APPENDIX 'A'

GEOTECHNICAL REPORT

Quality Engineering | Valued Relationships

WSP Canada Group Ltd

2018 Local Streets Package (PW File #: 18-R-06)

Prepared for:

WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B
Attention: Daniel Suh

Project Number:
0395 002 00

Date:
March 2, 2018
Final Report

www.trekgeotechnical.ca
1712 St. James Street | Winnipeg, Manitoba R3H 0L3 | Tel 1.204.975.9433 | Fax 1.204.975.9435

TREK GEOTECHNICAL

Quality Engineering | Valued Relationships

March 2, 2018

Our File No. 0395 002 00

Daniel Suh, EIT
WSP Canada Group Ltd.
111-93 Lombard Ave.
Winnipeg, MB R3B

RE: Sub-Surface Investigation Report for
2018 Local Streets Package (PW File #: 18-R-06)

TREK Geotechnical Inc. is pleased to submit our report for the sub-surface investigations for the 2018 Local Streets Package (PW File #: 18-R-06).

Please contact the undersigned if you have any questions. Thank you for the opportunity to serve you on this assignment.

Sincerely,

TREK Geotechnical Inc.
Per:

Nelson John Ferreira, Ph.D., P. Eng.
Geotechnical Engineer, Principal
Tel: 204.975.9433 ext. 103

cc: Angela Fidler-Kliewer C.Tech. (TREK Geotechnical)

Revision History

Revision No.	Author	Issue Date	Description
0	AFK	March 2, 2018	Final Report

Authorization Signatures

Prepared By:

Angela Fidler-Kliewer C.Tech.

PROVINCE OF MANITOBA
N. J. FERREIRA
Member
22892
Mar. 2 2018
REGISTERED PROFESSIONAL ENGINEER

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
TREK GEOTECHNICAL INC.
No. 4877 Date: Mar. 2, 2018

Reviewed By:

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

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1.0 Introduction

This report summarizes the results of the road investigation completed for the 2018 Local Streets Package 18-R-06 project. The streets included Molson Street, De Vries Avenue, Larsen Avenue, Aikins Street, Rue Aubert, Edison Avenue, Mutchmor Close and Bayne Crescent. The information collected describes the pavement structure of the existing road as well as the soil stratigraphy beneath the pavement structure at select locations.

2.0 Road Investigation and Laboratory Program

The investigation included coring of pavement or a combination of coring and drilling of test holes. WSP selected the investigation locations as shown on Figure 01 to Figure 08 (attached) and the table below summarizes the investigation program per street.

Road Investigation Program

Street	# of Locations	Investigation
Molson Street – Union Avenue to Nottingham Avenue	3	Pavement Cores and Test Holes
De Vries Avenue – Springfield Road to McIvor Avenue	9	Pavement Cores and Test Holes
Larsen Avenue – Henderson Highway to Brazier Street	4	Pavement Cores and Test Holes
Aikins Street – Templeton Avenue to North End.	6	Pavement Cores Only
Rue Aubert – Tache Avenue to Rue Joseph	3	Pavement Cores Only
Edison Avenue – De Graff Place to Raleigh Street.	4	Pavement Cores Only
Mutchmor Close – Tu-pelo Avenue to Tu-pelo Avenue	6	Pavement Cores Only
Bayne Crescent – Tu-pelo Avenue to London Street.	3	Pavement Cores Only

The road investigation was conducted between January 16, 2018 and January 24, 2018. The pavement structure (asphalt or concrete) was cored by Harsimran Singh of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The test holes were drilled to a depth of 3.0 m below road surface by Maple Leaf Drilling Ltd. using their B40 Mobile and CME 55 truck mounted drill rig equipped with 125 mm diameter solid stem augers. The sub-surface conditions were observed during drilling and visually classified by Dawn Sellick and Harsimran Singh of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Core samples were also retrieved and logged at TREK's material testing laboratory.

The laboratory testing program consisted of moisture content determination, Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods) on select samples between 0.5 and 1.0 m below pavement. Information gathered for each street 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, and photos of the pavement cores.

Core and test hole locations noted on the summary tables and test hole logs are based on their location relative to the nearest address, and measured distances from the edge of pavement or other permanent features.

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 WSP Canada Group Inc. (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.

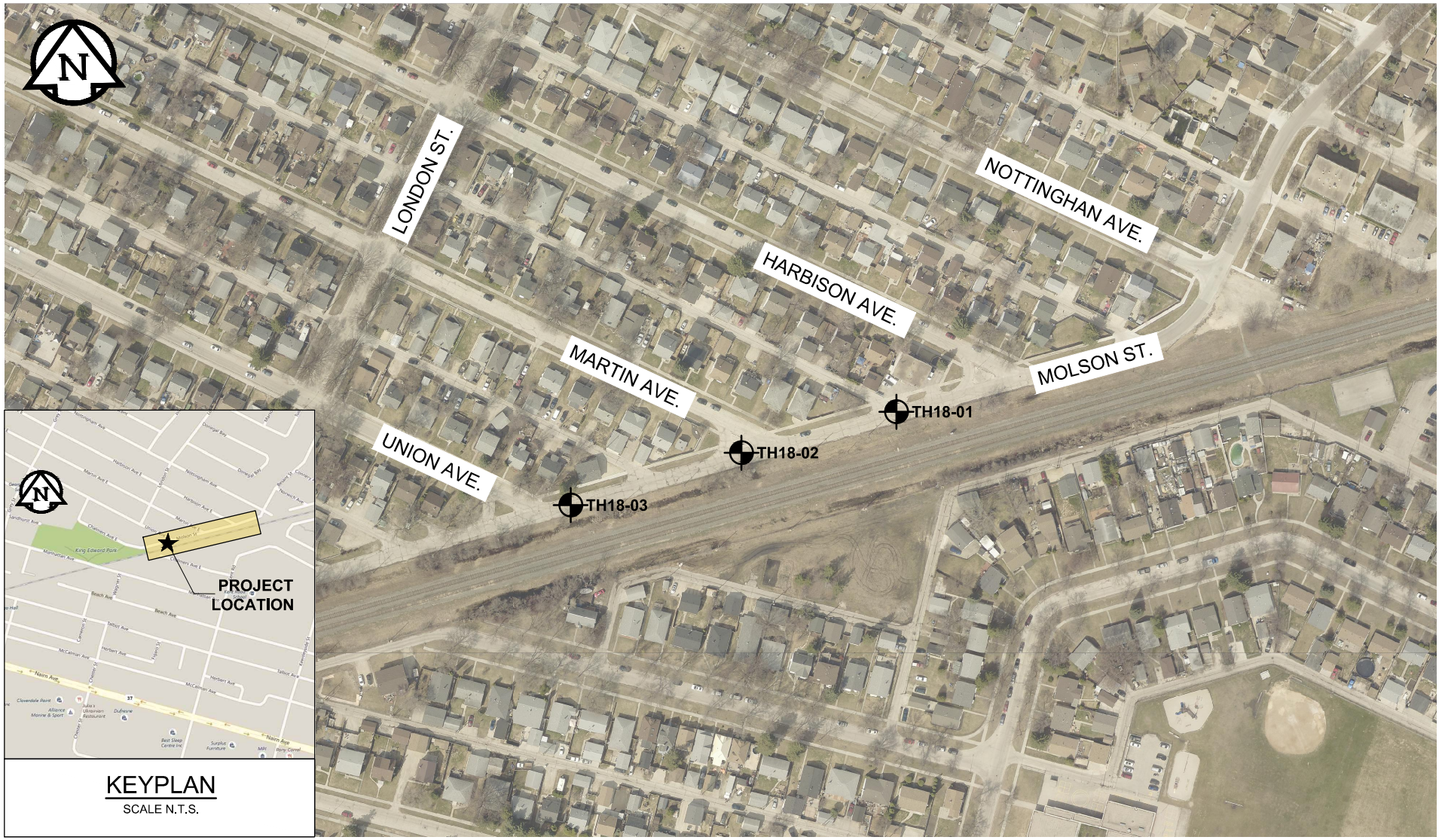
Figures

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Molson Street

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.001 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (Molson St.).dwg, 2/28/2018 10:31:18 AM



0 50 100 150 m

SCALE = 1 : 2 500 (216 mm x 279 mm)

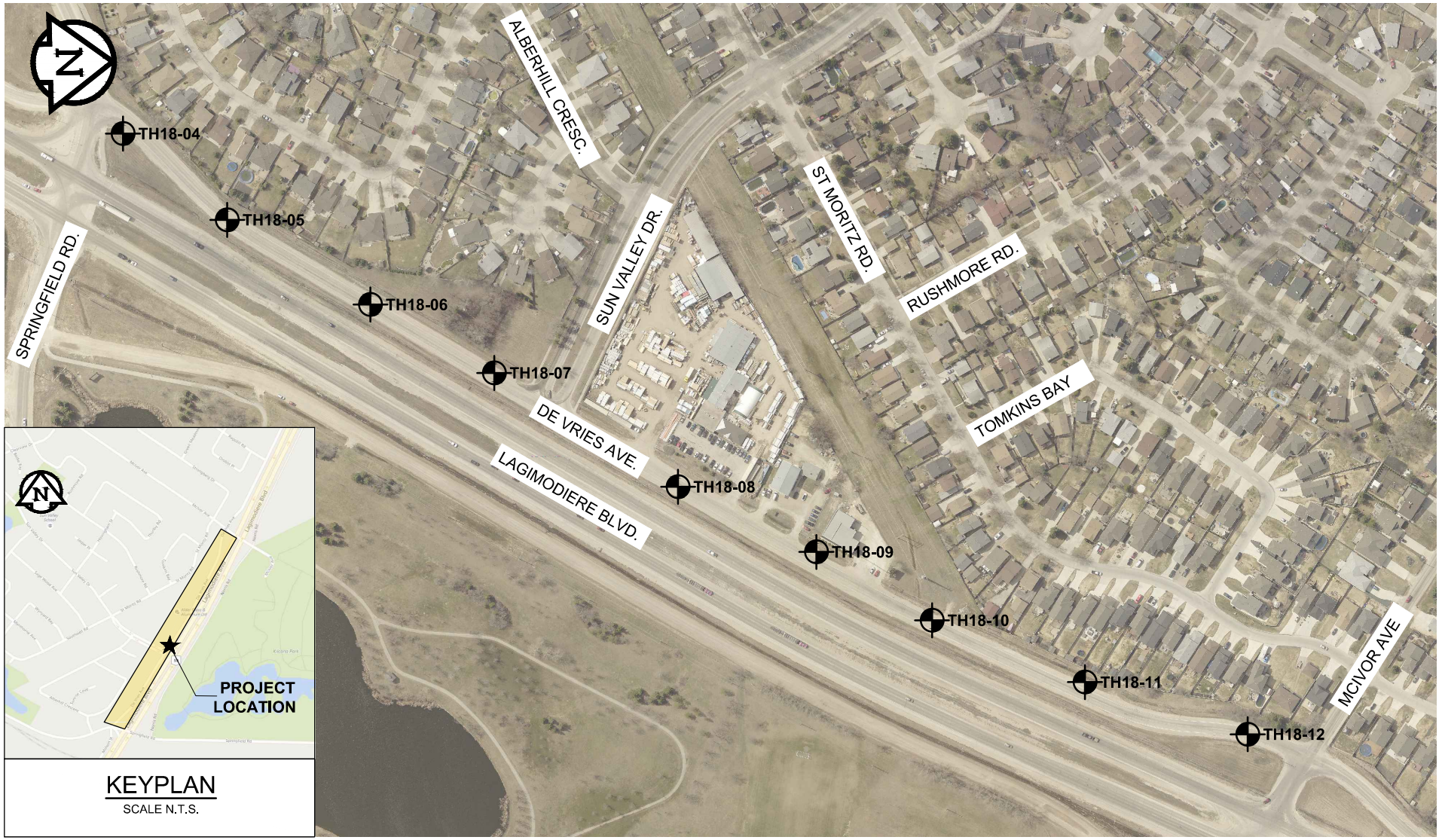
LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 01
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 De Vries Avenue



