

APPENDIX 'A'

GEOTECHNICAL REPORT



Quality Engineering | Valued Relationships

Morrison Hershfield

19-C-10 Erin Street Pavement Renewal

Prepared for:

Morrison Hershfield
1-59 Scurfield Boulevard
Winnipeg, MB R3Y 1V2
Attention: Ron Bruce, P. Eng

Project Number:

0035 082 00 401

Date:

November 8, 2019
Final Report



Quality Engineering | Valued Relationships

November 8, 2019

Our File No. 0035 082 00 401

Mr. Ron Bruce, P. Eng
Morrison Hershfield
1-59 Scurfield Boulevard
Winnipeg, Manitoba, R3Y 1V2

**RE: Sub-Surface Investigation Report for
19-C-10 Erin Pavement Renewal**

TREK Geotechnical Inc. is pleased to submit our report for the sub-surface investigations for the 19-C-10 Erin Pavement Renewal project.

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:

A handwritten signature in blue ink, appearing to read "Nelson John Ferreira".

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

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

Revision History

Revision No.	Author	Issue Date	Description
1	AFK	November 8, 2019	Final Report

Authorization Signatures

Prepared By:



Angela Fidler-Kliwer, C. Tech
Manager of Laboratory and Field Services



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 19-C-10 Erin Street Pavement Renewal project. The test holes were located along Erin Street between Wolever Avenue and Notre Dame Avenue. 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 followed by drilling of test holes at 25 locations. TREK Geotechnical and Morrison Hershfield selected the investigation locations as shown on Figure 01 and Figure 02 (attached). The road investigation was conducted between September 26, 2019 and October 2, 2019. The pavement structure (asphalt and/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. Twenty-five test holes were drilled to a depth of 3.0 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 Bryan Hiebert 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. Core samples were also retrieved and logged at TREK's material testing laboratory.

The locations noted on the summary tables and test hole logs are based on the core/test hole location relative to the nearest address, and measured distances 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 0.5 and 1.0 m below pavement as well as Standard Proctor and CBR testing. Laboratory testing results are included on the test hole logs in Appendix A, while the individual test results are included in Appendix B with a summary table. Photos of the asphalt and concrete pavement cores are included in Appendix C.

Three CBR's were completed on bulk samples of differing soil units and the results are shown in the table below.

Table 1. CBR Testing Summary

Sample Description	Test Hole	Depth (m)	SPMDD (kg/m ³)	Opt. Moisture (%)	Percent Proctor (%)	Moisture Content (%)	CBR Value at 2.54 mm	CBR Value at 5.08 mm
Bulk Silt	TH19-22	0.3-1.5	1787	17.0	95.3	17.0	5.4%	4.8%
	TH19-23	0.3-1.5						
Bulk Clay	TH19-10	0.3-1.5	1642	21.7	94.4	23.4	3.4%	2.9%
	TH19-12	0.6-1.5						
Silt and Clay	Combined Grab Samples ¹	Below pavement – 1.4 m max. depth	1638	21.1	94.3	24.5	4.5%	3.4%

¹ - Combined grab samples: G09, G25, G37, G43, G61, G67, G73, G85, G97, G98, G99, G103, G104, G115

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 Morrison Hershfield (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

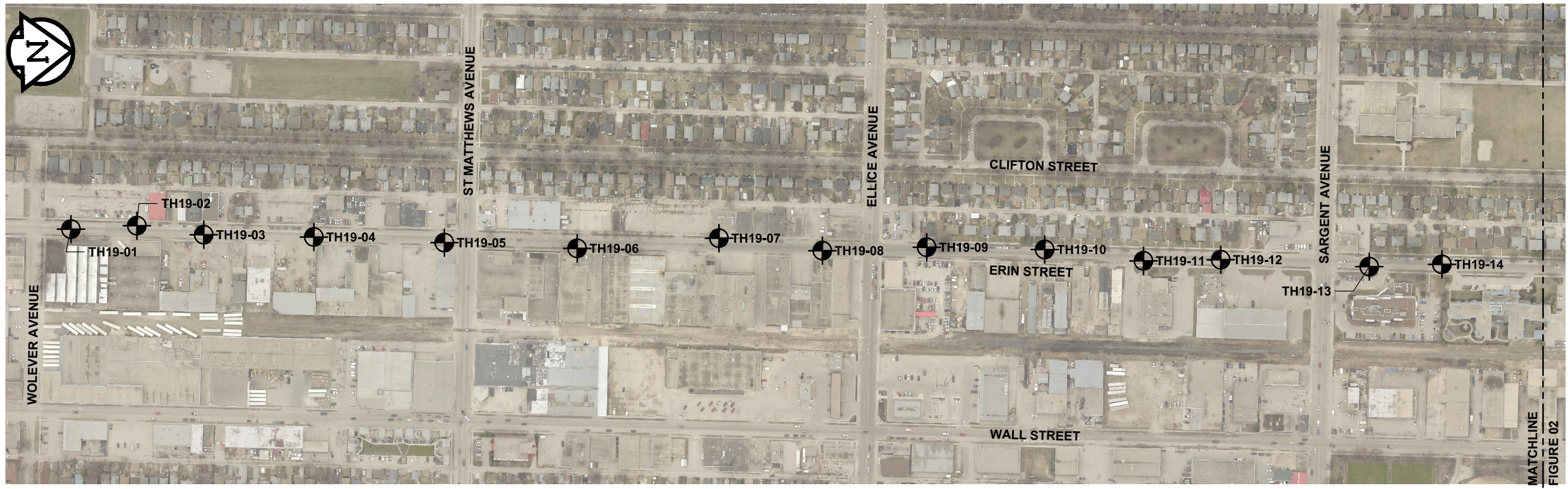
Z:\Projects\0035 Morrison Hershfield\0035 082 00 19-C-19 Erin-Wall-Sargent\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\ERIN STREET\0035-082-00-401\FIG 01-02_19-11-08_ERIN ST TH LOCATION_0_B_DW_0035-082-00.dwg, 11/8/2019 10:20:47 AM



0035 082 00

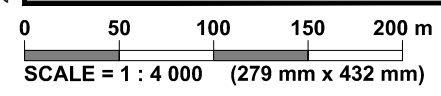
Morrison Hershfield

19-C-10 ERIN STREET PAVEMENT RENEWAL



KEY PLAN

SCALE : N.T.S.

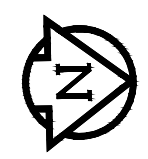


LEGEND:  TEST HOLE (TREK, 2019)

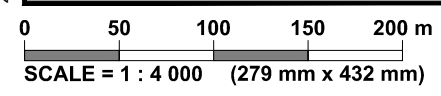
NOTES: 1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016

FIGURE 01
TEST HOLE LOCATION PLAN

Z:\Projects\0035 Morrison Hershfield\0035 082 00 19-C-19 Erin-Wall-Sargent\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\ERIN STREET\0035-082-00-401\FIG 01-02_19-11-08_ERIN ST TH LOCATION\TH19-15.dwg 2019 10:21:47 AM



KEY PLAN
SCALE : N.T.S.



LEGEND: TEST HOLE (TREK, 2019)

NOTES: 1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016

FIGURE 02
TEST HOLE LOCATION PLAN

Appendix A
Test Hole Logs

GENERAL NOTES

- 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.
- 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.
- 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		Particle Size		
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)	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 cases requiring dual symbols*	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3	ASTM Sieve sizes		
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines		Not meeting all gradation requirements for GW		#10 to #4 #40 to #10 #200 to #40	
		GM	Silty gravels, gravel-sand-silt mixtures		Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	mm	
		GC	Clayey gravels, gravel-sand-silt mixtures		Atterberg limits above "A" line or P.I. greater than 7			
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean gravel (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	mm	
			SP		Poorly-graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW		2.00 to 4.75 0.425 to 2.00 0.075 to 0.425
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols	Material
			SC		Clayey sands, sand-clay mixtures	Atterberg limits above "A" line or P.I. greater than 7		
					Sand	Coarse Medium Fine		
					Silt or Clay			
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		Particle Size ASTM Sieve Sizes mm > 300 75 to 300 19 to 75 4.75 to 19			
		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	

* 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

LEGEND OF ABBREVIATIONS AND SYMBOLS

LL - Liquid Limit (%)	▽ Water Level at Time of Drilling
PL - Plastic Limit (%)	▼ Water Level at End of Drilling
PI - Plasticity Index (%)	▽ Water Level After Drilling as Indicated on Test Hole Logs
MC - Moisture Content (%)	
SPT - Standard Penetration Test	
RQD- Rock Quality Designation	
Qu - Unconfined Compression	
Su - Undrained Shear Strength	
VW - Vibrating Wire Piezometer	
SI - Slope Incliner	

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:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
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:

<u>Descriptive Terms</u>	<u>SPT (N) (Blows/300 mm)</u>
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:

<u>Descriptive Terms</u>	<u>Undrained Shear Strength (kPa)</u>
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 TH19-01

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5527690, E-630384
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 110 mm thick														
		CONCRETE - 150 mm thick														
0.5		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics - black - moist, very stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G139												
		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G140												
1.0		SILT AND CLAY - brown - moist, stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G141												
		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G142												
1.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, stiff - high plasticity	<input checked="" type="checkbox"/>	G143												
2.0		- firm below 2.1 m														
2.5			<input checked="" type="checkbox"/>	G144												
3.0																

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 1.2 to 1.5 m.
 2) Test hole open to 1.4 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in East curb lane, 45 m North and 4.2 m West of fire hydrant at Erin Street and Wolver Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-02

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5527748, E-630381
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 3, 2019

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/m ³)		Undrained Shear Strength (kPa)	
					16	17	18	19
0.0 - 0.1		ASPHALT - 135 mm thick						
0.1 - 0.2		CONCRETE - 180 mm thick						
0.2 - 0.5		SAND AND CLAY - some silt, trace gravel (<20 mm diam.), trace organics - black - moist, firm - low plasticity	<input checked="" type="checkbox"/>	G145				
0.5 - 1.0		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G146				
1.0 - 1.5		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G147				
1.5 - 2.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G148				
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G149				
			<input checked="" type="checkbox"/>	G150				

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 1.5 m.
 2) Test hole open to 1.5 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in Median lane, 49.5 m North and 8 m West of fire hydrant at 777 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-03

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5527807, E-630389
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	50	100	150	200	250		
0.0 - 0.1		ASPHALT - 110 mm thick																
0.1 - 0.2		CONCRETE - 200 mm thick																
0.2 - 1.5		SAND AND GRAVEL (FILL) - silty - brown, moist, compact - well graded sand to gravel (<30 mm diam.) - sub-rounded to angular crushed "pit run"	<input checked="" type="checkbox"/>	G133														
0.5			<input checked="" type="checkbox"/>	G134														
1.0			<input checked="" type="checkbox"/>	G135														
1.5			<input checked="" type="checkbox"/>	G136														
1.5 - 1.8		TRANSITION: from SAND AND GRAVEL to CLAY	<input checked="" type="checkbox"/>	G137														
1.8 - 2.3		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G138														

END OF TEST HOLE AT 2.3 m IN CLAY

- 1) Seepage and sloughing observed below 1.5 m.
- 2) Test hole open to 1.8 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 16 m North and 4 m West of fire hydrant at 777 Erin Street.

SUB-SURFACE LOG LOGS 2019-10-04_ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL GDT 11/8/19

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira



Sub-Surface Log

Test Hole TH19-04

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5527904, E-630391
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - 115 mm thick														
0.1 - 0.2		CONCRETE - 150 mm thick														
0.2 - 0.8		SILT AND CLAY - trace gravel (<20 mm diam.), trace organics - black - moist, firm to stiff - intermediate to high plasticity		G127												
0.8 - 1.3		- grey, no organics below 0.8 m		G128												
1.3 - 1.5				G129												
1.5 - 1.9		SILT - trace clay - light brown - wet, soft - low plasticity		G130												
1.9 - 2.5				G131												
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, stiff - high plasticity		G132												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 1.3 to 1.9 m.
- 2) Test hole open to 1.2 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located between Median and West curb lane, 22 m South and 9 m West of fire hydrant at 803 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-05

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528019, E-630396
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Undrained Shear Strength (kPa)	
					16	17	18	19
0.0 - 0.1		ASPHALT - 225 mm thick						
0.1 - 0.2		CONCRETE - 125 mm thick						
0.2 - 0.4		SILT AND CLAY - trace gravel (<20 mm diam.), trace organics - black, moist, stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G121				<input checked="" type="checkbox"/>
0.4 - 1.5		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G122				
0.6 - 1.3			<input checked="" type="checkbox"/>	G123				
1.5 - 2.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G124				<input checked="" type="checkbox"/>
2.0 - 2.4			<input checked="" type="checkbox"/>	G125				<input checked="" type="checkbox"/>
2.4 - 2.6			<input checked="" type="checkbox"/>	G126				<input checked="" type="checkbox"/>

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.6 to 1.3 m.
- 2) Test hole open to 1.5 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 10 m South and 3 m West of fire hydrant at Erin Street and St. Matthews Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliwer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-06

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528136, E-630401
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	50	100	150	200	250		
0.0 - 0.1		ASPHALT - 170 mm thick																
0.1 - 0.2		CONCRETE - 190 mm thick																
0.2 - 0.6		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics - black, moist, stiff to very stiff - intermediate plasticity		G115														
0.6 - 1.5		SILT - trace to some clay - light brown - moist, soft - low plasticity - wet below 0.9 m		G116														
1.5 - 2.0		SILT - trace to some clay - light brown - moist, soft - low plasticity - wet below 0.9 m		G117														
2.0 - 2.5		SILT - trace to some clay - light brown - moist, soft - low plasticity - wet below 0.9 m		G118														
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity - firm below 2.0 m		G119														
3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity - firm below 2.0 m		G120														

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 0.6 to 1.5 m.
 2) Test hole open to 1.5 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in East curb lane, 11 m South and 3.1 m West of fire hydrant at 889 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-07

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528261, E-630392
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0 - 0.1		ASPHALT - 125 mm thick															
0.1 - 0.2		CONCRETE - 250 mm thick															
0.2 - 2.4		CLAY - silty, trace gravel (<20 mm diam.), trace organics - black - moist, firm to stiff - high plasticity - grey, no organics below 1.1 m - brown below 1.8 m		G109 G110 G111 G112 G113 G114													

END OF TEST HOLE AT 2.4 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 2.4 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in West curb lane, 15 m North and 9 m West of fire hydrant at 889 Erin Street.

