also the position of the reinforcement from vertical axis of core specimens.

Weighted nonlinear regression analysis has been performed to determine the factor (F_{reinf}) with the use of the software "SAS" package and "Data Fit." This shows that the correction factor for reinforcement (F_{reinf}) is given by the following expression:

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$$F_{reinf} = \left[1 + 1.5\frac{\sum[\Phi_r \times r + \Phi_r \times (S/10)]}{\Phi_c * L}\right] \times \frac{1.13}{f_{core}^{0.015}} \quad (13)$$

where F_{reinf} is the correction factor for reinforcement, Φ_r is the diameter of the reinforcement, Φ_c is the diameter of the concrete specimen, r is the distance of axis of bar from nearer end of specimen, S is the distance of axis of bar from axis of core specimen, L is the length of the specimen after end preparation by grinding or capping, and f_{core} is the concrete core strength (kg/cm^2).

6.1.6. *Effect of moisture condition of core*

Results of about 100 cores indicate that the strength of cores left to dry in air for 7 days is on average 13% greater than that of cores soaked at least 40 h before testing. The strength of cores with negligible moisture gradient and tested after cutting is found to be 7–9% larger than that of soaked cores as shown in Fig. 20. The authors strongly recommend to use a correction factor accounting for moisture condition (F_m) equals to 1.09 and 0.96, respectively, for cores tested after 48 h soaked in water and for those tested after 7 days dry in air.

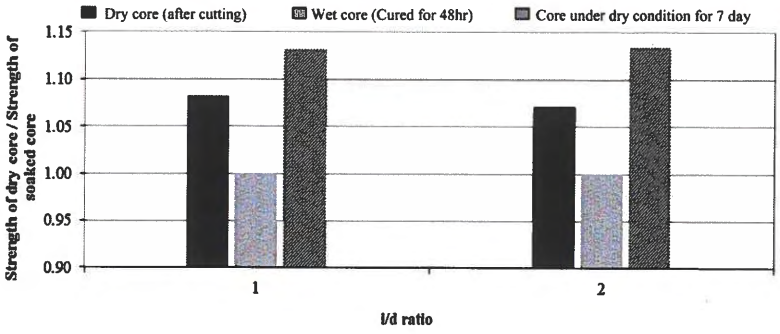

Figure 20 Effect of core moisture condition on core strength for different aspect ratios (l/d).

Photo 1: Pavement Core Sample PC-23

Photo 2: Pavement Core Sample PC-24

Photo 3: Pavement Core Sample PC-25

Photo 4: Pavement Core Sample PC-26