ANSI full bleed A (11.00 x 8.50 Inches)

FIG.002 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (De Vries Ave.).dwg, 2/28/2018 11:18:19 AM

0 50 100 150 m
SCALE = 1 : 3 500 (216 mm x 279 mm)

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

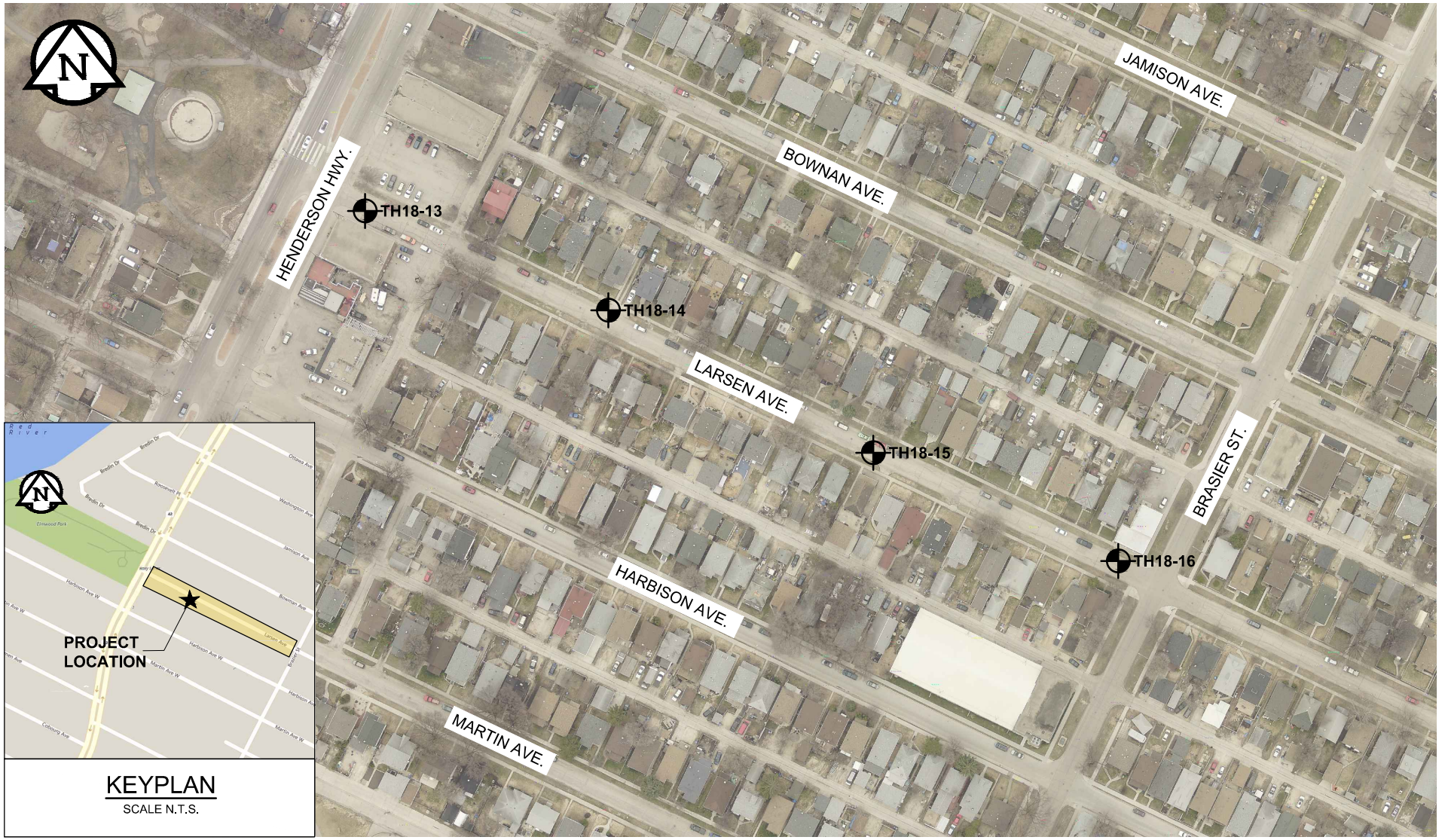
Figure 02
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Larsen Avenue

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.003 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (Larsen Ave.).dwg, 2/28/2018 4:23:54 PM



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

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 03
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Aikins Street

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.004 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (AIKINS ST.).dwg, 2/28/2018 1:47:58 PM

0 50 100 150 m
SCALE = 1 : 3 500 (216 mm x 279 mm)

LEGEND: TEST HOLE (TREK, 2018)

NOTES:
1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

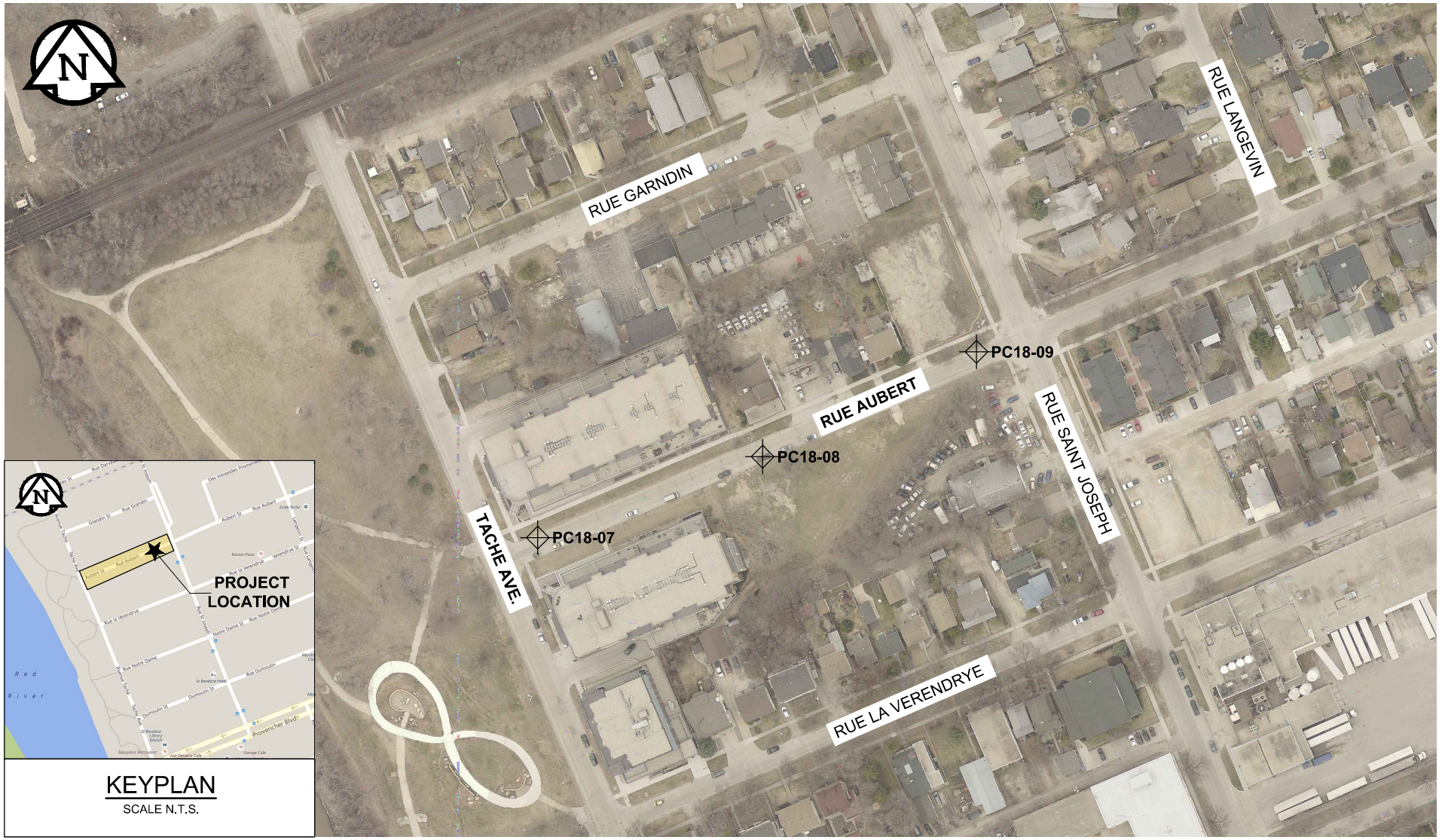
Figure 04
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Rue Aubert

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.005 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (RUE AUBERT.) dwg, 2/28/2018 2:18:22 PM



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

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 05
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Edison Ave.

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.006 2018-02-28 Test Hole Plan 0_A_SL 0406 002 00 (Edison Ave.).dwg, 2/28/2018 2:59:44 PM

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

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 06
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Mutchmor Close

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.007 2018-02-28 Test Hole Plan 0_A SL 0406 002 00 (Mutchmor Close).dwg, 2/28/2018 3:35:14 PM

0 50 100 150 m

SCALE = 1 : 2 500 (216 mm x 279 mm)

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 07
Test Hole Plan

TREK GEOTECHNICAL

0395 002 00
WSP GROUP CANADA LTD.
Local Streets 18-R-06 Bayne Crescent

ANSI full bleed A (11.00 x 8.50 Inches)

FIG.008 2018-02-28 Test Hole Plan 0_A SL 0406 002 00 (Bayne Cres.).dwg, 3/2/2018 12:31:31 PM

KEYPLAN
SCALE N.T.S.

0 50 100 150 m
SCALE = 1 : 2 500 (216 mm x 279 mm)

LEGEND: TEST HOLE (TREK, 2018)

NOTES: 1. AERIAL IMAGE FROM CITY OF WINNIPEG 2016

Figure 08
Test Hole Plan

Appendix A

Molson St., between Union Ave. and Nottingham Ave.

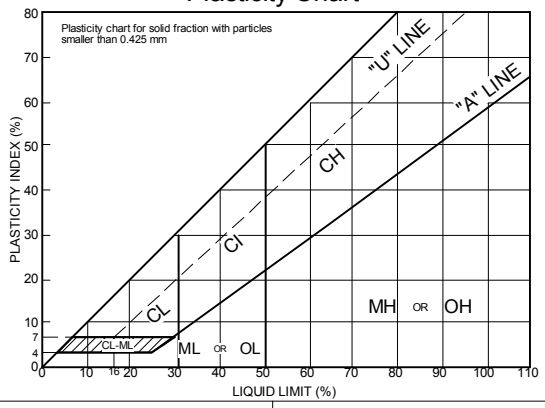
Test Hole Logs, Summary Table, Lab Data and Photographs of Pavement Core Samples

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		
#10 to #4	2.00 to 4.75		Sand
#40 to #10	0.425 to 2.00		Coarse
#200 to #40	0.075 to 0.425		Medium
< #200	< 0.075		Fine
			Silt or Clay

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

* 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 TH18-01
1 of 1

Client:	WSP Canada Goup Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Molson Street	**Location:**	UTM N-5530006, E-637668
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 17

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		CONCRETE - 152 mm thick				
		CLAY - silty, trace sand, trace gravel to 0.5 m - grey - frozen to 1.2 m, moist and soft when thawed - high plasticity		G01	●	
0.5		- firm to stiff, below 0.5 m		G02	●	△ ✤
				G03	●	
1.0		- brown below 1.1 m		G04	●	✤
		- light brown and firm below 1.4 m		G05	●	✤
1.5		SILT - trace clay, trace sand - light brown - wet, soft - low plasticity		G06	●	
2.0		CLAY - silty - brown - moist, firm - high plasticity		G07	●	△ ✤
2.5		- grey below 2.7 m		G08	●	✤
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at house #810, 3 m South of North edge of street.