SUB-SURFACE LOG LOGS 2019-10-04_ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira



Sub-Surface Log

Test Hole TH19-08

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528352, E-630403
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 190 mm thick														
		CONCRETE - 160 mm thick														
0.5		SILT AND CLAY - trace gravel (<20 mm diam.), trace organics - black - moist, stiff - intermediate to high plasticity	▲	G103												
		- brown, no gravel, no organics below 0.7 m	▲	G104												
1.0		SILT - trace clay - light brown - moist to wet, soft - low plasticity	▲	G105												
			▲	G106												
1.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, stiff - high plasticity	▲	G107												
2.0																
		- firm below 2.1 m														
2.5			▲	G108												
3.0																

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 1.1 to 1.5 m.
- 2) Test hole open to 1.7 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 33 m North and 4 m West of fire hydrant at Erin Street and Ellice Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-09

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528444, E-630400
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL ——— MC ——— LL —————●—————											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - 135 mm thick														
0.1 - 0.3		CONCRETE - 180 mm thick														
0.3 - 1.1		SILT AND CLAY - trace gravel (<20 mm diam.), trace organics - black - moist, stiff - intermediate plasticity		G97												
				G98												
				G99												
1.1 - 2.1		SILT - trace clay - light brown - wet, soft - low plasticity - hydrocarbon-like odour below 1.5 m		G100												
				G101												
2.1 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm - high plasticity, (hydrocarbon-like odour)		G102												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 1.1 to 2.1 m.
 2) Test hole open to 1.5 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in West curb lane, 39 m South and 9.2 m West of fire hydrant at 996 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04. ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-10

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528548, E-630402
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.15		ASPHALT - 115 mm thick														
0.15 - 0.3		CONCRETE - 140 mm thick														
0.3 - 0.6		SILT AND CLAY - trace sand, trace organics - black - moist, stiff - high plasticity	G91													
0.6 - 1.5		- grey, no organics below 0.6 m	G92													
1.5 - 2.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - grey - moist, firm - high plasticity	G93													
			G94													
			G95													
			G96													

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Bulk sample taken from 0.3 to 1.5 m for CBR testing.
 5) Test hole located in West curb lane, 11 m South and 9 m West of fire hydrant at 1020 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL GDT 11/8/19



Sub-Surface Log

Test Hole TH19-11

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528635, E-630412
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 290 mm thick														
		CONCRETE - 180 mm thick														
0.5		SILT AND CLAY - trace gravel (<20 mm diam.), trace organics - black - moist, stiff to very stiff - intermediate plasticity		G85												
1.0		SILT - trace clay - light brown - moist, soft - low plasticity - moist to wet below 1.0 m		G86												
1.5				G87												
1.5				G88												
2.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm - high plasticity		G89												
2.5				G90												
3.0																

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 1.5 m.
- 2) Test hole open to 1.4 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 25.5 m South and 2.8 m West of fire hydrant at 1052 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-12

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528703, E-630411
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 110 mm thick														
		CONCRETE - 220 mm thick														
0.5		SAND AND GRAVEL (FILL) - silty, some clay - brown, moist, compact - well graded sand to gravel (<40 mm diam.) - sub-rounded to angular crushed "pit run"	▲	G79												
1.0		CLAY - silty, trace gravel (<20 mm diam.) - brown - moist, stiff - high plasticity	▲	G80												
1.5		- firm to stiff below 1.5 m	▲	G81												
2.0		- firm below 2.1 m	▲	G82												
2.5			▲	G83												
3.0			▲	G84												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage or sloughing observed.
- 2) Test hole open to 3.0 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Bulk sample taken from 0.6 to 1.5 m for CBR testing.
- 5) Test hole located in Median lane, 25.5 m South and 2.8 m West of fire hydrant at 1052 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-13

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528834, E-630417
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Undrained Shear Strength (kPa)	
					16	17	18	19
0.0 - 0.1		ASPHALT - 170 mm thick						
0.1 - 0.2		CONCRETE - 210 mm thick						
0.2 - 0.4		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics, mottled black and grey, moist, very stiff, intermediate plasticity	<input checked="" type="checkbox"/>	G73				
0.4 - 0.8		CLAY - silty - brown - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G74				
0.8 - 1.4		SILT - trace to some clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G75				
1.4 - 1.8		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G76				
1.8 - 2.4		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G77				
2.4 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G78				

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in East curb lane, 28 m North and 3 m West of fire hydrant at Northeast of Erin Street and Sargent Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-14

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5528898, E-630415
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 2, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)								
					16	17	18	19	20	21	0	50	100	150	200	250	
0.0		ASPHALT - 135 mm thick															
0.1		CONCRETE - 185 mm thick															
0.2		SILT AND CLAY - some sand, trace organics - black - moist, firm to stiff - intermediate plasticity															
0.5		SILT - trace to some clay, trace sand - light brown - moist to wet, soft - no to low plasticity		G67													
0.8		SILT - trace to some clay, trace sand - light brown - moist to wet, soft - no to low plasticity		G68													
1.0		SILT - trace to some clay, trace sand - light brown - moist to wet, soft - no to low plasticity		G69													
1.5		SILT - trace to some clay, trace sand - light brown - moist to wet, soft - no to low plasticity		G70													
2.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity		G71													
2.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity		G72													
3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity															

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located between Median and West curb lane, 0.2 m North and 8 m West of fire hydrant at 1310 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-15

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529019, E-630422
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	50	100	150	200	250		
0.0 - 0.2		ASPHALT - 170 mm thick																
0.2 - 0.4		CONCRETE - 270 mm thick																
0.4 - 0.6		SILT AND CLAY - some sand, trace organics - black, stiff, low to intermediate plasticity	<input checked="" type="checkbox"/>	G61														
0.6 - 1.0		SILT - trace clay - light brown - moist, soft - no to low plasticity - moist to wet below 1.0 m	<input checked="" type="checkbox"/>	G62														
1.0 - 1.4		SILT - trace clay - light brown - moist, soft - no to low plasticity - moist to wet below 1.0 m	<input checked="" type="checkbox"/>	G63														
1.4 - 1.7		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, very stiff - high plasticity	<input checked="" type="checkbox"/>	G64														
1.7 - 2.1		- stiff below 1.7 m	<input checked="" type="checkbox"/>	G65														
2.1 - 3.0		- firm below 2.1 m	<input checked="" type="checkbox"/>	G66														

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage or sloughing observed.
- 2) Test hole open to 2.7 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 32 m North and 3.2 m West of fire hydrant at 1330 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-16

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529122, E-630424
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - 160 mm thick														
0.1 - 0.2		CONCRETE - 170 mm thick														
0.2 - 0.7		SILT AND CLAY - some sand - brown - moist, stiff - low plasticity	G55													
0.7 - 1.2		- soft below 0.7 m	G56													
1.2 - 1.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, stiff - high plasticity - firm below 1.5 m	G57													
1.5 - 2.0		- soft below 2.0 m	G58													
2.0 - 2.5			G59													
2.5 - 3.0			G60													

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 1.2 m.
- 2) Test hole open to 1.8 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 46 m South and 3.2 m West of fire hydrant at Southeast of Erin Street and Wellington Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira



Sub-Surface Log

Test Hole TH19-17

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529200, E-630420
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					<input type="checkbox"/> Torvane <input type="checkbox"/> <input checked="" type="checkbox"/> Pocket Pen. <input checked="" type="checkbox"/> <input type="checkbox"/> Qu <input type="checkbox"/> <input type="checkbox"/> Field Vane <input type="checkbox"/>											
0.0 - 0.1		ASPHALT - 135 mm thick														
0.1 - 0.3		CONCRETE - 185 mm thick														
0.3 - 3.0		CLAY - silty - grey - moist, stiff - high plasticity - soft below 1.5 m	<input checked="" type="checkbox"/>	G49												
			<input checked="" type="checkbox"/>	G50												
			<input checked="" type="checkbox"/>	G51												
			<input checked="" type="checkbox"/>	G52												
			<input checked="" type="checkbox"/>	G53												
			<input checked="" type="checkbox"/>	G54												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage or sloughing observed.
 2) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in West curb lane, 9 m North and 9 m West of fire hydrant at Northeast of Erin Street and Wellington Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-18

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529299, E-630422
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.1		ASPHALT - 90 mm thick														
0.1 - 0.3		CONCRETE - 200 mm thick														
0.3 - 0.6		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics - black - moist, stiff - intermediate plasticity	Grab (G)	G43												
0.6 - 1.0		SILT - trace clay - light brown - moist to wet, soft - low plasticity	Grab (G)	G44												
1.0 - 1.5		SILT - trace clay - light brown - moist to wet, soft - low plasticity	Grab (G)	G45												
1.5 - 2.1		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, very stiff - high plasticity - firm to stiff below 1.5 m	Grab (G)	G46												
2.1 - 2.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, very stiff - high plasticity - firm to stiff below 1.5 m	Grab (G)	G47												
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, very stiff - high plasticity - firm to stiff below 1.5 m	Grab (G)	G48												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.6 to 1.2 m.
- 2) Test hole open to 2.1 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in West curb lane, 26 m North and 7.5 m West of fire hydrant at 1407 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-19

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529410, E-630433
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)		Undrained Shear Strength (kPa)	
					16	17	18	19
0.0 - 0.05		ASPHALT - 70 mm thick						
0.05 - 0.15		CONCRETE - 190 mm thick						
0.15 - 0.45		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics - black - moist, firm to stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G37				
0.45 - 1.0		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G38				
1.0 - 1.5		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G39				
1.5 - 2.1		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm - high plasticity	<input checked="" type="checkbox"/>	G41				
2.1 - 2.7		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm - high plasticity	<input checked="" type="checkbox"/>	G42				

END OF TEST HOLE AT 3.0 m IN CLAY
 2) No seepage or sloughing observed.
 1) Test hole open to 3.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in East curb lane, 43 m North and 3 m West of fire hydrant at 1445 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-20

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529492, E-630429
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL _____ MC _____ LL _____ 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 130 mm thick														
		CONCRETE - 175 mm thick														
0.5		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics (wood debris) - black - moist, stiff - low plasticity	<input checked="" type="checkbox"/>	G31												
		SILT - trace to some clay - light brown - moist, soft - low plasticity	<input checked="" type="checkbox"/>	G32												
1.0			<input checked="" type="checkbox"/>	G33												
		TRANSITION: SILT to CLAY	<input checked="" type="checkbox"/>	G34												
1.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G35												
2.0																
2.5			<input checked="" type="checkbox"/>	G36												
3.0																

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 1.5 m.
- 2) Test hole open to 0.9 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located between Median and West curb lane, 40 m North and 7.4 m West of fire hydrant at 1474 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-21

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529602, E-630438
 Contractor: Maple Leaf Drilling Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 40 mm thick														
		CONCRETE - 235 mm thick														
0.5		SILT AND CLAY - some sand, trace gravel (<20 mm diam.), trace organics - mottled black and grey - moist to wet, firm - intermediate plasticity		G25												
		SILT - trace clay - light brown - moist to wet, soft - low plasticity		G26												
1.0				G27												
				G28												
1.5		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm - high plasticity		G29												
2.0																
				G30												
2.5																
3.0																

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 1.5 m.
- 2) Test hole open to 1.5 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 50 m North and 3 m West of fire hydrant at Erin Street and Richard Ave intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-22

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529691, E-630435
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)		Particle Size (%)		Undrained Shear Strength (kPa)									
					16	17	18	19	20	21	0	50	100	150	200	250		
0.0 - 0.1		ASPHALT - 130 mm thick																
0.1 - 0.2		CONCRETE - 180 mm thick																
0.2 - 0.7		SILT AND CLAY - some sand, trace organics (wood debris) - black - moist, very stiff - intermediate plasticity	<input checked="" type="checkbox"/>	G19														
0.7 - 1.0		- light brown, no organics, soft, low plasticity below 0.6 m	<input checked="" type="checkbox"/>	G20														
1.0 - 1.5		- moist to wet below 0.9 m	<input checked="" type="checkbox"/>	G21														
1.5 - 2.1			<input checked="" type="checkbox"/>	G22														
2.1 - 2.5			<input checked="" type="checkbox"/>	G23														
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, very stiff - high plasticity	<input checked="" type="checkbox"/>	G24														

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 0.7 to 2.1 m.
 2) Test hole open to 1.8 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Bulk sample taken from 0.6 to 1.5 m for CBR testing.
 5) Test hole located at intersection of Median and West curb lane, 7 m North and 10 m East of at 1560 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL GDT 11/8/19



Sub-Surface Log

Test Hole TH19-23

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529848, E-630443
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL											
					0	20	40	60	80	100	0	50	100	150	200	250
		ASPHALT - 120 mm thick														
		CONCRETE - 200 mm thick														
0.5		SILT AND CLAY - some sand - grey - moist, soft to firm - intermediate plasticity	G13													
		- light brown, soft below 0.9 m	G14													
1.0			G15													
			G16													
1.5		- hydrocarbon-like odour below 1.5 m	G17													
			G18													

END OF TEST HOLE AT 3.0 m IN SILT AND CLAY
 1) No seepage observed. Sloughing in silt and clay layer observed from 1.5 to 3.0 m.
 2) Test hole open to 2.0 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Bulk sample taken from 0.9 to 1.5 m for CBR testing.
 5) Test hole located in East curb lane, 16 m North and 3 m West of fire hydrant at 1395 Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL GDT 11/8/19