Logged By: Dawn Sellick **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-24_LOCAL STREETS 18-R-06 MOLSON STREET_0395-002-00_0_A_DS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-02
1 of 1

Client:	WSP Canada Goup Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Molson Street	**Location:**	UTM N-5529988, E-637600
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 17

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		CONCRETE - 178 mm thick				
		CLAY - silty, trace sand - grey - frozen to 1.2 m, moist and soft when thawed - high plasticity		G09		
0.5				G10		
				G11		
1.0		- light brown below 1.1 m		G12		
		SILT - trace clay, trace sand - light brown - wet, very soft to soft - low plasticity		G13		
1.5				G14		
2.0						
2.5						
		CLAY - silty - brown - moist, firm - high plasticity		G15		
3.0						

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

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located 6.2 m South of Martin Avenue and Molson Street intersection, 1.5 m South of North edge of street.

Logged By: Dawn Sellick **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-24_LOCAL STREETS 18-R-06 MOLSON STREET_0395-002-00_0_A_DS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-03
1 of 1

Client:	WSP Canada Goup Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Molson Street	**Location:**	UTM N-5529965, E-637525
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 17

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		CONCRETE - 165 mm thick				
		CLAY (FILL) - silty, trace sand to 0.8 m, trace gravel to 0.5 m - dark grey to black - frozen, moist and soft when thawed - intermediate plasticity		G16		
0.5				G17		
				G18		
1.0		SILT AND CLAY - trace sand - mottled light brown and grey - frozen to 1.2 m, moist and soft when thawed - intermediate plasticity		G19		
1.5		CLAY - silty - brown - moist, firm to stiff - high plasticity		G20		
				G21		
2.0						
2.5						
				G22		
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at house #781, 5.7 m South of North edge of street.

Logged By: Dawn Sellick **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-24_LOCAL STREETS 18-R-06 MOLSON STREET_0395-002-00_0_A_DS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Local Streets Package 18-R-06
Sub-Surface Investigation
Molson Street

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)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH18-01	UTM: 5530006 N, 637668 E Located at House #810, 3 m South of North edge of street.	Asphalt	N/A	Concrete	152											
						CLAY	0.2	0.3	34							
						CLAY	0.5	0.6	34							
						CLAY	0.8	0.9	33							
						CLAY	1.1	1.2	30							
						CLAY	1.4	1.5	26							
						SILT	1.7	1.8	24							
						CLAY	2.1	2.3	44							
						CLAY	2.7	2.9	47							
TH18-02	UTM: 5529988 N, 637600 E Located 6.2 m South of Marten Avenue and Molson Street intersection, 1.5 m South of North edge of street.	Asphalt	N/A	Concrete	178											
						CLAY	0.2	0.3	39							
						CLAY	0.5	0.6	34							
						CLAY	0.8	0.9	32	0	1	24	75	19	70	51
						CLAY	1.1	1.2	36							
						SILT	1.4	1.5	22							
						SILT	1.7	1.8	26							
						CLAY	2.6	2.7	29							
TH18-03	UTM: 5529965 N, 637525 E Located at House #781, 5.7 m South of North edge of street.	Asphalt	N/A	Concrete	165											
						CLAY (FILL)	0.2	0.3	32							
						CLAY (FILL)	0.5	0.6	24							
						CLAY (FILL)	0.8	0.9	35							
						CLAY AND SILT	1.1	1.2	26							
						CLAY	1.4	1.5	31							
						CLAY	1.7	1.8	33							
						CLAY	2.7	2.9	39							

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - Molson Street

Sample Date 17-Jan-18
Test Date 11-Feb-18
Technician DS

Test Pit	TH18-01	TH18-01	TH18-01	TH18-01	TH18-01	TH18-01
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	W4	N19	K28	K20	W35	AC03
Mass of tare	8.5	8.6	8.6	8.5	8.3	6.7
Mass wet + tare	302.1	363.4	334.7	327.1	343.8	412.5
Mass dry + tare	227.9	274.2	254.4	253.7	275.1	334.5
Mass water	74.2	89.2	80.3	73.4	68.7	78.0
Mass dry soil	219.4	265.6	245.8	245.2	266.8	327.8
Moisture %	33.8%	33.6%	32.7%	29.9%	25.7%	23.8%

Test Pit	TH18-01	TH18-01	TH18-02	TH18-02	TH18-02	TH18-02
Depth (m)	2.1 - 2.3	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	Z136	Z18	AB18	W19	AC09	AC02
Mass of tare	8.5	8.7	6.7	9.0	6.7	6.7
Mass wet + tare	325.2	309.8	329.9	323.2	402.6	408.1
Mass dry + tare	228.1	213.5	239.2	244.1	307.2	302.9
Mass water	97.1	96.3	90.7	79.1	95.4	105.2
Mass dry soil	219.6	204.8	232.5	235.1	300.5	296.2
Moisture %	44.2%	47.0%	39.0%	33.6%	31.7%	35.5%

Test Pit	TH18-02	TH18-02	TH18-02	TH18-03	TH18-03	TH18-03
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.6 - 2.7	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	D2	Z12	P23	Z70	W11	F70
Mass of tare	8.3	8.6	8.5	8.7	6.6	8.5
Mass wet + tare	430.9	346.3	342.7	344.5	332.1	329.8
Mass dry + tare	354.6	277.3	268.6	263.8	268.5	245.8
Mass water	76.3	69.0	74.1	80.7	63.6	84.0
Mass dry soil	346.3	268.7	260.1	255.1	261.9	237.3
Moisture %	22.0%	25.7%	28.5%	31.6%	24.3%	35.4%

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - Molson Street

Sample Date 17-Jan-18
Test Date 11-Feb-18
Technician DS

Test Pit	TH18-03	TH18-03	TH18-03	TH18-03		
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9		
Sample #	G19	G20	G21	G22		
Tare ID	AB100	H6	E95	E8		
Mass of tare	6.7	8.5	8.6	8.5		
Mass wet + tare	348.4	340.7	355.2	330.7		
Mass dry + tare	277.0	262.6	269.2	239.7		
Mass water	71.4	78.1	86.0	91.0		
Mass dry soil	270.3	254.1	260.6	231.2		
Moisture %	26.4%	30.7%	33.0%	39.4%		

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						

Test Pit						
Depth (m)						
Sample #						
Tare ID						
Mass of tare						
Mass wet + tare						
Mass dry + tare						
Mass water						
Mass dry soil						
Moisture %						

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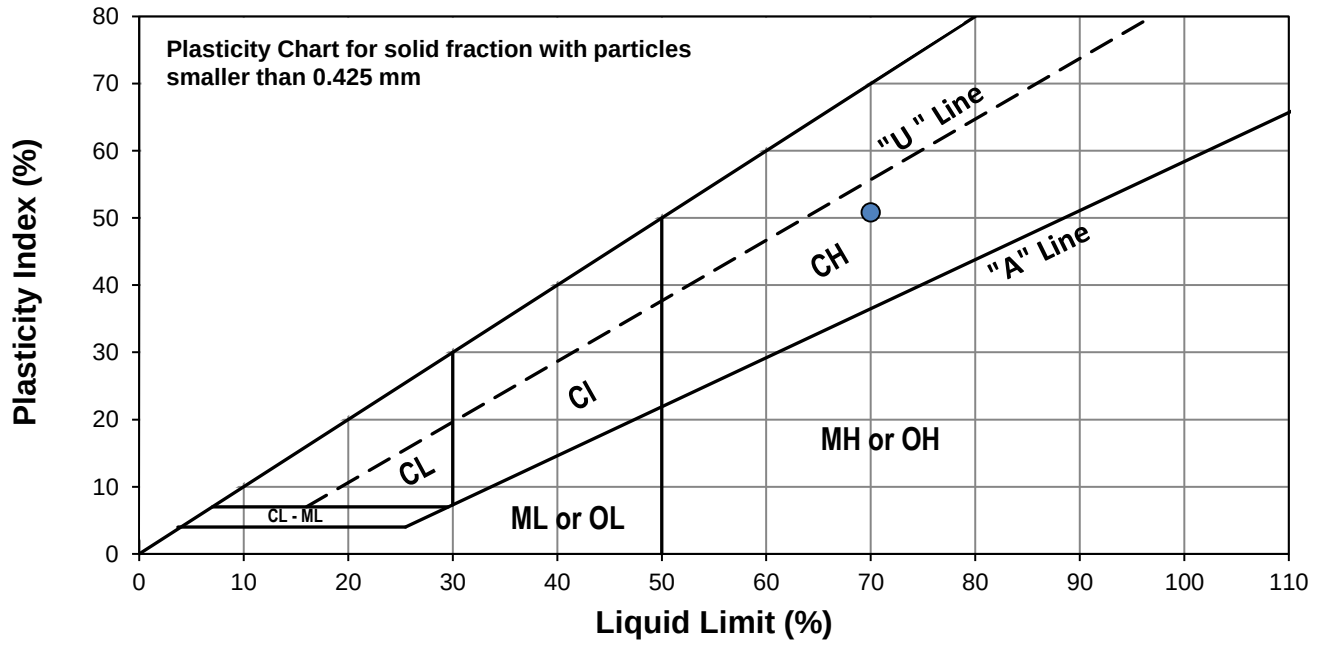
Atterberg Limits
ASTM D4318-10e1

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-04 Molson Street
Test Hole	TH18-02
Sample #	G11
Depth (m)	0.5-0.6
Sample Date	17-Jan-18
Test Date	21-Feb-18
Technician	DS

Liquid Limit	70
Plastic Limit	19
Plasticity Index	51

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	20	30		
Mass Wet Soil + Tare (g)	13.482	13.337	12.824		
Mass Dry Soil + Tare (g)	10.764	10.752	10.535		
Mass Tare (g)	7.114	7.147	7.188		
Mass Water (g)	2.718	2.585	2.289		
Mass Dry Soil (g)	3.650	3.605	3.347		
Moisture Content (%)	74.466	71.706	68.390		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	22.151	22.461			
Mass Wet Soil + Tare (g)	20.900	21.113			
Mass Dry Soil + Tare (g)	14.304	14.147			
Mass Water (g)	1.251	1.348			
Mass Dry Soil (g)	6.596	6.966			
Moisture Content (%)	18.966	19.351			

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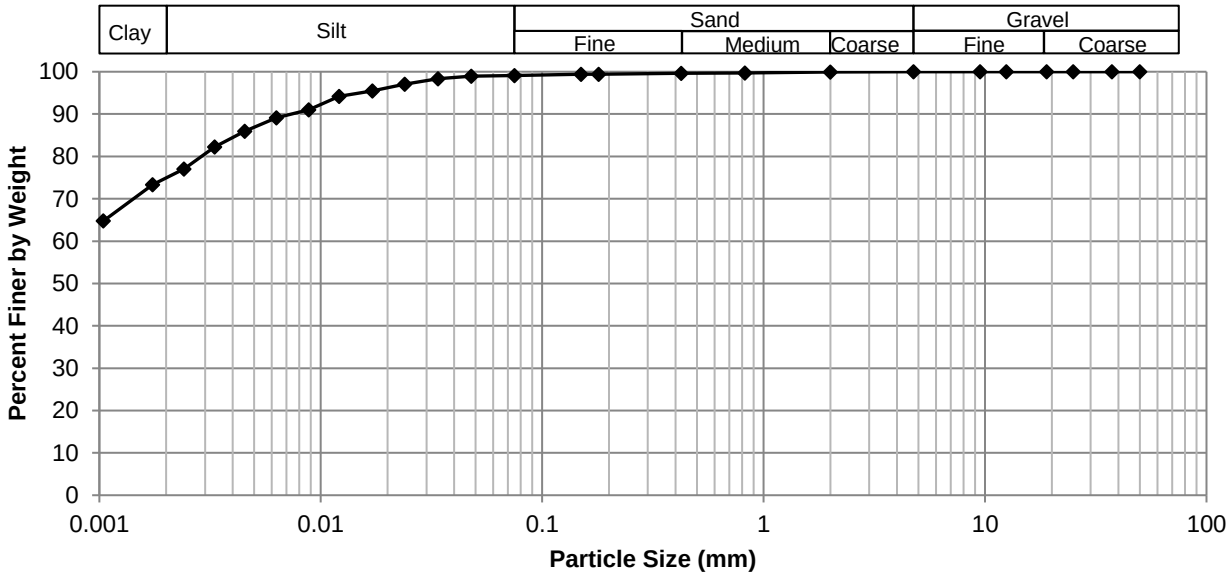
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - Molson Street
Test Hole	TH18-02
Sample #	G11
Depth (m)	0.8 - 0.9
Sample Date	17-Jan-18
Test Date	14-Feb-18
Technician	DS

Gravel	0.0%
Sand	0.9%
Silt	24.3%
Clay	74.8%

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	99.11
37.5	100.00	2.00	99.91	0.0479	98.95
25.0	100.00	0.825	99.74	0.0339	98.31
19.0	100.00	0.425	99.62	0.0240	97.04
12.5	100.00	0.180	99.43	0.0171	95.46
9.50	100.00	0.150	99.43	0.0121	94.19
4.75	100.00	0.075	99.11	0.0088	91.01
				0.0063	89.11
				0.0045	85.94
				0.0033	82.23
				0.0024	77.05
				0.0017	73.35
				0.0010	64.78

Photo 1: Pavement Core Sample at Test Hole TH18-01

Photo 2: Pavement Core Sample at Test Hole TH18-02

Photo 3: Pavement Core Sample at Test Hole TH18-03

Appendix B

De Vries Avenue, between Springfield Road to McIvor Ave.