Sub-Surface Log

Test Hole TH19-24

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5529935, E-630438
 Contractor: Maple Leaf Drilling Ltd. Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.0 - 0.2		ASPHALT - 280 mm thick														
0.2 - 0.5		CONCRETE - 350 mm thick														
0.5 - 0.7		SAND AND GRAVEL (FILL) - silty, brown, moist, compact, well graded sand to gravel (<40 mm diam.), sub-rounded to angular crushed "pit run"	<input checked="" type="checkbox"/>	G07												
0.7 - 1.0		CLAY - silty, trace organics - black - stiff to very stiff - intermediate to high plasticity	<input checked="" type="checkbox"/>	G08												
1.0 - 1.5		- grey, firm to stiff below 1.2 m	<input checked="" type="checkbox"/>	G09												
1.5 - 2.0		SILT - trace clay - light brown - moist to wet, soft - low plasticity	<input checked="" type="checkbox"/>	G10												
2.0 - 2.5			<input checked="" type="checkbox"/>	G11												
2.5 - 3.0		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity	<input checked="" type="checkbox"/>	G12												

END OF TEST HOLE AT 3.0 m IN CLAY
 1) No seepage observed. Sloughing in silt layer observed from 1.5 to 2.4 m.
 2) Test hole open to 1.8 m immediately after drilling.
 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
 4) Test hole located in West curb lane, 2.5 m South and 10 m West of fire hydrant at South of Railway crossing of Erin Street.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04 ERIN STREET 0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19



Sub-Surface Log

Test Hole TH19-25

1 of 1

Client: Morrison Hershfield Project Number: 0035-082-00-401
 Project Name: 19-C-10 Erin Street Pavement Renewal Location: UTM N-5530059, E-630448
 Contractor: Maple Leaf Drilling Ground Elevation: Top of Pavement
 Method: 125 mm Solid Stem Auger, CME55 Truck Mount Date Drilled: October 1, 2019

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/m ³)						Undrained Shear Strength (kPa)					
					16	17	18	19	20	21	Test Type					
					Particle Size (%)											
					0	20	40	60	80	100						
					PL MC LL 0 20 40 60 80 100											
					0	20	40	60	80	100	0	50	100	150	200	250
0.00 - 0.05		ASPHALT - 160 mm thick														
0.05 - 0.10		CONCRETE - 100 mm thick														
0.10 - 0.40		SAND AND GRAVEL (FILL) - silty, brown, moist, compact, well graded sand to gravel (<20 mm diam.), sub-rounded to angular crushed "pit run"		G01												
0.40 - 1.20		CLAY - silty, trace organics - black - moist, stiff to very stiff - high plasticity - dark grey, no organics below 0.6 m		G02												
1.20 - 1.50		- brown below 1.2 m		G03												
1.50 - 2.00		SILT - some clay - light brown - moist to wet, soft - low plasticity		G04												
2.00 - 3.00		CLAY - silty, trace silt inclusions (<10 mm diam.), trace precipitates (sulphate, <10 mm diam.) - mottled brown and grey - moist, firm to stiff - high plasticity		G05												
				G06												

END OF TEST HOLE AT 3.0 m IN CLAY

- 1) No seepage observed. Sloughing in silt layer observed from 1.2 to 2.0 m.
- 2) Test hole open to 1.7 m immediately after drilling.
- 3) Test hole backfilled with auger cuttings, granular fill and cold patch asphalt.
- 4) Test hole located in East curb lane, 25 m South and 3.5 m East of fire hydrant at intersection of Notre Dame Ave and Erin Street intersection.

Logged By: Bryan Hiebert Reviewed By: Angela Fidler-Kliewer Project Engineer: Nelson Ferreira

SUB-SURFACE LOG LOGS 2019-10-04. ERIN STREET_0035-082-00_0_A_BMH.GPJ TREK GEOTECHNICAL.GDT 11/8/19

Appendix B

Summary Table & Lab Testing Results



**19-C-10 Erin Street Renewal
Sub-Surface Investigation
Erin 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)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index	
TH19-05	UTM : 5528019 N, 630396 E Located in Southbound, East curb lane, 10 m South and 3 m West of fire hydrant at Erin Street and St. Matthews Ave intersection	Asphalt	225	Concrete	125	Silt and Clay	0.5	0.6	30								
						Silt	0.8	0.9	21								
						Silt	1.1	1.2	22								
						Clay	1.4	1.5	26								
						Clay	1.7	1.8	40								
						Clay	2.3	2.4	48								
TH19-06	UTM : 5528136 N, 630401 E Located in Southbound, East curb lane, 11 m South and 3.1 m West of fire hydrant at 889 Erin Street	Asphalt	170	Concrete	190	Silt and Clay	0.5	0.6	16								
						Silt	0.8	0.9	19								
						Silt	1.1	1.2	24								
						Silt	1.4	1.5	28								
						Clay	1.7	1.8	39								
						Clay	2.3	2.4	49								
TH19-07	UTM : 5528261 N, 630392 E Located in Southbound, West curb lane, 15 m North and 9 m West of fire hydrant at 889 Erin Street	Asphalt	125	Concrete	250	Clay	0.5	0.6	32								
						Clay	0.8	0.9	30								
						Clay	1.1	1.2	32								
						Clay	1.4	1.5	34								
						Clay	1.7	1.8	37								
						Clay	2.3	2.4	43								
TH19-08	UTM : 5528352 N, 630403 E Located in Southbound, East curb lane, 33 m North and 4 m West of fire hydrant at Erin Street and Ellice Ave intersection	Asphalt	190	Concrete	160	Silt and Clay	0.5	0.6	27								
						Silt and Clay	0.8	0.9	29								
						Silt	1.1	1.2	24								
						Silt	1.4	1.5	22								
						Clay	1.7	1.8	39								
						Clay	2.4	2.6	26								



**19-C-10 Erin Street Renewal
Sub-Surface Investigation
Erin 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)		Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Plastic	Liquid	Plasticity Index
TH19-13	UTM : 5528834 N, 630417 E Located in Southbound, East curb lane, 28 m North and 3 m West of fire hydrant at Northeast of Erin Street and Sargent Ave intersection.	Asphalt	170	Concrete	210	Silt and Clay	0.5	0.6	16							
						Clay	0.8	0.9	28							
						Silt	1.1	1.2	22							
						Silt	1.4	1.5	26							
						Clay	1.7	1.8	45							
						Clay	2.4	2.6	53							
TH19-14	UTM : 5528898 N, 630415 E Located in Southbound, Intersection of Median and West curb lane, 0.2 m North and 8 m West of fire hydrant at 1310 Erin Street	Asphalt	135	Concrete	185	Silt and Clay	0.5	0.6	30							
						Silt	0.8	0.9	20	11.5	79.0	9.5		17	22	6
						Silt	1.1	1.2	22							
						Silt	1.4	1.5	22							
						Clay	1.7	1.8	38							
						Clay	2.4	2.6	47							
TH19-15	UTM : 5529019 N, 630422 E Located in Southbound, East curb lane, 32 m North and 3.2 m West of fire hydrant at 1330 Erin Street	Asphalt	170	Concrete	270	Silt and Clay	0.5	0.6	26							
						Silt	0.8	0.9	16							
						Silt	1.1	1.2	20							
						Clay	1.4	1.5	28							
						Clay	1.7	1.8	45							
						Clay	2.1	2.3	47							
TH19-16	UTM : 5529122 N, 630424 E Located in Southbound, East curb lane, 46 m South and 3.2 m West of fire hydrant at Southeast of Erin Street and Wellington Ave intersection	Asphalt	160	Concrete	170	Silt and Clay	0.3	0.5	28							
						Silt and Clay	0.6	0.8	16	16.8	65.5	17.8		15	25	11
						Silt and Clay	0.9	1.1	24							
						Clay	1.2	1.4	40							
						Clay	1.5	1.7	46							
						Clay	2.1	2.3	57							



Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street

Sample Date 02-Oct-19
Test Date 04-Oct-19
Technician DS

Test Hole	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01	TH19-01
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.3 - 2.4
Sample #	G139	G140	G141	G142	G143	G144
Tare ID	AB58	AC28	Z22	H77	K7	F61
Mass of tare	6.8	6.6	8.4	8.6	8.6	8.4
Mass wet + tare	196.8	241.6	209.4	255.6	191.6	176.6
Mass dry + tare	155.1	199.0	166.4	207.4	143.0	124.0
Mass water	41.7	42.6	43.0	48.2	48.6	52.6
Mass dry soil	148.3	192.4	158.0	198.8	134.4	115.6
Moisture %	28.1%	22.1%	27.2%	24.2%	36.2%	45.5%

Test Hole	TH19-02	TH19-02	TH19-02	TH19-02	TH19-02	TH19-02
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.3 - 2.4
Sample #	G145	G146	G147	G148	G149	G150
Tare ID	Z134	H60	F95	A103	D31	Z74
Mass of tare	8.4	8.6	8.4	8.6	8.6	8.6
Mass wet + tare	509.6	231.2	239.0	219.8	181.8	189.8
Mass dry + tare	448.0	189.7	196.1	179.7	133.7	131.1
Mass water	61.6	41.5	42.9	40.1	48.1	58.7
Mass dry soil	439.6	181.1	187.7	171.1	125.1	122.5
Moisture %	14.0%	22.9%	22.9%	23.4%	38.4%	47.9%

Test Hole	TH19-03	TH19-03	TH19-03	TH19-03	TH19-03	TH19-03
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G133	G134	G135	G136	G137	G138
Tare ID	LOCKEY	N36	N44	P01	Z111	Z08
Mass of tare	356.6	8.4	8.6	8.6	8.4	8.4
Mass wet + tare	1462.2	257.6	227.0	238.4	287.2	183.8
Mass dry + tare	1402.1	240.1	213.6	221.8	251.3	132.6
Mass water	60.1	17.5	13.4	16.6	35.9	51.2
Mass dry soil	1045.5	231.7	205.0	213.2	242.9	124.2
Moisture %	5.7%	7.6%	6.5%	7.8%	14.8%	41.2%



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Test Hole	TH19-04	TH19-04	TH19-04	TH19-04	TH19-04	TH19-04
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.3 - 2.4
Sample #	G127	G128	G129	G130	G131	G132
Tare ID	W99	AC08	Z127	F126	Z62	N03
Mass of tare	8.6	6.7	8.6	8.4	8.8	8.5
Mass wet + tare	238.2	295.3	254.8	295.6	288.4	276.6
Mass dry + tare	187.4	231.7	198.7	230.7	238.6	201.1
Mass water	50.8	63.6	56.1	64.9	49.8	75.5
Mass dry soil	178.8	225.0	190.1	222.3	229.8	192.6
Moisture %	28.4%	28.3%	29.5%	29.2%	21.7%	39.2%

Test Hole	TH19-05	TH19-05	TH19-05	TH19-05	TH19-05	TH19-05
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.3 - 2.4
Sample #	G121	G122	G123	G124	G125	G126
Tare ID	AC17	W15	Q01	Z98	A19	F142
Mass of tare	6.7	8.4	8.5	8.4	8.6	8.8
Mass wet + tare	310.0	257.7	248.4	269.3	222.7	305.7
Mass dry + tare	240.1	213.9	205.2	215.7	161.4	209.9
Mass water	69.9	43.8	43.2	53.6	61.3	95.8
Mass dry soil	233.4	205.5	196.7	207.3	152.8	201.1
Moisture %	29.9%	21.3%	22.0%	25.9%	40.1%	47.6%

Test Hole	TH19-06	TH19-06	TH19-06	TH19-06	TH19-06	TH19-06
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.3 - 2.4
Sample #	G115	G116	G117	G118	G119	G120
Tare ID	E121	N42	E138	C17	Z09	AA01
Mass of tare	8.4	8.5	8.7	8.7	8.5	6.7
Mass wet + tare	242.9	227.7	163.1	232.4	242.0	200.2
Mass dry + tare	210.0	192.7	133.5	183.9	176.4	136.3
Mass water	32.9	35.0	29.6	48.5	65.6	63.9
Mass dry soil	201.6	184.2	124.8	175.2	167.9	129.6
Moisture %	16.3%	19.0%	23.7%	27.7%	39.1%	49.3%



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Test Hole	TH19-07	TH19-07	TH19-07	TH19-07	TH19-07	TH19-07
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.3 - 2.4
Sample #	G109	G110	G111	G112	G113	G114
Tare ID	AB87	W08	E55	AA14	E78	P24
Mass of tare	6.7	8.5	8.7	6.7	8.6	8.6
Mass wet + tare	236.0	211.2	197.2	221.7	260.4	210.1
Mass dry + tare	181.1	164.6	152.1	167.8	192.3	149.2
Mass water	54.9	46.6	45.1	53.9	68.1	60.9
Mass dry soil	174.4	156.1	143.4	161.1	183.7	140.6
Moisture %	31.5%	29.9%	31.5%	33.5%	37.1%	43.3%

Test Hole	TH19-08	TH19-08	TH19-08	TH19-08	TH19-08	TH19-08
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.4 - 2.6
Sample #	G103	G104	G105	G106	G107	G108
Tare ID	N85	AB20	W09	E94	E100	Z85
Mass of tare	8.5	6.7	8.8	8.5	8.5	8.4
Mass wet + tare	278.8	214.0	219.9	218.7	175.6	156.4
Mass dry + tare	220.9	167.7	179.2	180.3	128.9	126.2
Mass water	57.9	46.3	40.7	38.4	46.7	30.2
Mass dry soil	212.4	161.0	170.4	171.8	120.4	117.8
Moisture %	27.3%	28.8%	23.9%	22.4%	38.8%	25.6%