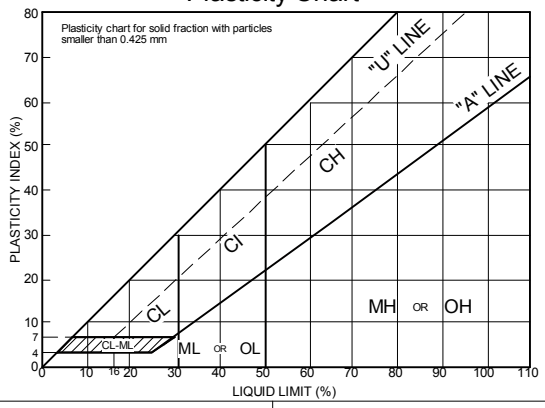
Test Hole Logs, Summary Table, Lab Data and Photographs of Pavement Core Samples

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		
#10 to #4	2.00 to 4.75		Sand
#40 to #10	0.425 to 2.00		Coarse
#200 to #40	0.075 to 0.425		Medium
< #200	< 0.075		Fine
			Silt or Clay

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

* 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 TH18-04
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5532842, E-640301
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 100 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, sandy, trace gravel, trace organics - black and brown - frozen to 1.2 m, moist and soft when thawed - intermediate to high plasticity		G23		
0.5				G24		
				G25		
		- firm below 0.9 m				
1.0				G26		
		- stiff below 1.2 m				
				G27		
1.5		SILT - trace clay, trace sand - brown - moist and soft - low plasticity		G28		
		CLAY - silty, trace silt inclusions (<10 mm diam.) - brown - moist, firm - high plasticity				
2.0						
2.5				G29		
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 4 m North and 5 m East of Springfield Road and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-05
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5532906, E-640354
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 80 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen to 1.2 m, moist and soft when thawed - high plasticity		G30	●	
0.5				G31	●	
				G32	●	
1.0		- brown, firm below 0.9 m		G33	●	✿
		- stiff below 1.2 m		G34	●	△✿
1.5		CLAY - silty, trace sand, trace gravel to 1.9 m - grey to brown - moist, firm - high plasticity		G35	●	△✿
2.0		- trace silt inclusions (<10 mm diam.) below 2.1 m				
2.5				G36	●	✿
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 110 m North and 2 m East of Springfield Road and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-06
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5532994, E-640406
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250 / Test Type: Torvane, Pocket Pen., Qu, Field Vane
		ASPHALT - 130 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen to 1.2 m, moist and soft when thawed - high plasticity		G37		
0.5				G38		
				G39		
1.0				G40		
		CLAY - silty, trace sand to 1.9 m - brown - moist, soft - high plasticity		G41		
1.5		- grey, trace silt inclusions (<10 mm diam.) below 1.7 m		G42		
2.0						
2.5				G43		
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 210 m North and 5 m East of Springfield Road and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 DE VRIES AVE 0395-002-00 0 A HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-07
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533070, E-640448
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 130 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen, moist and soft when thawed - high plasticity		G44	●	
0.5				G45	●	
		CLAY - silty, trace sand - mottled brown - frozen to 1.2 m, moist and firm when thawed - high plasticity		G46	●	△
1.0				G47	●	✤
		- grey, stiff below 1.4 m		G48	●	△ ✤
1.5						
		- brown, trace oxdiation, trace silt inclusions (<20 mm diam.) below 1.8 m		G49	●	△ ✤
2.0						
2.5		SILT - trace clay, trace sand - brown - moist and firm - low plasticity		G50	●	✤
3.0						

END OF TEST HOLE AT 3.0 m IN SILT
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 24 m South and 4 m East of Sun Valley Drive and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-08
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533183, E-640518
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 130 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen to 1.2 m, moist and soft when thawed - high plasticity	Grab	G51		
0.5			Grab	G52		
		- stiff below 0.8 m	Grab	G53		
1.0			Grab	G54		
			Grab	G55		
1.5		- very stiff below 1.5 m				
		CLAY - silty, trace sand - brown - moist, soft - high plasticity	Grab	G56		
2.0						
2.5		- firm, trace silt inclusions (<10 mm diam.) below 2.4 m				
			Grab	G57		
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 18 m North and 5 m East of 1820 De Vries Avenue.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-09
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533268, E-640558
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 130 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen, moist and soft when thawed - high plasticity		G58	●	
0.5				G59	●	✤△
				G60	●	△✤
1.0		CLAY - silty, trace sand to 1.7 m - grey - frozen to 1.2 m, moist and stiff when thawed - high plasticity		G61	●	
		- trace silt inclusions (<20 mm diam.) below 1.4 m		G62	●	✤△
1.5		- brown below 1.7 m		G63	●	△✤
2.0						
2.5				G64	●	△✤
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 13 m North and 3 m East of 1838 De Vries Avenue.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-10

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533339, E-640600
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 130 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen, moist and soft to firm when thawed - high plasticity		G65		
0.5				G66		
				G67		
		CLAY - silty, trace sand and trace gravel to 1.8 m - black and grey - frozen to 1.2 m, moist and stiff when thawed - high plasticity		G68		
1.0		- very stiff below 1.2 m				
				G69		
1.5		- brown, trace gravel, trace silt inclusions (<20 mm diam.) below 1.5 m				
				G70		
2.0						
2.5						
		- stiff below 2.7 m		G71		
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 35 m North and 6 m East of 1-1856 De Vries Avenue.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

Sub-Surface Log

Test Hole TH18-11
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533433, E-640638
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: Torvane, Pocket Pen., Qu, Field Vane 0 50 100 150 200 250
		ASPHALT - 160 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)		G72		
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen, moist and stiff when thawed - high plasticity		G73		
0.5						
		CLAY - silty, trace sand to 1.9 m - grey - frozen to 1.2 m, moist and stiff when thawed - high plasticity		G74		
1.0				G75		
				G76		
1.5				G77		
2.0		- brown, trace silt inclusions (<10 mm diam.), firm below 2.1 m				
				G78		
2.5		- grey below 2.8 m		G79		
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 136 m South and 2 m East of McIvor Avenue and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 DE VRIES AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-12
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - De Vries Avenue	**Location:**	UTM N-5533533, E-640670
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger, CME55 Truck Mount	**Date Drilled:**	2018 January 19

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250 / Test Type: Torvane, Pocket Pen., Qu, Field Vane
		ASPHALT - 100 mm thick				
		SAND AND GRAVEL (FILL) - trace silt, trace clay, light brown, frozen, moist and loose when thawed, (rounded to angular)				
		CLAY (FILL) - silty, trace sand, trace gravel, trace organics - black - frozen, moist and soft when thawed - high plasticity		G80		
0.5				G81		
				G82		
1.0						
		CLAY - silty, trace sand to 1.9 m - brown - frozen to 1.2 m, moist and soft when thawed - high plasticity		G83		
		- grey, stiff below 1.4 m		G84		
1.5						
		- trace silt inclusions (<10 mm diam.) below 1.7 m		G85		
2.0						
2.5						
				G86		
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at 26 m South and 7 m East of McIvor Avenue and De Vries Avenue intersection.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 DE VRIES AVE 0395-002-00 0 A HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Local Streets Package 18-R-06
Sub-Surface Investigation
De Vries Avenue

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)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH18-04	UTM: 5532842 N, 640301 E Located 4 m North and 5 m East of Springfield Road and De Vries Ave. intersection	Asphalt	100	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	15							
						CLAY (FILL)	0.5	0.6	12							
						CLAY (FILL)	0.8	0.9	25	1	31	27	41	21	51	30
						CLAY (FILL)	1.1	1.2	34							
						CLAY (FILL)	1.4	1.5	34							
						SILT	1.7	1.8	25							
						CLAY	2.7	2.9	50							
TH18-05	UTM: 5532906 N, 640354 E Located 110 m North and 2 m East of Springfield Road and De Vries Ave. intersection.	Asphalt	55	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	15							
						CLAY (FILL)	0.5	0.6	26							
						CLAY (FILL)	0.8	0.9	31							
						CLAY (FILL)	1.1	1.2	34							
						CLAY (FILL)	1.4	1.5	31							
						CLAY	1.7	1.8	28							
						CLAY	2.7	2.9	45							
TH18-06	UTM: 5532994 N, 64046 E Located 210 m North and 5 m East of Springfield Road and De Vries Ave. intersection.	Asphalt	130	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	30							
						CLAY (FILL)	0.5	0.6	31							
						CLAY	0.8	0.9	34							
						CLAY	1.1	1.2	42							
						CLAY	1.4	1.5	28							
						CLAY	1.7	1.8	40							
						SILT	2.7	2.9	54							
TH18-07	UTM: 5533070 N, 640448 E Located 24 m South and 4 m East of Sun Valley Drive and De Vries Ave. intersection.	Asphalt	130	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	15							
						CLAY (FILL)	0.5	0.6	30							
						CLAY (FILL)	0.8	0.9	38							
						CLAY	1.1	1.2	34							
						SILT	1.4	1.5	32							
						CLAY	1.7	1.8	26							
						CLAY	2.7	2.9	25							

Local Streets Package 18-R-06
Sub-Surface Investigation
De Vries Avenue

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)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH18-08	UTM: 5533183 N, 640518 E Located 18 m North and 5 m East of 1820 De Vries Ave.	Asphalt	130	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	27							
						CLAY (FILL)	0.5	0.6	36							
						CLAY (FILL)	0.8	0.9	40							
						CLAY (FILL)	1.1	1.2	41							
						CLAY (FILL)	1.4	1.5	37							
						CLAY	1.7	1.8	25							
						CLAY	2.7	2.9	40							
TH18-09	UTM: 5533268 N, 640558 E Located 13 m North and 3 m East of 1838 De Vries Ave.	Asphalt	130	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	15							
						CLAY (FILL)	0.5	0.6	42							
						CLAY (FILL)	0.8	0.9	43							
						CLAY	1.1	1.2	41							
						CLAY	1.4	1.5	35							
						CLAY	1.7	1.8	29							
						CLAY	2.7	2.9	46							
TH18-10	UTM: 5533339 N, 6404600 E Located 35 m North and 6 m East of 1-1856 De Vries Ave.	Asphalt	130	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	20							
						CLAY (FILL)	0.5	0.6	42							
						CLAY (FILL)	0.8	0.9	41							
						CLAY	1.1	1.2	34							
						CLAY	1.4	1.5	33							
						CLAY	1.7	1.8	28							
							2.7	2.9	50							
TH18-11	UTM: 5533433 N, 640638 E Located 136 m South and 2 m East of McIvor Ave. and De Vries Ave. intersection.	Asphalt	160	Concrete	N/A							%Fines				
						SAND AND GRAVEL (FILL)	0.2	0.3	5	42	47	11				
						CLAY	0.5	0.6	28							
						CLAY	0.8	0.9	33	0	3	30	67	26	75	49
						CLAY	1.1	1.2	30							
						CLAY	1.4	1.5	31							
						CLAY	1.7	1.8	37							
						CLAY	2.7	2.9	37							