Test Hole	TH19-09	TH19-09	TH19-09	TH19-09	TH19-09	TH19-09
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.3 - 2.4
Sample #	G97	G98	G99	G100	G101	G102
Tare ID	W70	H74	N82	Q11	E22	A6
Mass of tare	8.6	8.7	8.4	8.7	8.8	8.2
Mass wet + tare	204.5	213.8	255.0	208.5	239.2	183.3
Mass dry + tare	163.4	166.3	202.2	169.1	194.7	137.6
Mass water	41.1	47.5	52.8	39.4	44.5	45.7
Mass dry soil	154.8	157.6	193.8	160.4	185.9	129.4
Moisture %	26.6%	30.1%	27.2%	24.6%	23.9%	35.3%



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Test Hole	TH19-10	TH19-10	TH19-10	TH19-10	TH19-10	TH19-10
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.4 - 2.6
Sample #	G91	G92	G93	G94	G95	G96
Tare ID	Z75	N75	F116	N37	W71	C28
Mass of tare	8.5	8.8	8.3	8.5	8.4	8.3
Mass wet + tare	197.6	359.0	151.3	203.7	199.6	158.4
Mass dry + tare	157.8	283.4	119.3	158.1	141.4	109.1
Mass water	39.8	75.6	32.0	45.6	58.2	49.3
Mass dry soil	149.3	274.6	111.0	149.6	133.0	100.8
Moisture %	26.7%	27.5%	28.8%	30.5%	43.8%	48.9%

Test Hole	TH19-11	TH19-11	TH19-11	TH19-11	TH19-11	TH19-11
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.4 - 2.6
Sample #	G85	G86	G87	G88	G89	G90
Tare ID	F1	Z73	AA22	A30	E44	E41
Mass of tare	8.6	8.5	6.9	8.2	8.6	8.5
Mass wet + tare	271.6	195.0	192.8	204.6	175.7	273.3
Mass dry + tare	221.0	165.4	159.1	165.5	123.5	187.3
Mass water	50.6	29.6	33.7	39.1	52.2	86.0
Mass dry soil	212.4	156.9	152.2	157.3	114.9	178.8
Moisture %	23.8%	18.9%	22.1%	24.9%	45.4%	48.1%

Test Hole	TH19-12	TH19-12	TH19-12	TH19-12	TH19-12	TH19-12
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.4 - 2.6
Sample #	G79	G80	G81	G82	G83	G84
Tare ID	E42	H35	W17	K24	W15	E2
Mass of tare	8.7	8.4	8.7	8.6	8.5	8.6
Mass wet + tare	336.4	269.2	208.8	242.7	221.4	219.4
Mass dry + tare	303.1	216.3	161.5	187.0	157.9	148.2
Mass water	33.3	52.9	47.3	55.7	63.5	71.2
Mass dry soil	294.4	207.9	152.8	178.4	149.4	139.6
Moisture %	11.3%	25.4%	31.0%	31.2%	42.5%	51.0%



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Test Hole	TH19-13	TH19-13	TH19-13	TH19-13	TH19-13	TH19-13
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.4 - 2.6
Sample #	G73	G74	G75	G76	G77	G78
Tare ID	F132	C2	N59	N32	A32	E52
Mass of tare	8.6	8.9	8.5	8.3	9.1	8.4
Mass wet + tare	192.8	181.9	195.8	184.6	160.3	248.2
Mass dry + tare	168.1	144.5	161.5	148.8	113.3	164.9
Mass water	24.7	37.4	34.3	35.8	47.0	83.3
Mass dry soil	159.5	135.6	153.0	140.5	104.2	156.5
Moisture %	15.5%	27.6%	22.4%	25.5%	45.1%	53.2%

Test Hole	TH19-14	TH19-14	TH19-14	TH19-14	TH19-14	TH19-14
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.4 - 2.6
Sample #	G67	G68	G69	G70	G71	G72
Tare ID	P28	P85	D21	AC10	N22	Z26
Mass of tare	8.5	8.4	8.4	6.4	8.4	8.3
Mass wet + tare	251.6	407.7	202.8	172.2	200.2	295.2
Mass dry + tare	195.2	341.8	168.4	142.1	147.6	202.9
Mass water	56.4	65.9	34.4	30.1	52.6	92.3
Mass dry soil	186.7	333.4	160.0	135.7	139.2	194.6
Moisture %	30.2%	19.8%	21.5%	22.2%	37.8%	47.4%

Test Hole	TH19-15	TH19-15	TH19-15	TH19-15	TH19-15	TH19-15
Depth (m)	0.5 - 0.6	0.8 - 0.9	1.1 - 1.2	1.4 - 1.5	1.7 - 1.8	2.1 - 2.3
Sample #	G61	G62	G63	G64	G65	G66
Tare ID	AB07	AA19	F32	ABC2	W47	AB28
Mass of tare	6.8	6.8	8.3	6.7	8.6	6.8
Mass wet + tare	294.5	180.1	347.1	265.4	265.9	319.4
Mass dry + tare	235.7	156.3	289.6	208.4	186.5	219.8
Mass water	58.8	23.8	57.5	57.0	79.4	99.6
Mass dry soil	228.9	149.5	281.3	201.7	177.9	213.0
Moisture %	25.7%	15.9%	20.4%	28.3%	44.6%	46.8%



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Test Hole	TH19-16	TH19-16	TH19-16	TH19-16	TH19-16	TH19-16
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G55	G56	G57	G58	G59	G60
Tare ID	E5	P21	H20	AB96	H53	Z185
Mass of tare	8.6	8.4	8.4	6.8	8.6	8.6
Mass wet + tare	215.8	518.8	232.4	201.2	179.2	184.2
Mass dry + tare	171.1	447.2	189.5	145.6	125.5	120.6
Mass water	44.7	71.6	42.9	55.6	53.7	63.6
Mass dry soil	162.5	438.8	181.1	138.8	116.9	112.0
Moisture %	27.5%	16.3%	23.7%	40.1%	45.9%	56.8%

Test Hole	TH19-17	TH19-17	TH19-17	TH19-17	TH19-17	TH19-17
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G49	G50	G51	G52	G53	G54
Tare ID	AC06	E113	E90	AB11	W19	F53
Mass of tare	8.2	8.6	8.6	6.7	8.7	8.6
Mass wet + tare	230.0	215.1	145.6	154.5	173.6	135.3
Mass dry + tare	176.2	163.1	108.5	112.6	110.1	86.7
Mass water	53.8	52.0	37.1	41.9	63.5	48.6
Mass dry soil	168.0	154.5	99.9	105.9	101.4	78.1
Moisture %	32.0%	33.7%	37.1%	39.6%	62.6%	62.2%

Test Hole	TH19-18	TH19-18	TH19-18	TH19-18	TH19-18	TH19-18
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G43	G44	G45	G46	G47	G48
Tare ID	N104	H59	H56	W80	N92	E99
Mass of tare	8.5	8.6	8.6	8.7	8.5	8.7
Mass wet + tare	310.7	182.3	199.3	262.5	214.2	168.2
Mass dry + tare	252.4	149.7	160.9	204.3	152.5	112.7
Mass water	58.3	32.6	38.4	58.2	61.7	55.5
Mass dry soil	243.9	141.1	152.3	195.6	144.0	104.0
Moisture %	23.9%	23.1%	25.2%	29.8%	42.8%	53.4%



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Test Hole	TH19-19	TH19-19	TH19-19	TH19-19	TH19-19	TH19-19
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G37	G38	G39	G40	G41	G42
Tare ID	P33	D20	E67	W45	F114	F6
Mass of tare	8.4	8.7	8.6	8.4	8.6	8.7
Mass wet + tare	190.4	184.7	193.3	193.5	207.3	220.9
Mass dry + tare	150.0	153.8	158.8	158.7	144.8	149.5
Mass water	40.4	30.9	34.5	34.8	62.5	71.4
Mass dry soil	141.6	145.1	150.2	150.3	136.2	140.8
Moisture %	28.5%	21.3%	23.0%	23.2%	45.9%	50.7%

Test Hole	TH19-20	TH19-20	TH19-20	TH19-20	TH19-20	TH19-20
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G31	G32	G33	G34	G35	G36
Tare ID	W69	W75	P23	Z103	W06	N06
Mass of tare	8.4	8.5	8.3	8.4	8.6	8.7
Mass wet + tare	252.7	211.2	249.9	281.9	222.6	249.3
Mass dry + tare	205	173.7	206.5	215.6	155.2	170.9
Mass water	47.7	37.5	43.4	66.3	67.4	78.4
Mass dry soil	196.6	165.2	198.2	207.2	146.6	162.2
Moisture %	24.3%	22.7%	21.9%	32.0%	46.0%	48.3%

Test Hole	TH19-21	TH19-21	TH19-21	TH19-21	TH19-21	TH19-21
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G25	G26	G27	G28	G29	G30
Tare ID	C12	F5	E95	E114	F130	Z82
Mass of tare	8.5	8.6	8.7	8.7	8.6	8.3
Mass wet + tare	281.8	248.3	241.7	220.2	237	210.9
Mass dry + tare	233.4	205.9	198.8	179.1	163.1	151.7
Mass water	48.4	42.4	42.9	41.1	73.9	59.2
Mass dry soil	224.9	197.3	190.1	170.4	154.5	143.4
Moisture %	21.5%	21.5%	22.6%	24.1%	47.8%	41.3%



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Test Hole	TH19-22	TH19-22	TH19-22	TH19-22	TH19-22	TH19-22
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G19	G20	G21	G22	G23	G24
Tare ID	W04	E56	AA08	W10	K12	K22
Mass of tare	8.5	8.7	6.8	8.4	8.7	8.5
Mass wet + tare	161	201.9	225.6	250.7	230.8	195.5
Mass dry + tare	126.8	165.8	179.7	206.1	186.9	147.5
Mass water	34.2	36.1	45.9	44.6	43.9	48.0
Mass dry soil	118.3	157.1	172.9	197.7	178.2	139.0
Moisture %	28.9%	23.0%	26.5%	22.6%	24.6%	34.5%

Test Hole	TH19-23	TH19-23	TH19-23	TH19-23	TH19-23	TH19-23
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	2.1 - 2.3
Sample #	G13	G14	G15	G16	G17	G18
Tare ID	P34	Z81	C11	F86	F2	D35
Mass of tare	8.5	8.4	8.3	8.3	8.4	8.5
Mass wet + tare	248.9	200.8	210	199.7	200.7	219.1
Mass dry + tare	212.5	164	170	163.8	158.4	177.2
Mass water	36.4	36.8	40.0	35.9	42.3	41.9
Mass dry soil	204.0	155.6	161.7	155.5	150.0	168.7
Moisture %	17.8%	23.7%	24.7%	23.1%	28.2%	24.8%

Test Hole	TH19-24	TH19-24	TH19-24	TH19-24	TH19-24	TH19-24
Depth (m)	0.5 - 0.8	0.9 - 1.1	1.2 - 1.4	1.5 - 1.7	1.8 - 2.0	2.4 - 2.6
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	A102	P08	E60	W13	W70	E18
Mass of tare	8.4	8.6	8.4	8.4	8.4	8.4
Mass wet + tare	262.6	220.2	171.8	182.8	228.6	162.6
Mass dry + tare	214.2	170.7	132.7	147.9	186.8	114.2
Mass water	48.4	49.5	39.1	34.9	41.8	48.4
Mass dry soil	205.8	162.1	124.3	139.5	178.4	105.8
Moisture %	23.5%	30.5%	31.5%	25.0%	23.4%	45.7%



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Test Hole	TH19-25	TH19-25	TH19-25	TH19-25	TH19-25	TH19-25
Depth (m)	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.4	1.7 - 1.8	2.1 - 2.3
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	A27	P03	E38	W96	N47	F100
Mass of tare	8.4	8.7	8.4	8.7	8.4	8.5
Mass wet + tare	156.2	189.3	202.1	180	176.7	241.3
Mass dry + tare	129	141	153.9	138.6	146	168.5
Mass water	27.2	48.3	48.2	41.4	30.7	72.8
Mass dry soil	120.6	132.3	145.5	129.9	137.6	160.0
Moisture %	22.6%	36.5%	33.1%	31.9%	22.3%	45.5%



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Grain Size Analysis (Sieve Method)

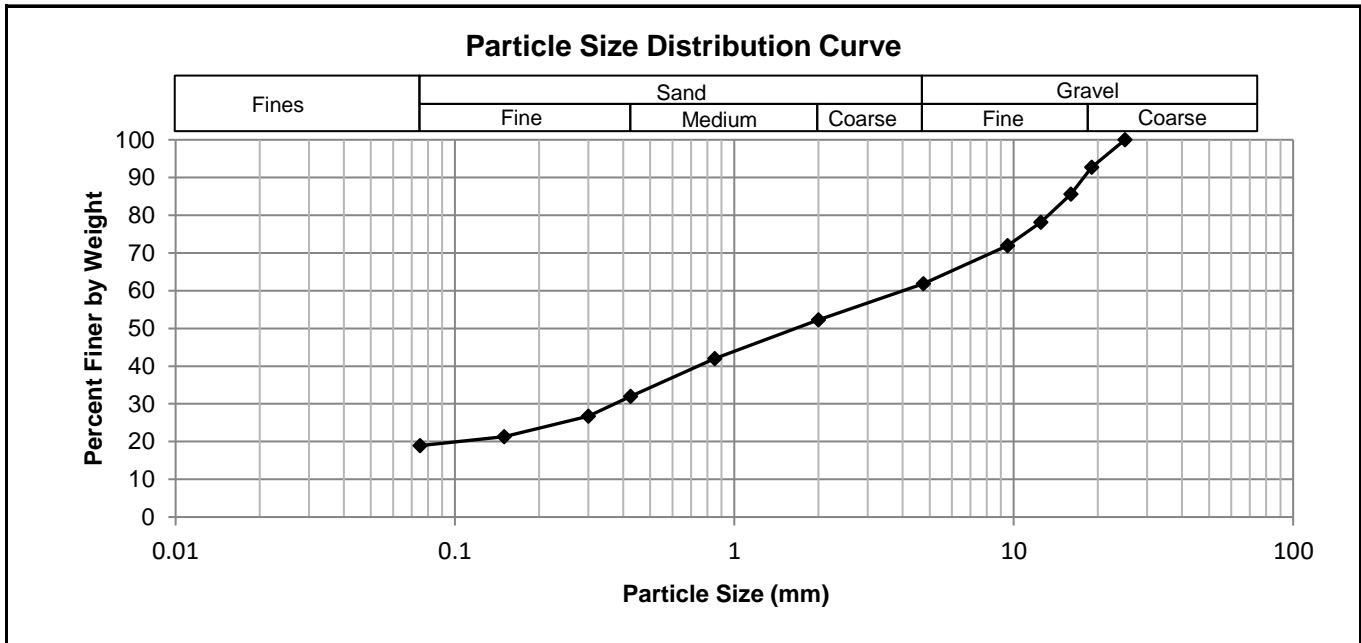
ASTM C136-14

ASTM C117-13

Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street

Test Hole TH19-03
Sample # G133
Depth (m) 0.3 - 0.45
Date Sampled 2-Oct-19
Date Tested 7-Oct-19
Technician BMH