Local Streets Package 18-R-06
Sub-Surface Investigation
De Vries Avenue

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)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH18-12	UTM: 5533533 N, 640670 E Located 26 m South and 7 m East of McIvor Ave. and De Vries Ave. intersection.	Asphalt	100	Concrete	N/A											
						SAND AND GRAVEL (FILL)	-	-	-							
						CLAY (FILL)	0.2	0.3	38							
						CLAY (FILL)	0.5	0.6	33							
						CLAY (FILL)	0.8	0.9	40							
						CLAY	1.1	1.2	39							
						CLAY	1.4	1.5	32							
						CLAY	1.7	1.8	36							
						CLAY	2.7	2.9	48							

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Winnipeg, MB R3H 0L3
Tel: 204.975.9433 Fax: 204.975.9435

Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - De Vries Ave

Sample Date 19-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-04	TH18-04	TH18-04	TH18-04	TH18-04	TH18-04
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G23	G24	G25	G26	G27	G28
Tare ID	AB15	H21	F54	F131	E56	N76
Mass of tare	6.7	8.4	8.5	8.5	8.5	8.6
Mass wet + tare	313.9	403.0	536.3	242.6	281.4	414.5
Mass dry + tare	273.0	362.0	431.5	183.4	211.8	332.3
Mass water	40.9	41.0	104.8	59.2	69.6	82.2
Mass dry soil	266.3	353.6	423.0	174.9	203.3	323.7
Moisture %	15.4%	11.6%	24.8%	33.8%	34.2%	25.4%

Test Pit	TH18-04	TH18-05	TH18-05	TH18-05	TH18-05	TH18-05
Depth (m)	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G29	G30	G31	G32	G33	G34
Tare ID	P25	D3	D38	N37	Z58	W68
Mass of tare	8.7	8.5	8.6	8.6	8.6	8.6
Mass wet + tare	281.6	327.2	348.5	331.9	295.4	318.7
Mass dry + tare	190.8	286.5	278.0	256.2	222.7	246.5
Mass water	90.8	40.7	70.5	75.7	72.7	72.2
Mass dry soil	182.1	278.0	269.4	247.6	214.1	237.9
Moisture %	49.9%	14.6%	26.2%	30.6%	34.0%	30.3%

Test Pit	TH18-05	TH18-05	TH18-06	TH18-06	TH18-06	TH18-06
Depth (m)	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G35	G36	G37	G38	G39	G40
Tare ID	H5	N107	H4	AA15	E117	A3
Mass of tare	8.4	8.4	8.4	6.9	8.4	8.6
Mass wet + tare	376.1	382.7	310.0	290.5	219.0	265.8
Mass dry + tare	295.3	266.9	240.9	222.8	165.6	190.1
Mass water	80.8	115.8	69.1	67.7	53.4	75.7
Mass dry soil	286.9	258.5	232.5	215.9	157.2	181.5
Moisture %	28.2%	44.8%	29.7%	31.4%	34.0%	41.7%

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - De Vries Ave

Sample Date 19-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-06	TH18-06	TH18-06	TH18-07	TH18-07	TH18-07
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G41	G42	G43	G44	G45	G46
Tare ID	Z57	AA03	E138	F12	F105	K32
Mass of tare	8.5	6.9	8.6	8.5	8.4	8.7
Mass wet + tare	418.0	332.4	328.3	275.3	307.2	252.2
Mass dry + tare	328.3	239.8	216.3	240.1	238.6	184.8
Mass water	89.7	92.6	112.0	35.2	68.6	67.4
Mass dry soil	319.8	232.9	207.7	231.6	230.2	176.1
Moisture %	28.0%	39.8%	53.9%	15.2%	29.8%	38.3%

Test Pit	TH18-07	TH18-07	TH18-07	TH18-07	TH18-08	TH18-08
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6
Sample #	G47	G48	G49	G50	G51	G52
Tare ID	AA08	W110	A14	N111	H9	H41
Mass of tare	8.0	8.4	8.4	8.4	8.8	8.6
Mass wet + tare	342.1	362.3	365.8	559.4	337.4	213.2
Mass dry + tare	256.9	276.8	292.0	447.8	267.9	158.9
Mass water	85.2	85.5	73.8	111.6	69.5	54.3
Mass dry soil	248.9	268.4	283.6	439.4	259.1	150.3
Moisture %	34.2%	31.9%	26.0%	25.4%	26.8%	36.1%

Test Pit	TH18-08	TH18-08	TH18-08	TH18-08	TH18-08	TH18-09
Depth (m)	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3
Sample #	G53	G54	G55	G56	G57	G58
Tare ID	W14	D27	K1	AB40	C2	W41
Mass of tare	8.5	8.2	8.5	6.7	8.5	8.5
Mass wet + tare	218.2	320.9	230.8	351.8	341.8	415.3
Mass dry + tare	158.5	229.7	170.9	283.3	247.0	337.3
Mass water	59.7	91.2	59.9	68.5	94.8	78.0
Mass dry soil	150.0	221.5	162.4	276.6	238.5	328.8
Moisture %	39.8%	41.2%	36.9%	24.8%	39.7%	23.7%

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - De Vries Ave

Sample Date 19-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-09	TH18-09	TH18-09	TH18-09	TH18-09	TH18-09
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9
Sample #	G59	G60	G61	G62	G63	G64
Tare ID	AB94	D15	F129	AB44	C22	AA10
Mass of tare	6.8	8.5	8.8	6.9	8.6	6.8
Mass wet + tare	255.1	322.5	276.2	283.4	387.8	364.8
Mass dry + tare	181.9	228.9	198.3	212.0	302.2	252.2
Mass water	73.2	93.6	77.9	71.4	85.6	112.6
Mass dry soil	175.1	220.4	189.5	205.1	293.6	245.4
Moisture %	41.8%	42.5%	41.1%	34.8%	29.2%	45.9%

Test Pit	TH18-10	TH18-10	TH18-10	TH18-10	TH18-10	TH18-10
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G65	G66	G67	G68	G69	G70
Tare ID	N64	Z11	AC26	K35	AB49	H44
Mass of tare	8.6	8.4	6.8	8.3	6.3	8.4
Mass wet + tare	346.9	243.5	244.5	338.2	413.4	323.9
Mass dry + tare	291.0	173.8	175.9	254.6	313.0	254.3
Mass water	55.9	69.7	68.6	83.6	100.4	69.6
Mass dry soil	282.4	165.4	169.1	246.3	306.7	245.9
Moisture %	19.8%	42.1%	40.6%	33.9%	32.7%	28.3%

Test Pit	TH18-10	TH18-11	TH18-11	TH18-11	TH18-11	TH18-11
Depth (m)	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G71	G72	G73	G74	G75	G76
Tare ID	Z69	AB80	Z06	F112	F121	D29
Mass of tare	8.6	0	8.5	8.4	8.4	8.3
Mass wet + tare	314.5	1533.6	300.2	271.2	362.1	298.5
Mass dry + tare	213.1	1466.2	236.6	206.7	280.0	230.0
Mass water	101.4	67.4	63.6	64.5	82.1	68.5
Mass dry soil	204.5	1466.2	228.1	198.3	271.6	221.7
Moisture %	49.6%	4.6%	27.9%	32.5%	30.2%	30.9%

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - De Vries Ave

Sample Date 19-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-11	TH18-11	TH18-11	TH18-12	TH18-12	TH18-12
Depth (m)	1.7 - 1.8	2.3 - 2.4	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G77	G78	G79	G80	G81	G82
Tare ID	E88	D19	Z27	W76	D1	F44
Mass of tare	8.6	8.7	8.8	8.6	8.6	8.7
Mass wet + tare	341.7	377.8	278.5	253.7	268.4	297.6
Mass dry + tare	252.3	277.9	190.7	186.2	203.5	215.3
Mass water	89.4	99.9	87.8	67.5	64.9	82.3
Mass dry soil	243.7	269.2	181.9	177.6	194.9	206.6
Moisture %	36.7%	37.1%	48.3%	38.0%	33.3%	39.8%

Test Pit	TH18-12	TH18-12	TH18-12	TH18-12		
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9		
Sample #	G83	G84	G85	G86		
Tare ID	A11	H29	W77	F56		
Mass of tare	6.8	8.5	8.4	8.6		
Mass wet + tare	343.7	301.9	534.3	547.3		
Mass dry + tare	249.0	231.2	393.9	372.3		
Mass water	94.7	70.7	140.4	175.0		
Mass dry soil	242.2	222.7	385.5	363.7		
Moisture %	39.1%	31.7%	36.4%	48.1%		

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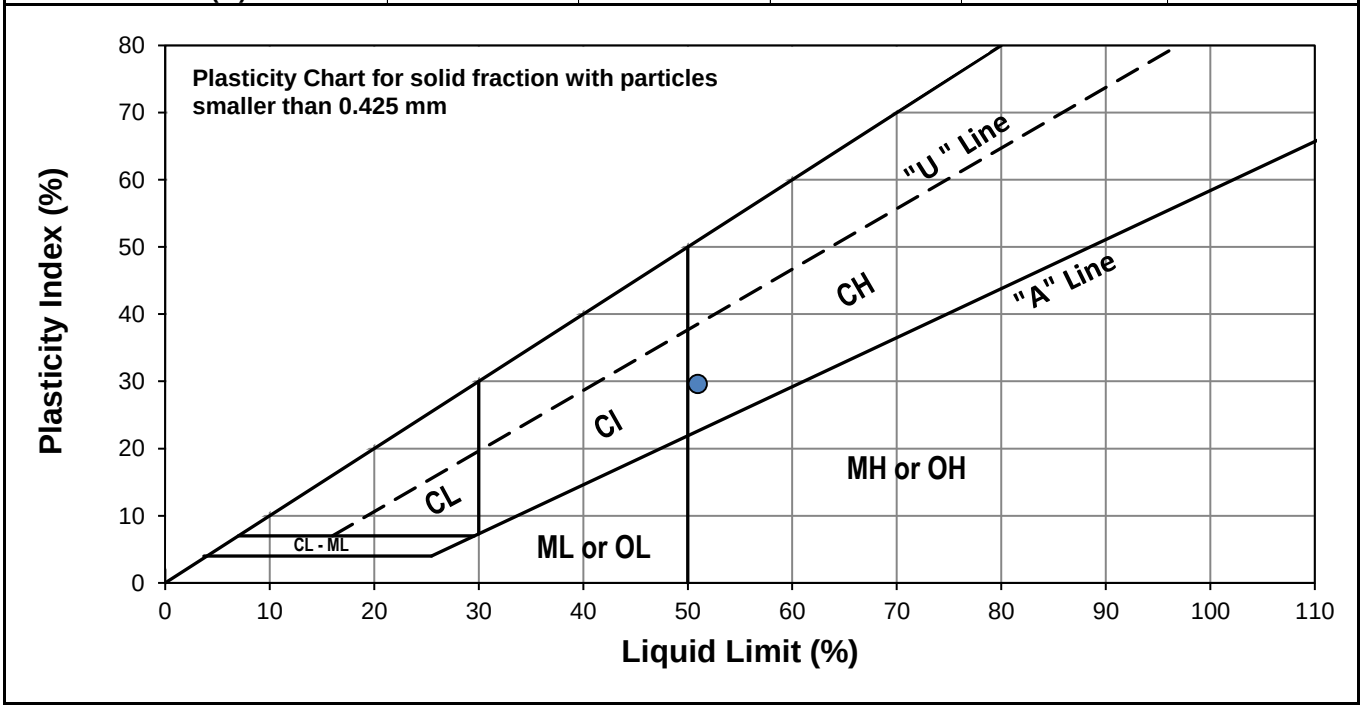
Atterberg Limits
ASTM D4318-10e1

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - De Vries Avenue
Test Hole	TH18-04
Sample #	G25
Depth (m)	0.8-0.9
Sample Date	19-Jan-18
Test Date	20-Feb-18
Technician	HS

Liquid Limit	51
Plastic Limit	21
Plasticity Index	30

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	15	21	26		
Mass Wet Soil + Tare (g)	22.454	22.922	20.891		
Mass Dry Soil + Tare (g)	19.527	19.945	18.646		
Mass Tare (g)	14.175	14.266	14.205		
Mass Water (g)	2.927	2.977	2.245		
Mass Dry Soil (g)	5.352	5.679	4.441		
Moisture Content (%)	54.690	52.421	50.552		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	20.384	20.410			
Mass Wet Soil + Tare (g)	19.326	19.323			
Mass Dry Soil + Tare (g)	14.365	14.229			
Mass Water (g)	1.058	1.087			
Mass Dry Soil (g)	4.961	5.094			
Moisture Content (%)	21.326	21.339			

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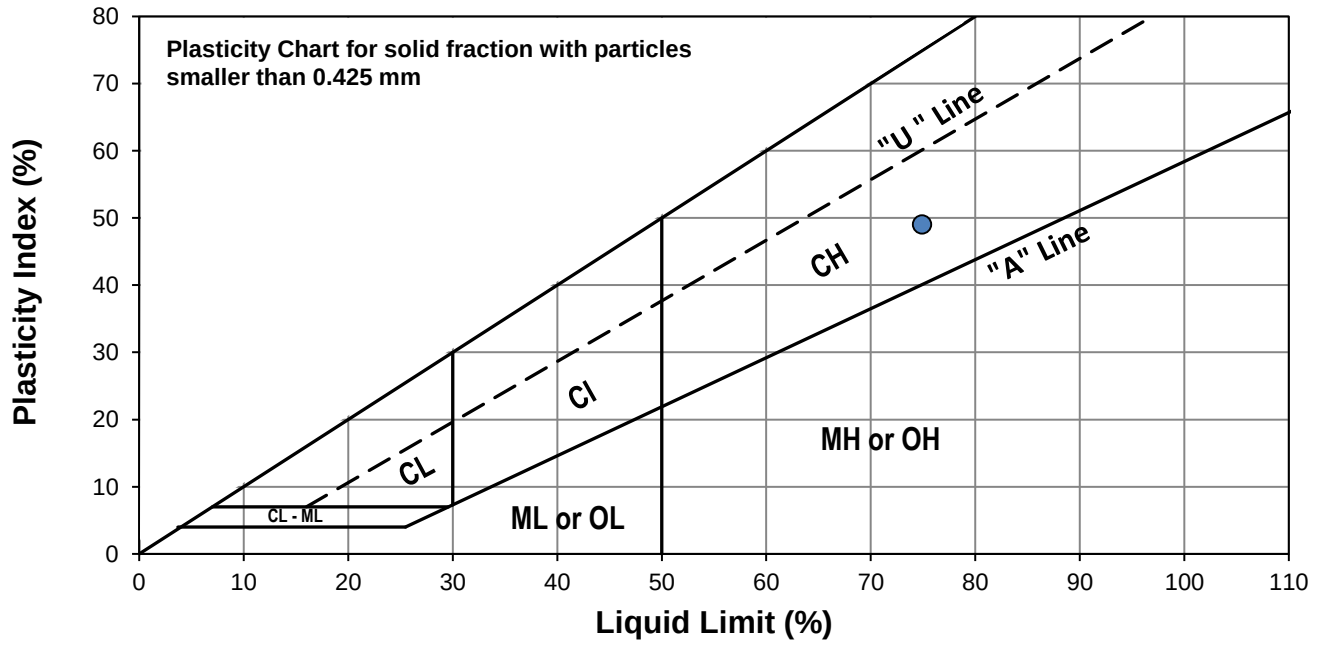
Atterberg Limits
ASTM D4318-10e1

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - De Vries Avenue
Test Hole	TH18-11
Sample #	G74
Depth (m)	0.8-0.9
Sample Date	19-Jan-18
Test Date	26-Feb-18
Technician	HS

Liquid Limit	75
Plastic Limit	26
Plasticity Index	49

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	18	26	32		
Mass Wet Soil + Tare (g)	27.912	27.676	25.789		
Mass Dry Soil + Tare (g)	21.831	21.915	21.043		
Mass Tare (g)	14.262	14.230	14.277		
Mass Water (g)	6.081	5.761	4.746		
Mass Dry Soil (g)	7.569	7.685	6.766		
Moisture Content (%)	80.341	74.964	70.145		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	21.295	20.480			
Mass Wet Soil + Tare (g)	19.804	19.175			
Mass Dry Soil + Tare (g)	14.080	14.104			
Mass Water (g)	1.491	1.305			
Mass Dry Soil (g)	5.724	5.071			
Moisture Content (%)	26.048	25.735			

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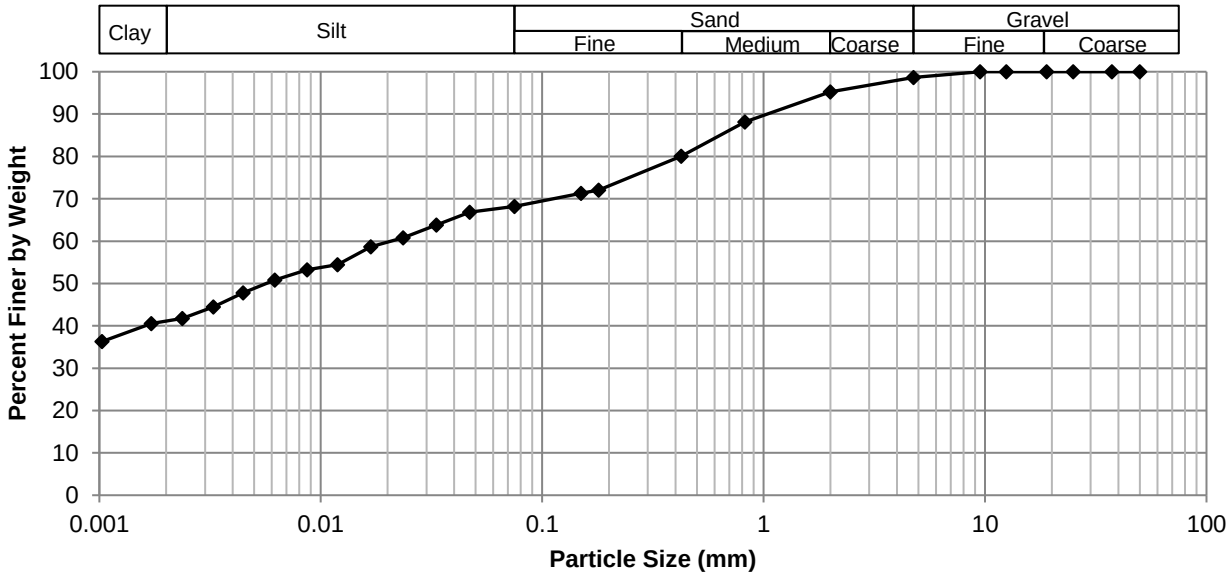
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - De Vries Avenue
Test Hole	TH18-04
Sample #	G25
Depth (m)	0.8 - 0.9
Sample Date	19-Jan-18
Test Date	19-Feb-18
Technician	HS

Gravel	1.3%
Sand	30.5%
Silt	27.1%
Clay	41.1%

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	98.67	0.0750	68.16
37.5	100.00	2.00	95.29	0.0471	66.86
25.0	100.00	0.825	88.16	0.0333	63.83
19.0	100.00	0.425	80.08	0.0236	60.81
12.5	100.00	0.180	72.02	0.0168	58.69
9.50	100.00	0.150	71.31	0.0119	54.45
4.75	98.67	0.075	68.16	0.0087	53.24
				0.0062	50.82
				0.0045	47.79
				0.0033	44.46
				0.0024	41.74
				0.0017	40.53
				0.0010	36.29

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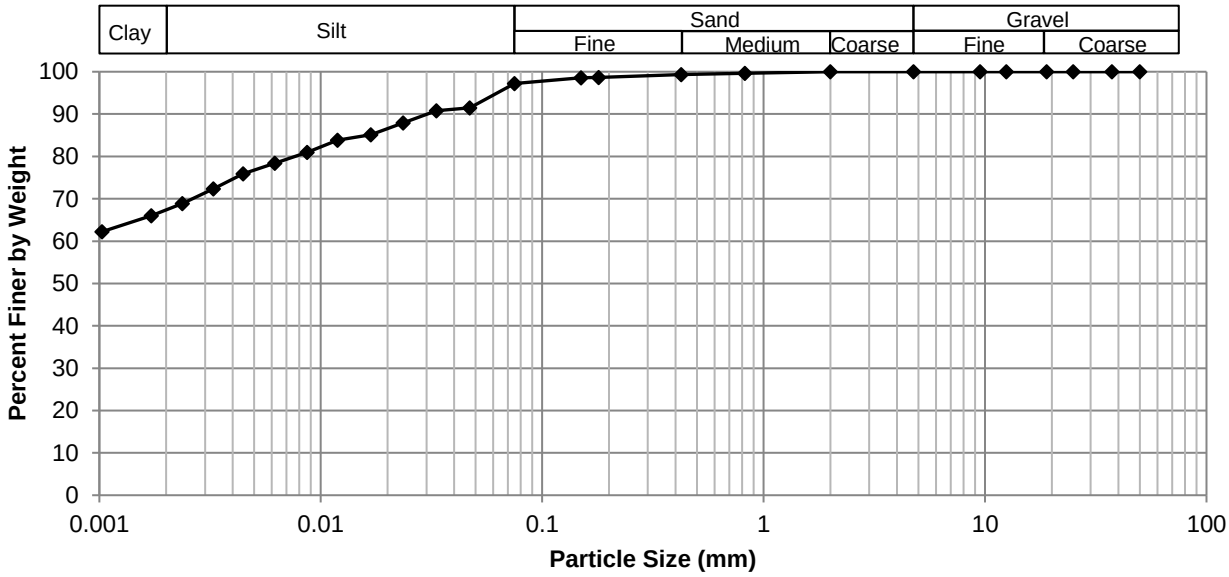
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - De Vries Avenue
Test Hole	TH18-11
Sample #	G74
Depth (m)	0.8 - 0.9
Sample Date	19-Jan-18
Test Date	25-Feb-18
Technician	HS

Gravel	0.0%
Sand	2.8%
Silt	29.9%
Clay	67.3%

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	97.19
37.5	100.00	2.00	100.00	0.0471	91.45
25.0	100.00	0.825	99.65	0.0333	90.81
19.0	100.00	0.425	99.31	0.0236	87.96
12.5	100.00	0.180	98.68	0.0168	85.10
9.50	100.00	0.150	98.55	0.0119	83.83
4.75	100.00	0.075	97.19	0.0087	80.97
				0.0062	78.43
				0.0045	75.89
				0.0033	72.39
				0.0024	68.90
				0.0017	66.04
				0.0010	62.23