Gravel %	38.2
Sand %	42.9
Fines %	18.9



Sieve Opening (mm)	Percent Passing	Specification (Min - Max)
25.0	100	-
19.0	93	-
16.0	86	-
12.5	78	-
9.5	72	-
4.75	62	-
2.00	52	-
0.85	42	-
0.425	32	-
0.300	27	-
0.150	21	-
0.075	19	-



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

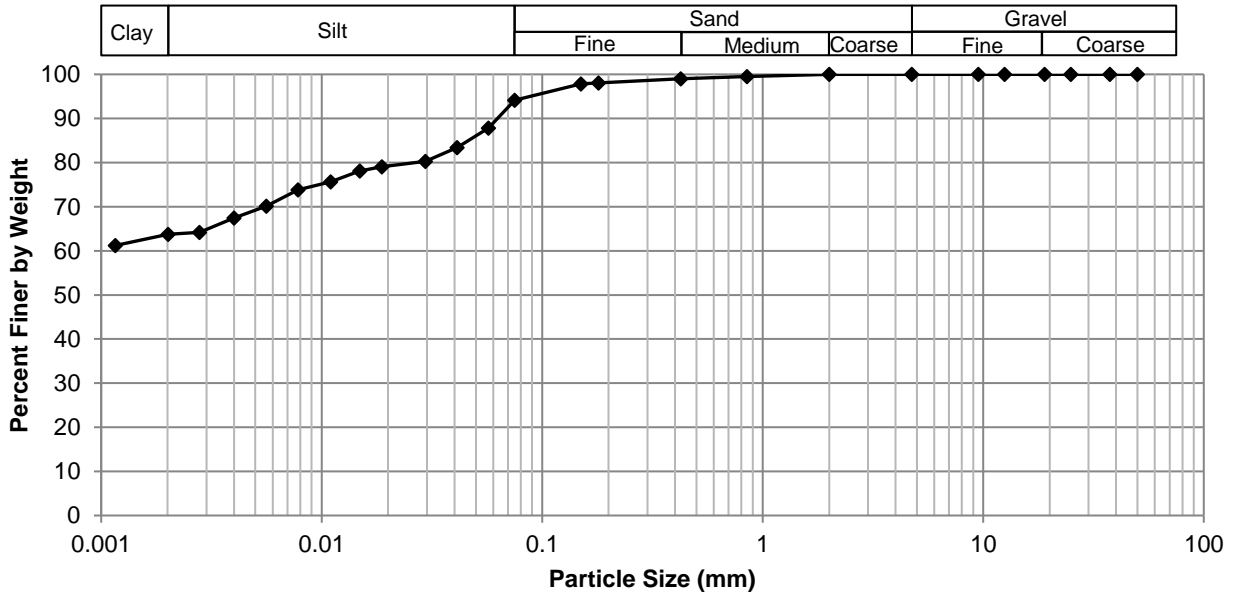
Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Test Hole TH19-25
Sample # G02
Depth (m) 0.6 - 0.8
Sample Date 4-Oct-19
Test Date 16-Oct-19
Technician SB/KG

Gravel	0.0%
Sand	5.9%
Silt	30.4%
Clay	63.7%

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	94.12
37.5	100.00	2.00	100.00	0.0570	87.82
25.0	100.00	0.850	99.51	0.0412	83.44
19.0	100.00	0.425	99.02	0.0295	80.31
12.5	100.00	0.180	98.05	0.0188	79.06
9.50	100.00	0.150	97.83	0.0149	78.12
4.75	100.00	0.075	94.12	0.0110	75.68
				0.0078	73.86
				0.0056	70.16
				0.0040	67.46
				0.0028	64.18
				0.0020	63.72
				0.0012	61.20



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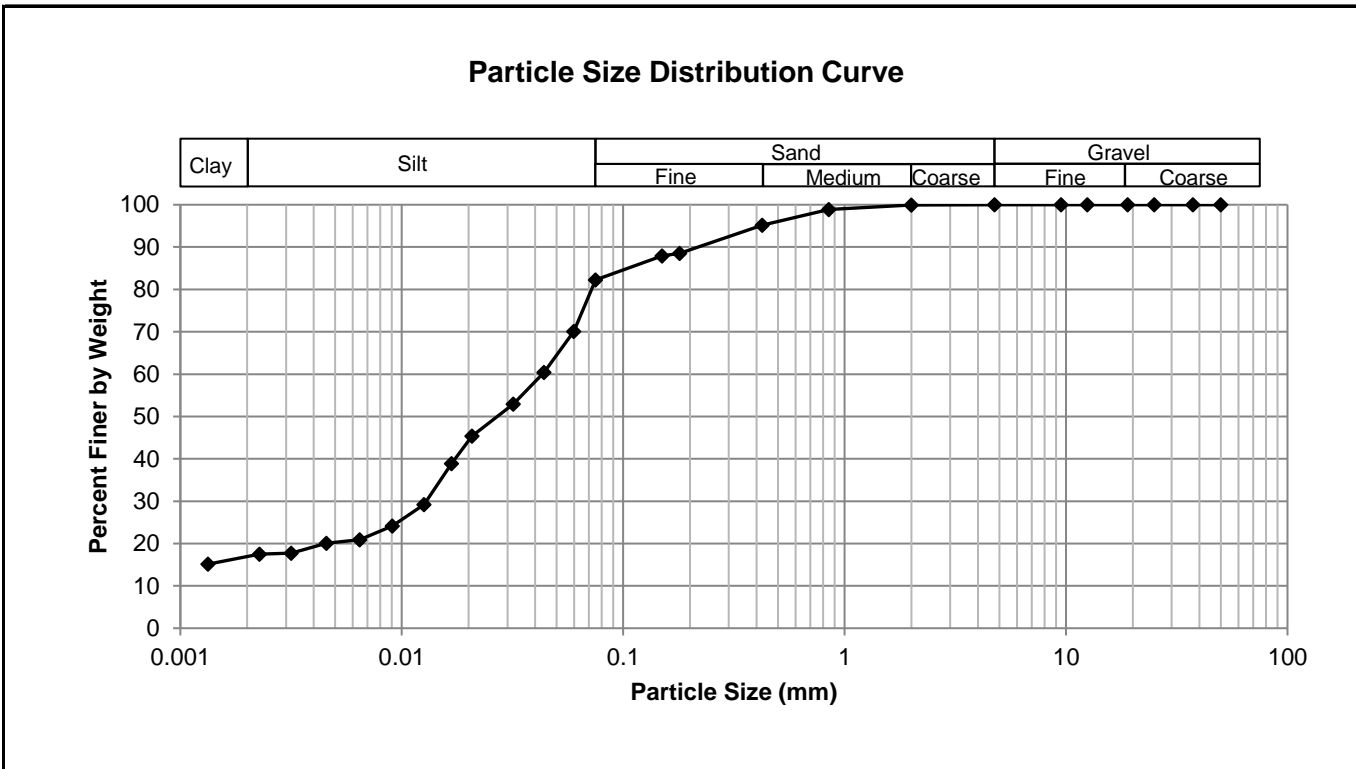
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Test Hole TH19-16
Sample # G56
Depth (m) 0.6 - 0.8
Sample Date 1-Oct-19
Test Date 8-Oct-19
Technician KG

Gravel	0.0%
Sand	17.8%
Silt	65.5%
Clay	16.8%



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	82.23
37.5	100.00	2.00	99.91	0.0598	70.09
25.0	100.00	0.850	98.87	0.0440	60.41
19.0	100.00	0.425	95.16	0.0319	52.91
12.5	100.00	0.180	88.56	0.0207	45.42
9.50	100.00	0.150	87.89	0.0168	38.86
4.75	100.00	0.075	82.23	0.0126	29.17
				0.0091	24.17
				0.0065	20.87
				0.0046	20.06
				0.0032	17.76
				0.0023	17.46
				0.0013	15.13



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

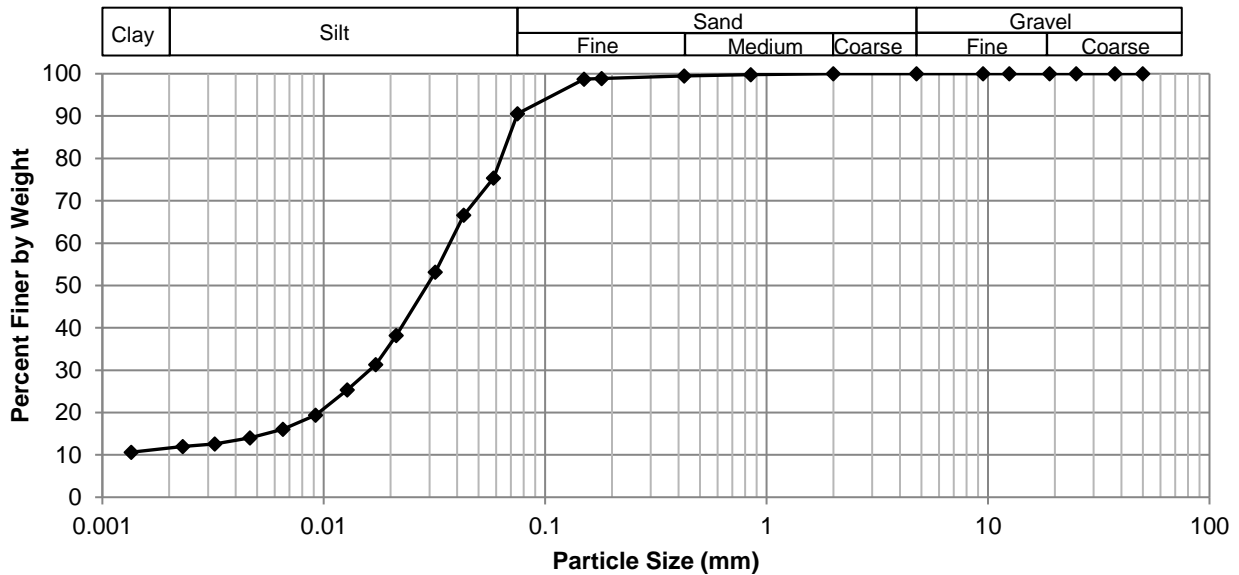
Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Test Hole TH19-14
Sample # G68
Depth (m) 0.8 - 0.9
Sample Date 1-Oct-19
Test Date 8-Oct-19
Technician KG

Gravel	0.0%
Sand	9.5%
Silt	79.0%
Clay	11.5%

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	90.54
37.5	100.00	2.00	100.00	0.0585	75.38
25.0	100.00	0.850	99.82	0.0429	66.63
19.0	100.00	0.425	99.47	0.0319	53.18
12.5	100.00	0.180	98.89	0.0212	38.18
9.50	100.00	0.150	98.75	0.0172	31.30
4.75	100.00	0.075	90.54	0.0128	25.36
				0.0092	19.42
				0.0065	16.09
				0.0046	14.01
				0.0032	12.61
				0.0023	11.95
				0.0014	10.62



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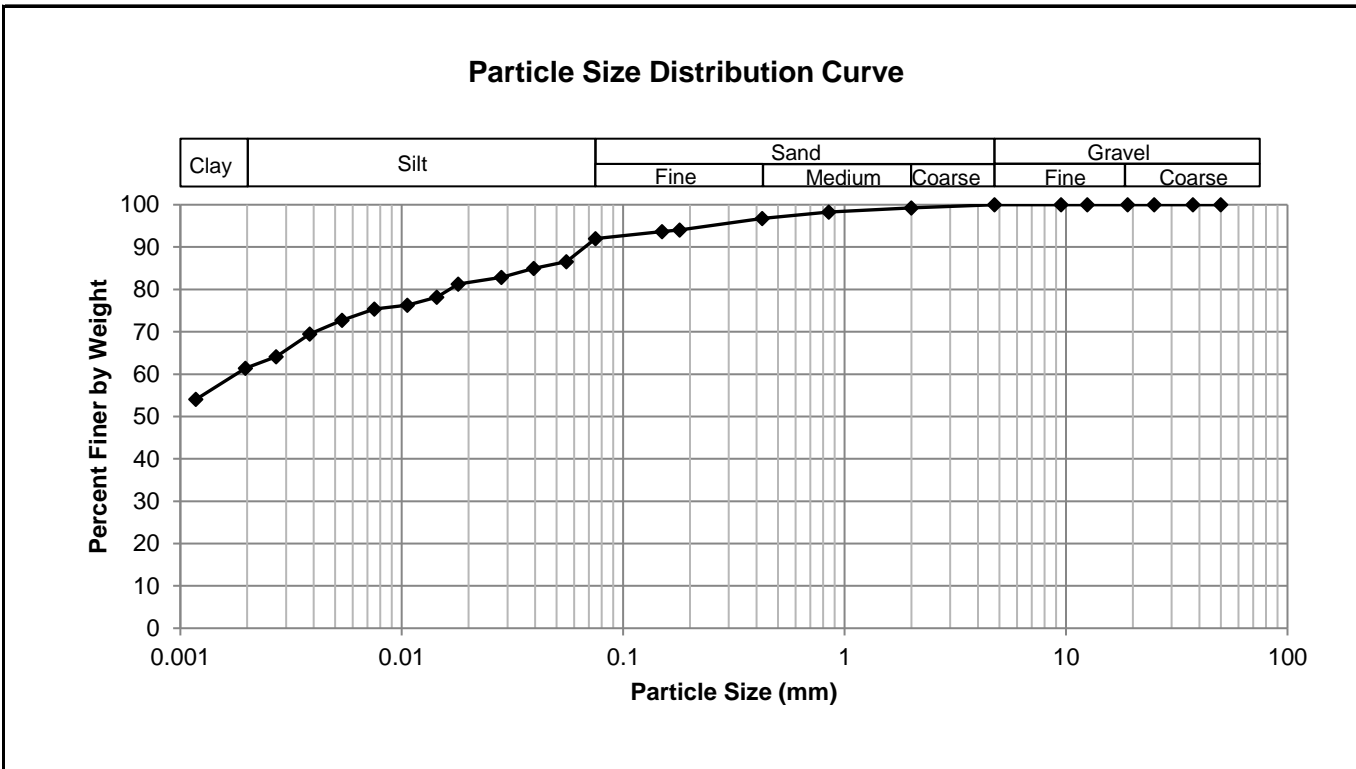
Grain Size Analysis (Hydrometer Method)
AASHTO T 88

Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Test Hole TH19-10
Sample # G92
Depth (m) 0.6 - 0.8
Sample Date 1-Oct-19
Test Date 8-Oct-19
Technician KG

Gravel	0.0%
Sand	8.0%
Silt	30.5%
Clay	61.5%



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	92.02
37.5	100.00	2.00	99.22	0.0555	86.56
25.0	100.00	0.850	98.30	0.0395	85.01
19.0	100.00	0.425	96.74	0.0282	82.83
12.5	100.00	0.180	94.04	0.0180	81.28
9.50	100.00	0.150	93.70	0.0144	78.18
4.75	100.00	0.075	92.02	0.0106	76.32
				0.0075	75.39
				0.0054	72.74
				0.0038	69.48
				0.0027	64.12
				0.0020	61.38
				0.0012	54.04



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Grain Size Analysis (Hydrometer Method)
AASHTO T 88

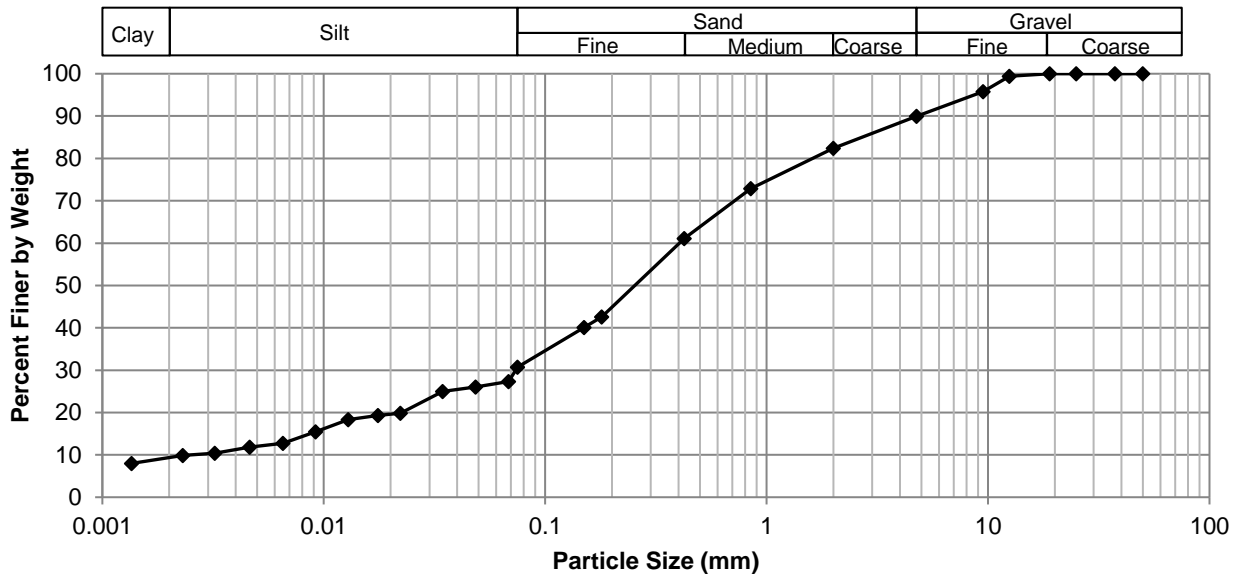
Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Test Hole TH19-02
Sample # G145
Depth (m) 0.3 - 0.5
Sample Date 3-Oct-19
Test Date 8-Oct-19
Technician KG

Gravel	10.1%
Sand	59.3%
Silt	21.5%
Clay	9.2%

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	89.95	0.0750	30.69
37.5	100.00	2.00	82.40	0.0683	27.33
25.0	100.00	0.850	72.86	0.0485	26.05
19.0	100.00	0.425	61.13	0.0344	25.01
12.5	99.43	0.180	42.57	0.0222	19.86
9.50	95.79	0.150	40.11	0.0176	19.35
4.75	89.95	0.075	30.69	0.0129	18.32
				0.0092	15.48
				0.0066	12.74
				0.0046	11.80
				0.0032	10.39
				0.0023	9.84
				0.0014	7.98



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Atterberg Limits
ASTM D4318-10e1

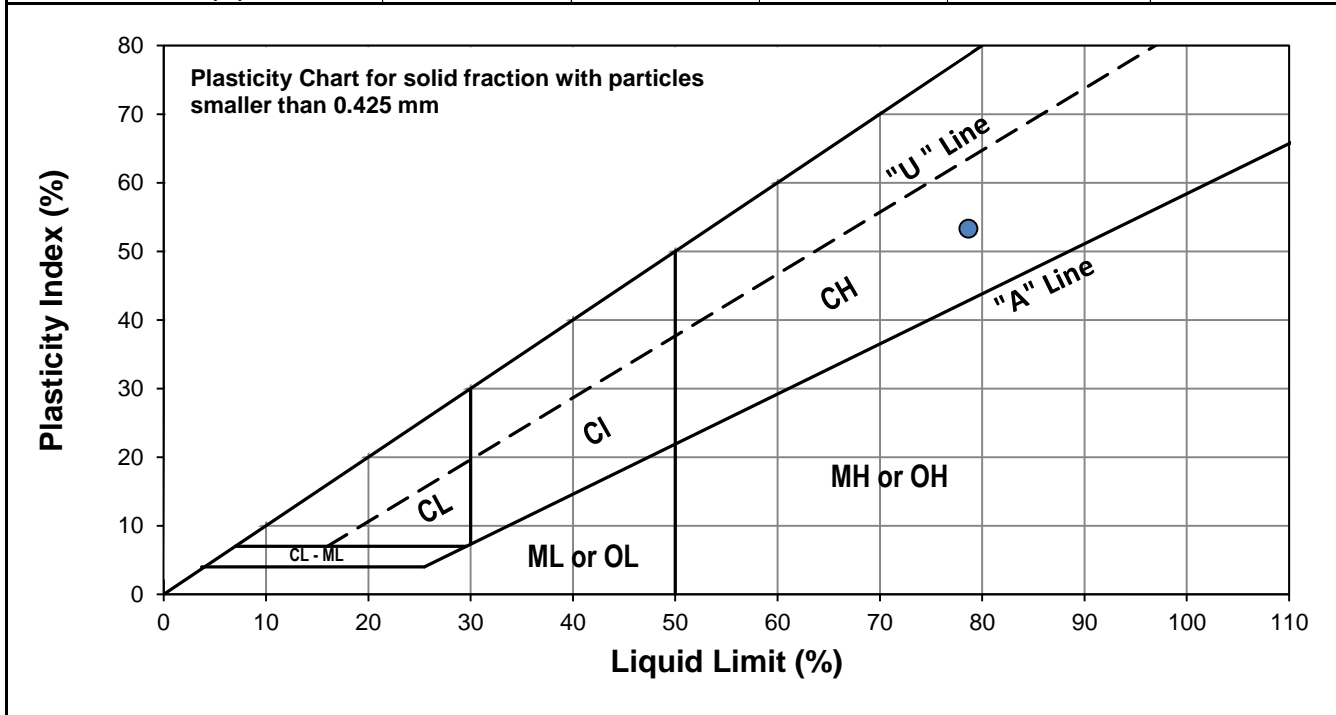
Project No.	0035-082-00-401
Client	Morrison Hershfield
Project	Erin Street
Test Hole	TH19-25
Sample #	G02
Depth (m)	0.6 - 0.8
Sample Date	4-Oct-19
Test Date	16-Oct-19
Technician	AD



Liquid Limit	79
Plastic Limit	25
Plasticity Index	53

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	18	27	32
Mass Wet Soil + Tare (g)	23.623	22.278	23.114
Mass Dry Soil + Tare (g)	19.398	18.704	19.251
Mass Tare (g)	14.183	14.123	14.234
Mass Water (g)	4.225	3.574	3.863
Mass Dry Soil (g)	5.215	4.581	5.017
Moisture Content (%)	81.016	78.018	76.998



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.267	14.137			
Mass Wet Soil + Tare (g)	23.619	22.082			
Mass Dry Soil + Tare (g)	21.724	20.474			
Mass Water (g)	1.895	1.608			
Mass Dry Soil (g)	7.457	6.337			
Moisture Content (%)	25.412	25.375			



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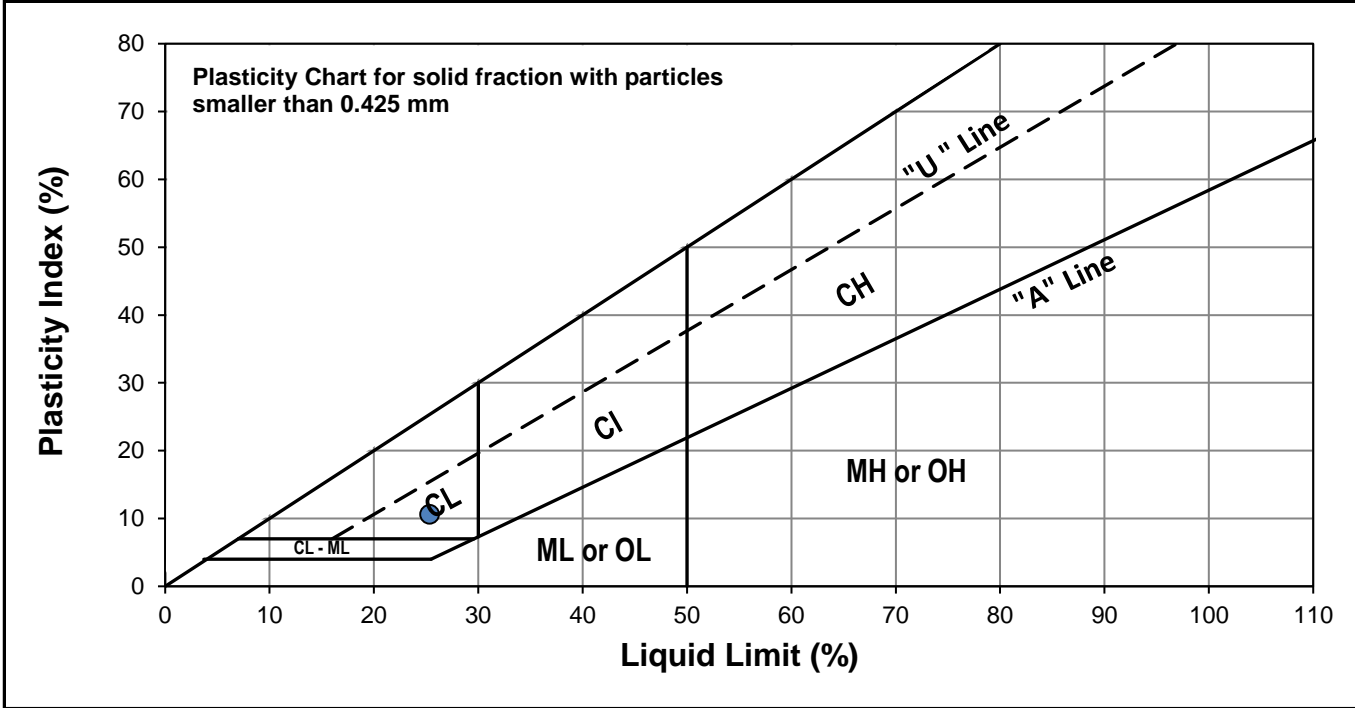
Project No.	0035-082-00
Client	Morrison Hershfield
Project	Erin Street
Test Hole	TH19-16
Sample #	G56
Depth (m)	0.6 - 0.8
Sample Date	03-Oct-19
Test Date	08-Oct-19
Technician	KG



Liquid Limit	25
Plastic Limit	15
Plasticity Index	11

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	19	25	35
Mass Wet Soil + Tare (g)	21.235	24.018	25.137
Mass Dry Soil + Tare (g)	19.788	22.010	22.983
Mass Tare (g)	14.215	14.128	14.143
Mass Water (g)	1.447	2.008	2.154
Mass Dry Soil (g)	5.573	7.882	8.840
Moisture Content (%)	25.964	25.476	24.367



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.195	14.144			
Mass Wet Soil + Tare (g)	20.381	21.973			
Mass Dry Soil + Tare (g)	19.605	20.946			
Mass Water (g)	0.776	1.027			
Mass Dry Soil (g)	5.410	6.802			
Moisture Content (%)	14.344	15.099			