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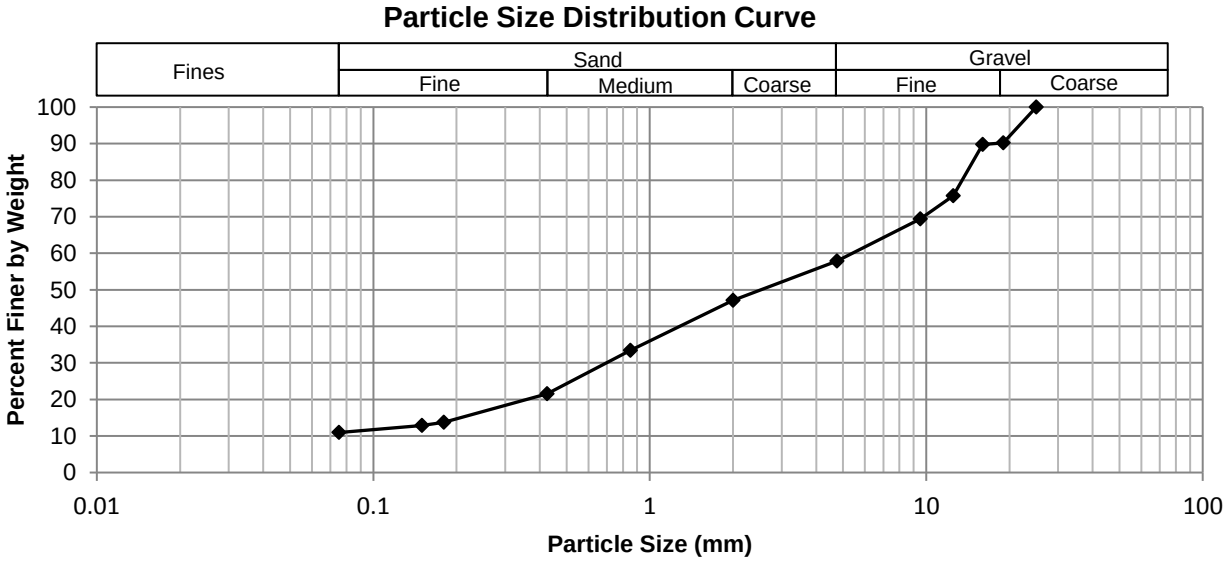
Grain Size Analysis (Sieve Method)
ASTM C136-06

Project No. 0395-002-00
Client WSP
Project Local Streets - 18-R-06 - De Vries Avenue

Test Hole TH18-11
Sample # G72
Depth (m) 0.15 - 0.24
Date Sampled 19-Jan-18
Date Tested 26-Feb-18
Technician HS

Total Weight (g)	1466.2
Gravel %	42.2
Sand %	46.9
Fines %	10.9



Sieve Number	Sieve Opening (mm)	Percent Passing	Specification (Min-Max)
6"	150		
5"	125		
4"	100		
3"	75.0		
2"	50.0		
1 1/2"	37.5		
1"	25.0	100	
3/4"	19.0	90	
5/8"	16.0	90	
1/2"	12.5	76	
3/8"	9.50	69	
no. 4	4.75	58	
no. 10	2.00	47	
no. 20	0.850	33	
no. 40	0.425	22	
no. 80	0.180	14	
no. 100	0.150	13	
no. 200	0.075	11	

Photo 1: Pavement Core Sample at Test Hole TH18-04

Photo 2: Pavement Core Sample at Test Hole TH18-05

Photo 3: Pavement Core Sample at Test Hole TH18-06

Photo 4: Pavement Core Sample at Test Hole TH18-07

Photo 5: Pavement Core Sample at Test Hole TH18-08

Photo 6: Pavement Core Sample at Test Hole TH18-09

Photo 7: Pavement Core Sample at Test Hole TH18-10

Photo 8: Pavement Core Sample at Test Hole TH18-11

Photo 9: Pavement Core Sample at Test Hole TH18-12

Appendix C

Larsen Avenue, between Henderson Hwy to Brazier St.

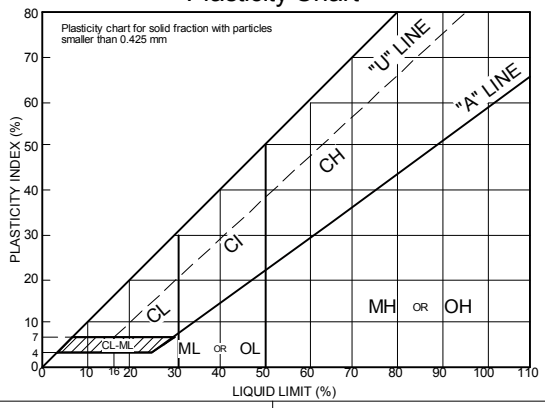
Test Hole Logs, Summary Table, Lab Data and Photographs of Pavement Core Samples

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		
#10 to #4	2.00 to 4.75		Sand
#40 to #10	0.425 to 2.00		Coarse
#200 to #40	0.075 to 0.425		Medium
< #200	< 0.075		Fine
			Silt or Clay

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

* 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 TH18-13
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Larsen Avenue	**Location:**	UTM N-5531191, E-635485
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 24

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 100 mm thick				
		CONCRETE - 150 mm thick				
		CLAY (FILL) - silty, trace sand, trace gravel, trace silt inclusions (<10 mm diam.) - black - frozen to 1.2 m, moist and stiff when thawed - high plasticity		G87		
0.5				G88		
				G89		
1.0				G90		
		CLAY - silty, trace sand to 1.7 m - grey - moist and stiff - high plasticity		G91		
1.5						
		- trace silt inclusions (<15 mm diam.) below 1.7 m		G92		
2.0						
2.5						
				G93		
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at building #210, 2.6 m North of South Curb.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 LARSEN AVE 0395-002-00 0 A HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-14
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Larsen Avenue	**Location:**	UTM N-5531191, E-635566
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 24

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 0 20 40 60 80 100	Undrained Shear Strength (kPa) Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○ 0 50 100 150 200 250
		ASPHALT - 55 mm thick				
		CONCRETE - 165 mm thick				
		CLAY (FILL) - silty, trace sand, trace gravel - black - frozen to 1.2 m, moist and firm when thawed - high plasticity		G94	●	
0.5				G95	●	
		- firm to stiff below 0.8 m		G96	●	△ ✤
1.0				G97	●	
		CLAY - silty - brown - moist, firm - high plasticity		G98	●	✤
1.5		- stiff below 1.5 m		G99	●	△ ✤
2.0		- grey, trace silt inclusions (<5 mm diam.) below 2.1 m				
2.5				G100	●	✤
3.0						

END OF TEST HOLE AT 3.0 m IN CLAY
1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at house #233, 1.5 m South of North Curb.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 LARSEN AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-15

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Larsen Avenue	**Location:**	UTM N-5531101, E-635659
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 24

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250
		ASPHALT - 55 mm thick				
		CONCRETE - 165 mm thick				
		CLAY (FILL) - silty, trace sand, trace gravel - black - frozen to 1.2 m, moist and stiff when thawed - high plasticity		G101		
0.5				G102		
		- firm below 0.9 m		G103		
1.0				G104		
		SILT - clayey, trace sand - brown - moist, soft - low plasticity		G105		
1.5						
		CLAY - silty - grey - moist, stiff to very stiff - high plasticity		G106		
2.0						
		- stiff, trace oxidation below 2.4 m				
2.5				G107		
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at house #268, 1.4 m North of South Curb.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22 LOCAL STREETS 18-R-06 LARSEN AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Sub-Surface Log

Test Hole TH18-16
1 of 1

Client:	WSP Canada Group Ltd.	**Project Number:**	0395-002-00
Project Name:	Local Streets 18-R-06 - Larsen Avenue	**Location:**	UTM N-5531063, E-635745
Contractor:	Maple Leaf Drilling	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, B40 Mobile Truck Mount	**Date Drilled:**	2018 January 24

Sample Type: Grab (G) | Shelby Tube (T) | Split Spoon (SS) | Split Barrel (SB) | 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 50 100 150 200 250 / Test Type: Torvane, Pocket Pen., Qu, Field Vane
		ASPHALT - 70 mm thick				
		CONCRETE - 150 mm thick				
		CLAY (FILL) - silty, trace sand, trace gravel - black - frozen, moist and stiff when thawed - high plasticity		G108		
0.5				G109		
				G110		
1.0		SILT AND CLAY - trace sand - brown - frozen to 1.2 m, moist and soft when thawed - high plasticity		G111		
				G112		
1.5		CLAY - silty, trace silt inclusions (<10 mm diam.) - brown - moist, stiff - high plasticity		G113		
2.0		- grey below 2.1 m				
2.5						
				G114		
3.0		END OF TEST HOLE AT 3.0 m IN CLAY				

1) No seepage or sloughing.
2) Test hole backfilled with auger cuttings, bentonite chips, sand and cold patch asphalt.
3) Test hole located at house #298, 1.3 m South of North Curb.

Logged By: Harsimran Singh **Reviewed By:** N.J Ferreira **Project Engineer:** Nelson Ferreira

SUB-SURFACE LOG LOGS 2018-02-22_LOCAL STREETS 18-R-06 LARSEN AVE_0395-002-00_0_A_HS.GPJ TREK GEOTECHNICAL.GDT 18-3-2

Local Streets Package 18-R-06
Sub-Surface Investigation
Larsen Avenue

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)		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
TH18-13	UTM: 5531191 N, 635485 E Located at House #210, 2.6 m North of South curb.	Asphalt	100	Concrete	150											
						CLAY (FILL)	0.2	0.3	31							
						CLAY (FILL)	0.5	0.6	36							
						CLAY	0.8	0.9	39							
						CLAY	1.1	1.2	35							
						CLAY	1.4	1.5	34							
						CLAY	1.7	1.8	35							
						CLAY	2.7	2.9	46							
TH18-14	UTM: 5531191 N, 635566 E Located at House # 233, 1.5 m South of North curb.	Asphalt	55	Concrete	165											
						CLAY (FILL)	0.2	0.3	24							
						CLAY (FILL)	0.5	0.6	25	1	10	25	64	27	64	36
						CLAY (FILL)	0.8	0.9	38							
						CLAY (FILL)	1.1	1.2	28							
						CLAY	1.4	1.5	34							
						CLAY	1.7	1.8	31							
						CLAY	2.7	2.9	48							
TH18-15	UTM: 5531101 N, 635659 E Located at House #268, 1.4 m North of South curb.	Asphalt	55	Concrete	165											
						CLAY (FILL)	0.2	0.3	33							
						CLAY (FILL)	0.5	0.6	30							
						CLAY (FILL)	0.8	0.9	29							
						CLAY (FILL)	1.1	1.2	32							
						CLAY	1.4	1.5	43							
						CLAY	1.7	1.8	36							
						CLAY	2.7	2.9	47							
TH18-16	UTM: 5531063 N, 635745 E Located at House #298, 1.3 m South of North curb.	Asphalt	70	Concrete	150											
						CLAY (FILL)	0.2	0.3	34							
						CLAY (FILL)	0.5	0.6	35							
						CLAY (FILL)	0.8	0.9	34							
						CLAY	1.1	1.2	33							
						SILT	1.4	1.5	25							
						CLAY	1.7	1.8	38							
						CLAY	2.7	2.9	48							

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - Larsen Ave

Sample Date 24-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-13	TH18-13	TH18-13	TH18-13	TH18-13	TH18-13
Depth (m)	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8
Sample #	G87	G88	G89	G90	G91	G92
Tare ID	P08	Z34	AB39	P28	AB90	F29
Mass of tare	8.6	8.5	6.7	8.4	6.9	8.6
Mass wet + tare	348.2	297.8	235.1	283.0	297.6	298.6
Mass dry + tare	267.6	221.3	171.3	212.6	223.7	223.1
Mass water	80.6	76.5	63.8	70.4	73.9	75.5
Mass dry soil	259.0	212.8	164.6	204.2	216.8	214.5
Moisture %	31.1%	35.9%	38.8%	34.5%	34.1%	35.2%

Test Pit	TH18-13	TH18-14	TH18-14	TH18-14	TH18-14	TH18-14
Depth (m)	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5
Sample #	G93	G94	G95	G96	G97	G98
Tare ID	W101	D24	P28	E115	H8	E19
Mass of tare	8.4	8.7	8.4	8.8	8.4	8.8
Mass wet + tare	286.2	205	147	265.7	450.7	284.5
Mass dry + tare	198.3	167.3	119.3	195.0	355.2	214.2
Mass water	87.9	37.7	27.7	70.7	95.5	70.3
Mass dry soil	189.9	158.6	110.9	186.2	346.8	205.4
Moisture %	46.3%	23.8%	25.0%	38.0%	27.5%	34.2%