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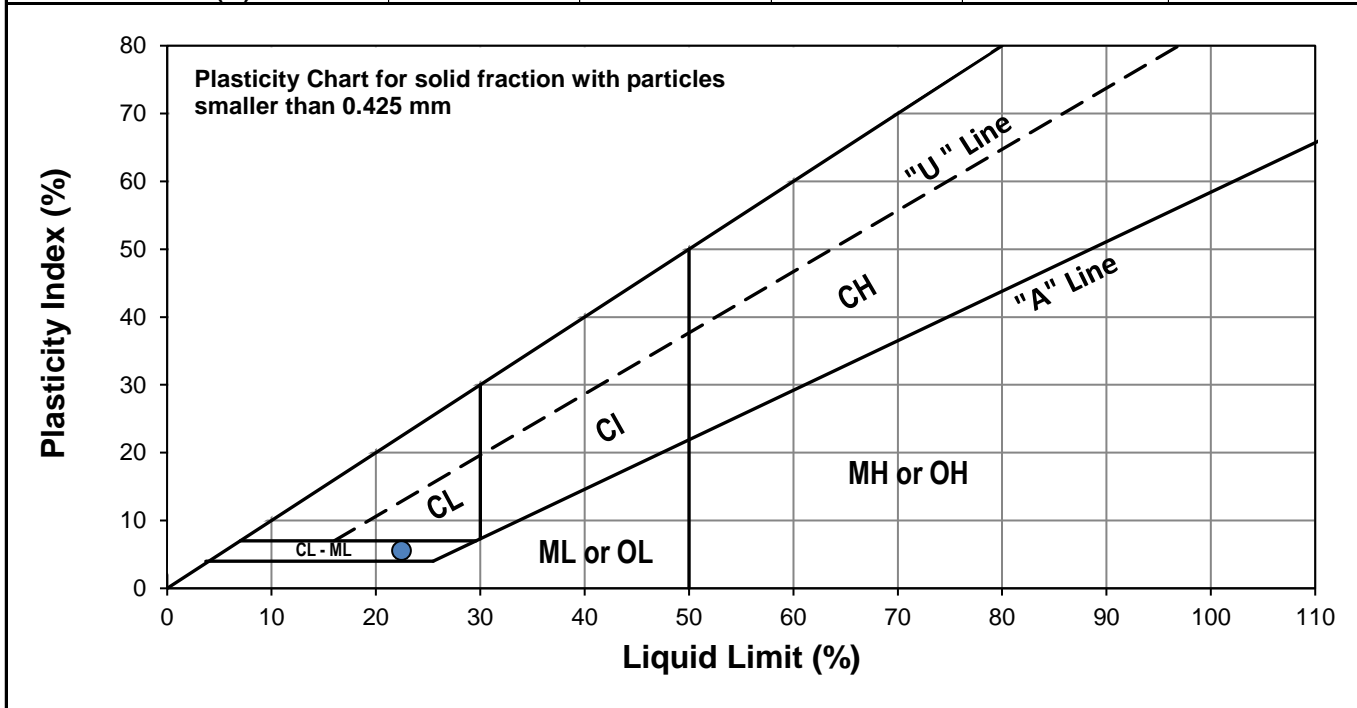
Project No.	0035-082-00
Client	Morrison Hershfield
Project	Erin Street
Test Hole	TH19-14
Sample #	G68
Depth (m)	0.8 - 0.9
Sample Date	03-Oct-19
Test Date	08-Oct-19
Technician	KG



Liquid Limit	22
Plastic Limit	17
Plasticity Index	6

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	20	34
Mass Wet Soil + Tare (g)	24.084	25.470	23.094
Mass Dry Soil + Tare (g)	22.234	23.364	21.522
Mass Tare (g)	14.317	14.112	14.350
Mass Water (g)	1.850	2.106	1.572
Mass Dry Soil (g)	7.917	9.252	7.172
Moisture Content (%)	23.367	22.763	21.919



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.186	14.216			
Mass Wet Soil + Tare (g)	19.703	27.100			
Mass Dry Soil + Tare (g)	18.909	25.236			
Mass Water (g)	0.794	1.864			
Mass Dry Soil (g)	4.723	11.020			
Moisture Content (%)	16.811	16.915			



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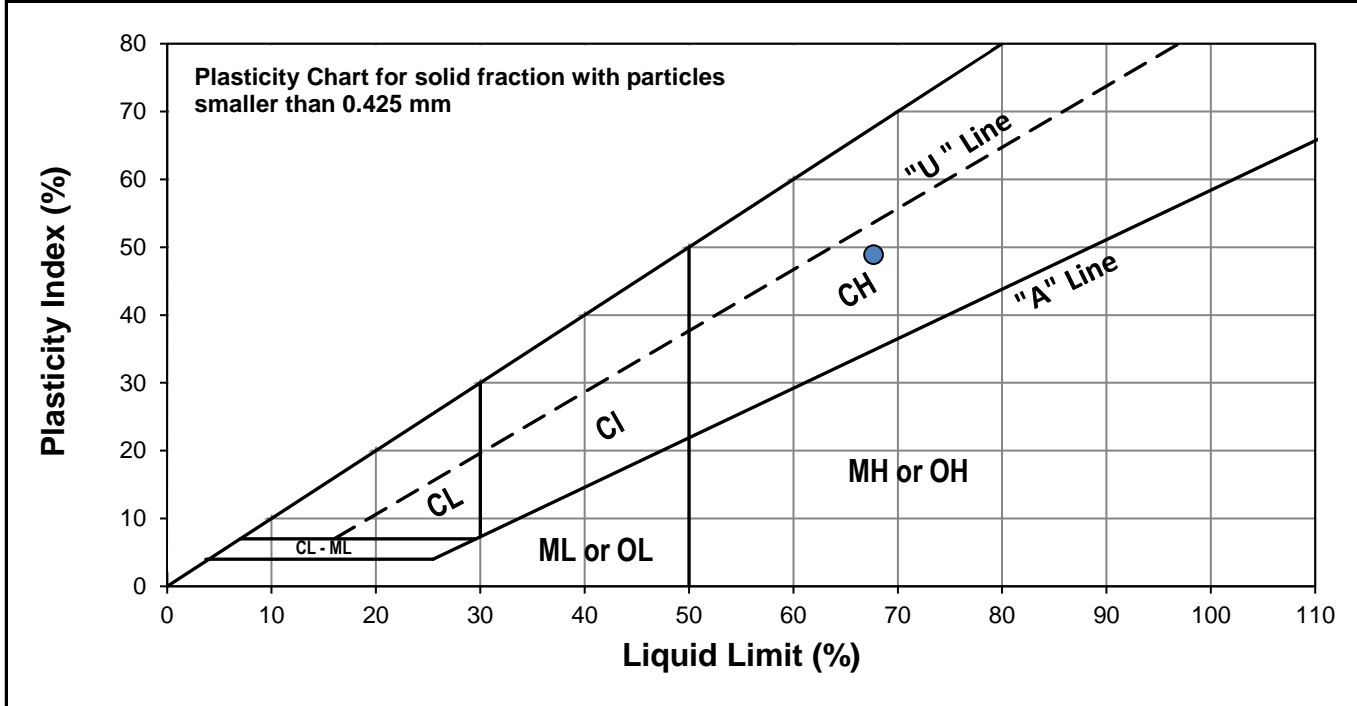
Project No.	0035-082-00
Client	Morrison Hershfield
Project	Erin Street
Test Hole	TH19-10
Sample #	G92
Depth (m)	0.6 - 0.8
Sample Date	04-Oct-19
Test Date	08-Oct-19
Technician	DS



Liquid Limit	68
Plastic Limit	19
Plasticity Index	49

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	16	20	33
Mass Wet Soil + Tare (g)	23.611	22.440	22.380
Mass Dry Soil + Tare (g)	19.623	18.976	19.104
Mass Tare (g)	13.977	13.968	14.129
Mass Water (g)	3.988	3.464	3.276
Mass Dry Soil (g)	5.646	5.008	4.975
Moisture Content (%)	70.634	69.169	65.849



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.219	14.128			
Mass Wet Soil + Tare (g)	20.629	22.039			
Mass Dry Soil + Tare (g)	19.620	20.780			
Mass Water (g)	1.009	1.259			
Mass Dry Soil (g)	5.401	6.652			
Moisture Content (%)	18.682	18.927			



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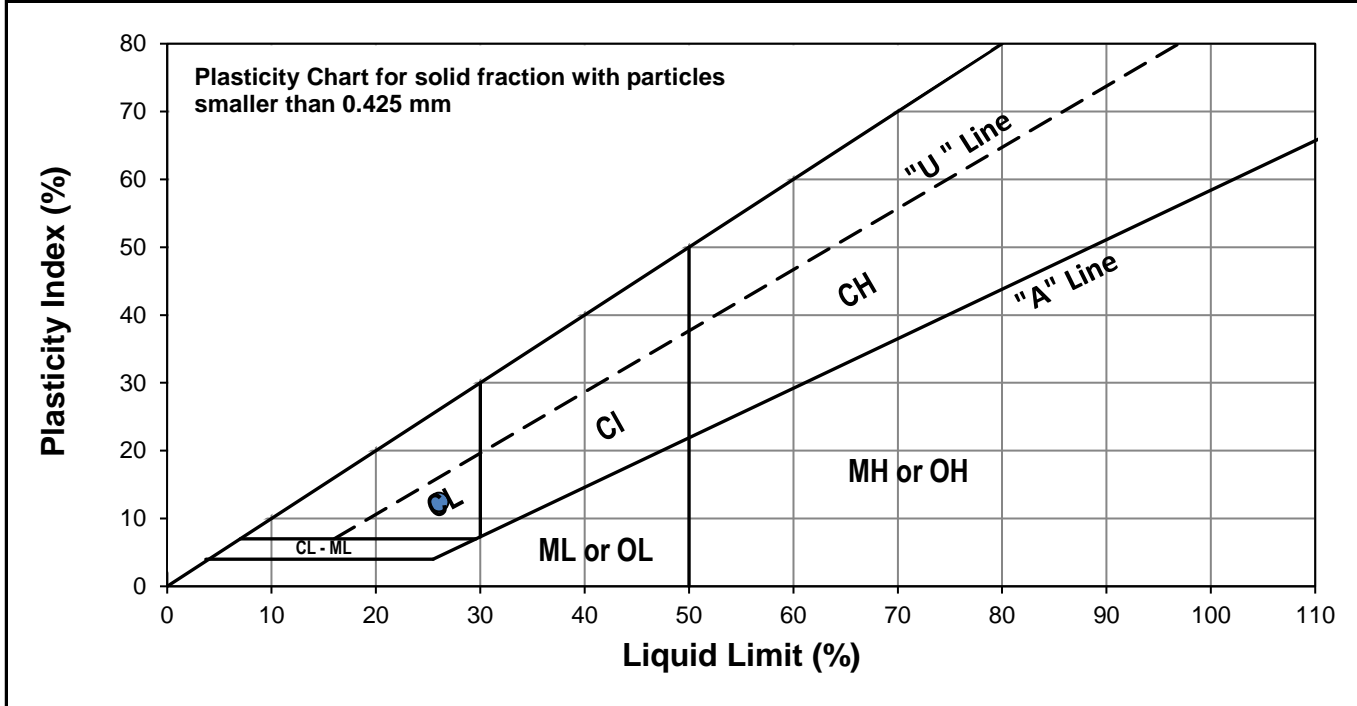
Project No.	0035-082-00
Client	Morrison Hershfield
Project	Erin Street
Test Hole	TH19-02
Sample #	G145
Depth (m)	0.3 - 0.5
Sample Date	04-Oct-19
Test Date	08-Oct-19
Technician	DS



Liquid Limit	26
Plastic Limit	14
Plasticity Index	12

Liquid Limit

Trial #	1	2	3
Number of Blows (N)	15	27	33
Mass Wet Soil + Tare (g)	27.079	25.985	25.443
Mass Dry Soil + Tare (g)	24.273	23.551	23.116
Mass Tare (g)	14.131	14.123	13.872
Mass Water (g)	2.806	2.434	2.327
Mass Dry Soil (g)	10.142	9.428	9.244
Moisture Content (%)	27.667	25.817	25.173



Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	14.124	14.117			
Mass Wet Soil + Tare (g)	24.437	26.508			
Mass Dry Soil + Tare (g)	23.190	25.034			
Mass Water (g)	1.247	1.474			
Mass Dry Soil (g)	9.066	10.917			
Moisture Content (%)	13.755	13.502			



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Standard Proctor Compaction Test