Test Pit	TH18-14	TH18-14	TH18-15	TH18-15	TH18-15	TH18-15
Depth (m)	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2
Sample #	G99	G100	G101	G102	G103	G104
Tare ID	AB92	W51	N08	N83	F48	AB07
Mass of tare	6.7	8.4	8.7	8.6	8.7	6.8
Mass wet + tare	360.4	282.9	302.2	289.5	284.6	309.8
Mass dry + tare	277.7	194.0	230.0	224.0	222.5	236.9
Mass water	82.7	88.9	72.2	65.5	62.1	72.9
Mass dry soil	271.0	185.6	221.3	215.4	213.8	230.1
Moisture %	30.5%	47.9%	32.6%	30.4%	29.0%	31.7%

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Moisture Content Report
ASTM D2216-10

Project No. 0395-002-00
Client WSP
Project Local Streets 18-R-06 - Larsen Ave

Sample Date 24-Jan-18
Test Date 18-Feb-18
Technician HS

Test Pit	TH18-15	TH18-15	TH18-15	TH18-16	TH18-16	TH18-16
Depth (m)	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9	0.2 - 0.3	0.5 - 0.6	0.8 - 0.9
Sample #	G105	G106	G107	G108	G109	G110
Tare ID	Z37	Z93	E138	W96	Z130	F15
Mass of tare	8.4	8.6	8.5	8.6	8.5	8.8
Mass wet + tare	204.4	362.3	510.8	297.0	299.3	475.5
Mass dry + tare	145.2	269.2	350.8	224.2	224.6	357.5
Mass water	59.2	93.1	160.0	72.8	74.7	118.0
Mass dry soil	136.8	260.6	342.3	215.6	216.1	348.7
Moisture %	43.3%	35.7%	46.7%	33.8%	34.6%	33.8%

Test Pit	TH18-16	TH18-16	TH18-16	TH18-16		
Depth (m)	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.7 - 2.9		
Sample #	G111	G112	G113	G114		
Tare ID	N22	Z64	K22	F128		
Mass of tare	8.5	8.3	8.6	8.5		
Mass wet + tare	280.5	397.2	329.0	333.0		
Mass dry + tare	213.3	320.0	241.4	227.8		
Mass water	67.2	77.2	87.6	105.2		
Mass dry soil	204.8	311.7	232.8	219.3		
Moisture %	32.8%	24.8%	37.6%	48.0%		

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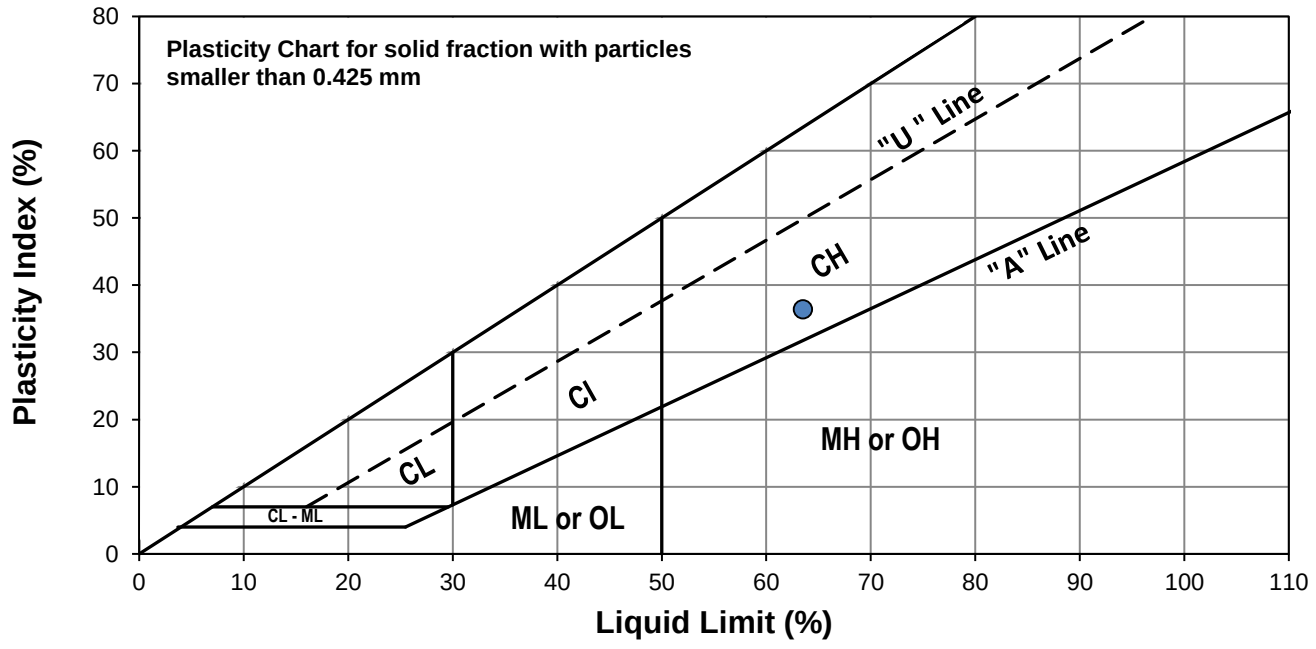
Atterberg Limits
ASTM D4318-10e1

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - Larsen Avenue
Test Hole	TH18-14
Sample #	G95
Depth (m)	0.5-0.6
Sample Date	24-Jan-18
Test Date	20-Feb-18
Technician	HS

Liquid Limit	64
Plastic Limit	27
Plasticity Index	36

Liquid Limit

Trial #	1	2	3		
Number of Blows (N)	16	25	33		
Mass Wet Soil + Tare (g)	27.291	25.709	22.710		
Mass Dry Soil + Tare (g)	22.084	21.270	19.420		
Mass Tare (g)	14.272	14.273	14.079		
Mass Water (g)	5.207	4.439	3.290		
Mass Dry Soil (g)	7.812	6.997	5.341		
Moisture Content (%)	66.654	63.441	61.599		



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	20.077	20.604			
Mass Wet Soil + Tare (g)	18.795	19.213			
Mass Dry Soil + Tare (g)	14.043	14.113			
Mass Water (g)	1.282	1.391			
Mass Dry Soil (g)	4.752	5.100			
Moisture Content (%)	26.978	27.275			

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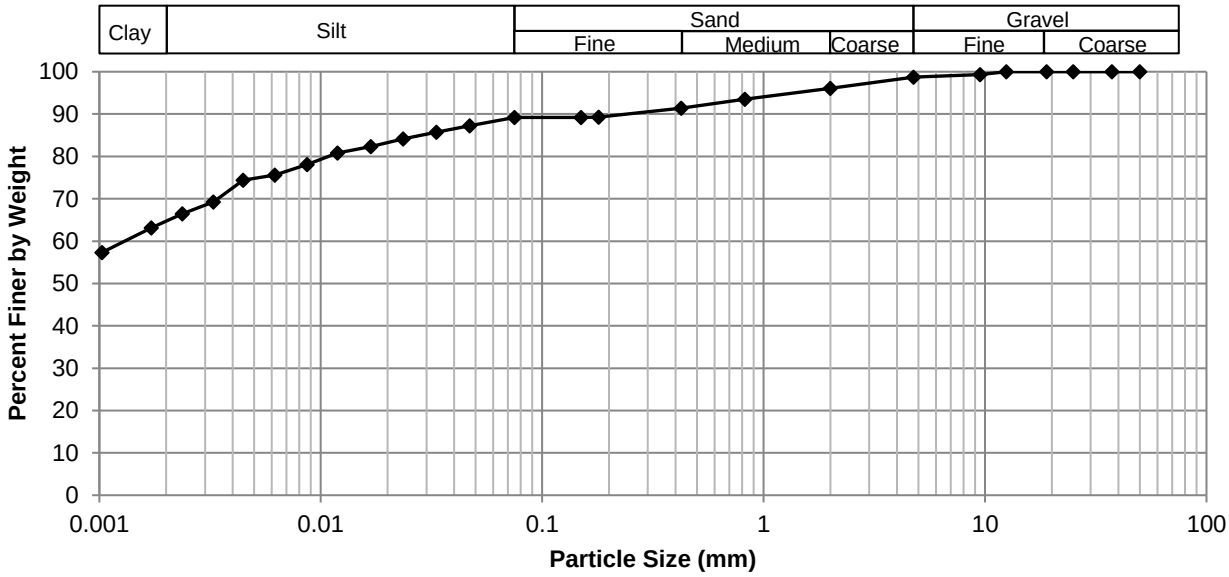
Grain Size Analysis (Hydrometer Method)
ASTM D422

Project No.	0395-002-00
Client	WSP
Project	Local Streets 18-R-06 - Larsen Avenue
Test Hole	TH18-14
Sample #	G95
Depth (m)	0.5 - 0.6
Sample Date	24-Jan-18
Test Date	19-Feb-18
Technician	HS

Gravel	1.2%
Sand	9.9%
Silt	24.5%
Clay	64.2%

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	98.75	0.0750	89.21
37.5	100.00	2.00	96.05	0.0471	87.23
25.0	100.00	0.825	93.50	0.0333	85.70
19.0	100.00	0.425	91.37	0.0236	84.18
12.5	100.00	0.180	89.26	0.0168	82.35
9.50	99.31	0.150	89.21	0.0119	80.82
4.75	98.75	0.075	89.21	0.0087	78.08
				0.0062	75.63
				0.0045	74.41
				0.0033	69.23
				0.0024	66.48
				0.0017	63.13
				0.0010	57.33

Photo 1: Pavement Core Sample at Test Hole TH18-13

Photo 2: Pavement Core Sample at Test Hole TH18-14

Photo 3: Pavement Core Sample at Test Hole TH18-15

Photo 4: Pavement Core Sample at Test Hole TH18-16

Appendix D

Aikens Street, between Templeton Ave. to North End

Photographs of Pavement Core Samples

Photo 1: Pavement Core Sample at Test Hole PC18-01

Photo 2: Pavement Core Sample at Test Hole PC18-02

Photo 3: Pavement Core Sample at Test Hole PC18-03

Photo 4: Pavement Core Sample at Test Hole PC18-04

Photo 5: Pavement Core Sample at Test Hole PC18-05

Photo 6: Pavement Core Sample at Test Hole PC18-06

Appendix E

Rue Aubert – between Tache Ave. to Rue Joseph

Photographs of Pavement Core Samples

Photo 1: Pavement Core Sample at Test Hole PC18-07

Photo 2: Pavement Core Sample at Test Hole PC18-08

Photo 3: Pavement Core Sample at Test Hole PC18-09

Appendix F

Edison Avenue, between De Graff Place to Raleigh St.

Photographs of Pavement Core Samples

Photo 1: Pavement Core Sample at Test Hole PC18-10

Photo 2: Pavement Core Sample at Test Hole PC18-11

Photo 3: Pavement Core Sample at Test Hole PC18-12

Photo 4: Pavement Core Sample at Test Hole PC18-13

Appendix G

Mutchmor Close – between Tu-pelo Ave. to Tu-pelo Ave.

Photographs of Pavement Core Samples

Photo 1: Pavement Core Sample at Test Hole PC18-14

Photo 2: Pavement Core Sample at Test Hole PC18-15

Photo 3: Pavement Core Sample at Test Hole PC18-16

Photo 4: Pavement Core Sample at Test Hole PC18-17

Photo 5: Pavement Core Sample at Test Hole PC18-18

Photo 6: Pavement Core Sample at Test Hole PC18-19

Appendix H

Bayne Crescent, between Tu-pelo Ave. to London St.

Photographs of Pavement Core Samples

Photo 1: Pavement Core Sample at Test Hole PC18-20

Photo 2: Pavement Core Sample at Test Hole PC18-21

Photo 3: Pavement Core Sample at Test Hole PC18-22