ASTM D698-12e2

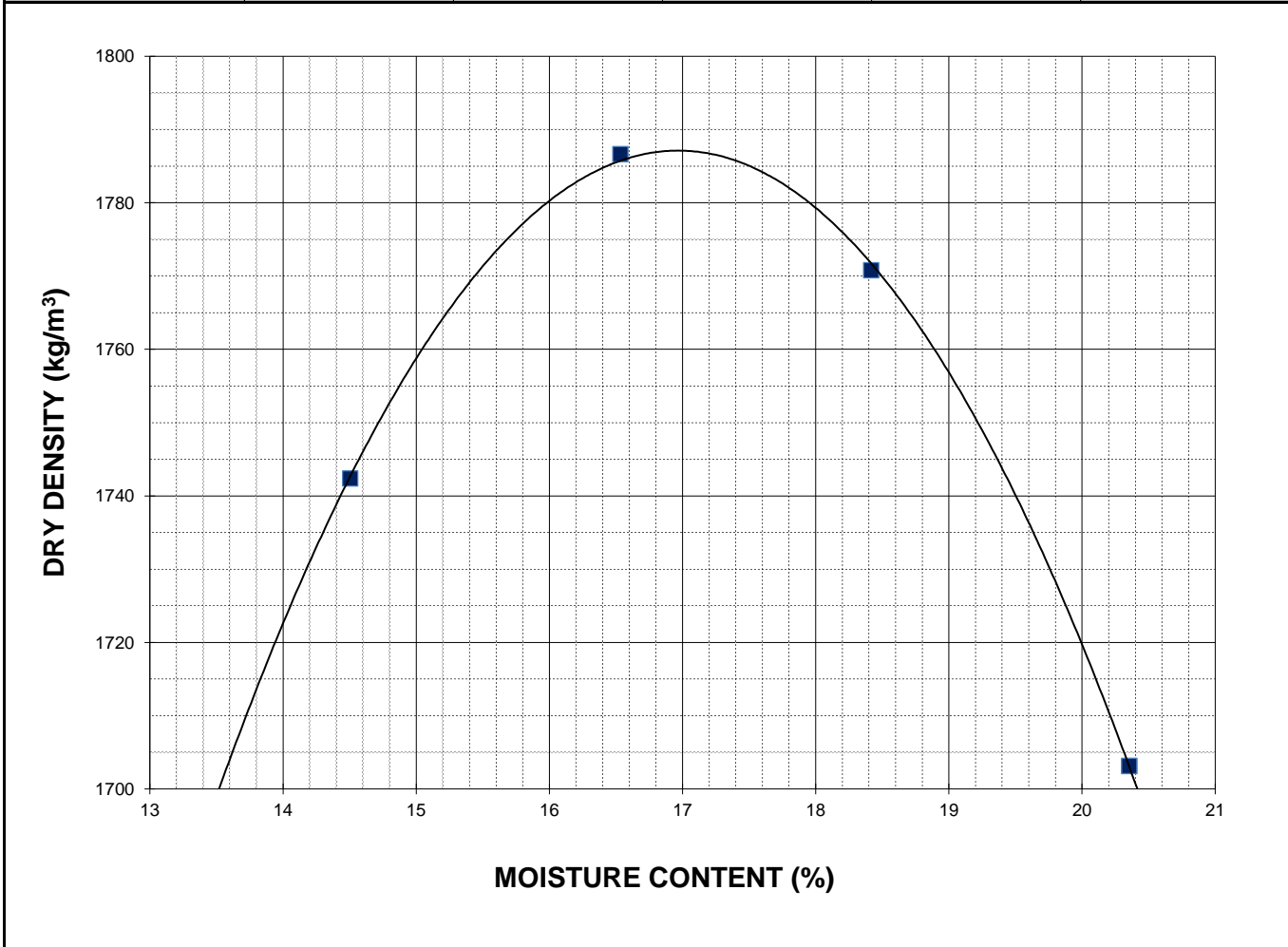
Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Sample # R19-211 (Bulk Silt)
Source TH19-22+23
Material Silt
Sample Date 07-Oct-19
Test Date 16-Oct-19
Technician SA

Maximum Dry Density (kg/m³)	1787
Optimum Moisture (%)	17.0

Trial Number	1	2	3	4
Wet Density (kg/m ³)	1995	2082	2097	2050
Dry Density (kg/m ³)	1742	1787	1771	1703
Moisture Content (%)	14.5	16.5	18.4	20.4





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Standard Proctor Compaction Test

ASTM D698-12e2

Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street

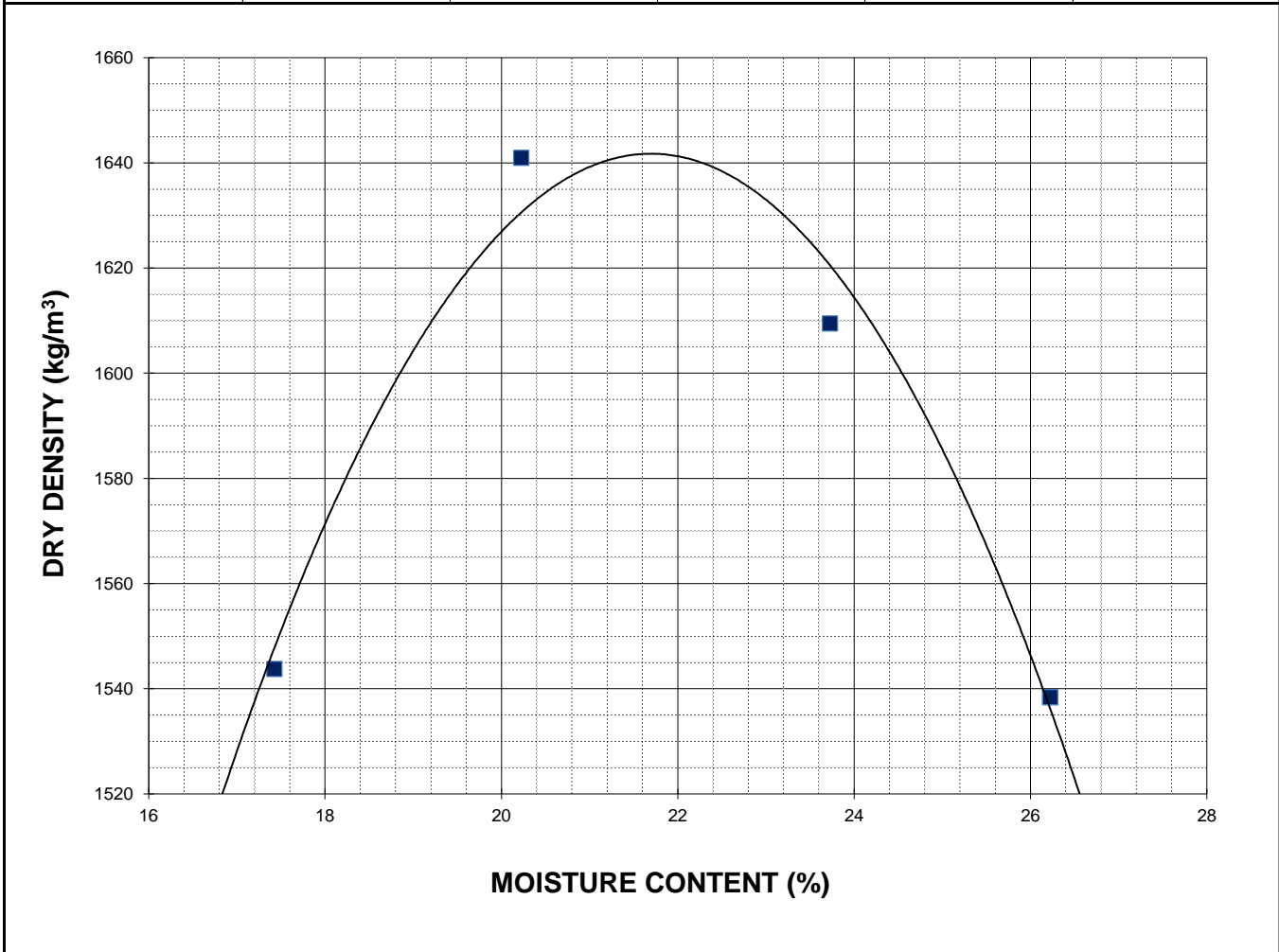


Sample # R19-211 (Bulk Clay)
Source TH19-10 & TH19-12
Material Clay
Sample Date

Test Date 16-Oct-19
Technician KG

Maximum Dry Density (kg/m³)	1642
Optimum Moisture (%)	21.7

Trial Number	1	2	3	4	
Wet Density (kg/m ³)	1813	1973	1991	1942	
Dry Density (kg/m ³)	1544	1641	1609	1538	
Moisture Content (%)	17.4	20.2	23.7	26.2	





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Standard Proctor Compaction Test

ASTM D698-12e2

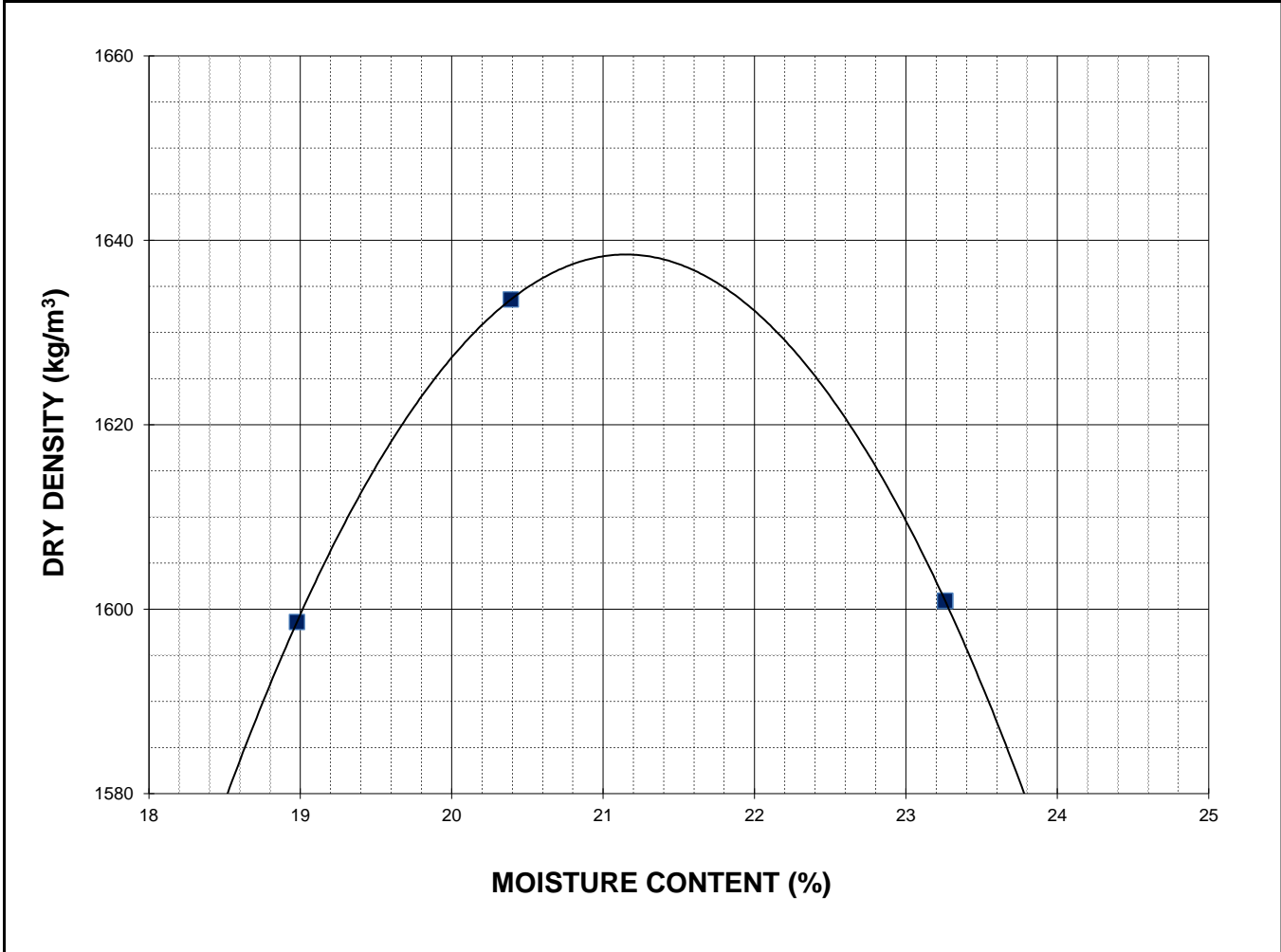
Project No. 0035-082-00-401
Client Morrison Hershfield
Project Erin Street



Sample # R19-211 (IP Clay)
Source Various test holes
Material Intermediate Plasticity Clay
Sample Date 07-Oct-19
Test Date 29-Oct-19
Technician BMH

Maximum Dry Density (kg/m³)	1638
Optimum Moisture (%)	21.1

Trial Number	1	2	3		
Wet Density (kg/m ³)	1902	1967	1973		
Dry Density (kg/m ³)	1599	1634	1601		
Moisture Content (%)	19.0	20.4	23.3		





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California Bearing Ratio Test Data Sheet
ASTM D1883-16

Project No.	0035-082-00-401	Source	TH19-22 & TH19-23
Client	Morrison Hershfield	Material	Silt
Project	Erin Street	Sample Date	07/10/2019
Sample #	R19-211 Bulk Silt	Test Date	25/10/2019
		Technician	BMH

Proctor Results (ASTM D698)

Maximum Dry Density	1787 kg/m ³
Optimum Moisture Content	17.0 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1702 kg/m ³
Initial Moisture Content	17.0 %
Relative Density	95.3 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.2 %
Moisture Content in top 25 mm	19.6 %
Immersion Period	69 h

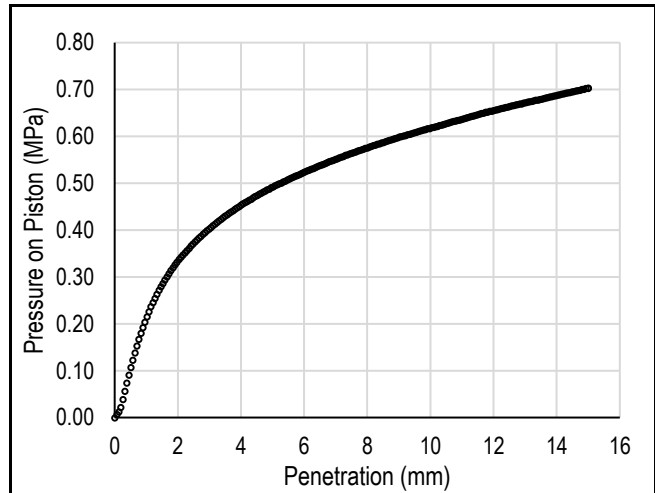
CBR Results

CBR at 2.54 mm	5.4 %
CBR at 5.08 mm	4.8 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.14	0.14
1.27	0.25	0.25
1.91	0.33	0.33
2.54	0.38	0.38
3.18	0.41	0.41
3.81	0.45	0.45
4.45	0.47	0.47
5.08	0.50	0.50
7.62	0.57	0.57
10.16	0.62	0.62
12.70	0.67	0.67

Load/Penetration Curve



Comments:



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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	0035-082-00-401	Source	TH19-10 & TH19-12
Client	Morrison Hershfield	Material	Clay
Project	Erin Street	Sample Date	07/10/2019
Sample #	R19-211 Bulk Clay	Test Date	01/11/2019
		Technician	BMH

Proctor Results (ASTM D698)

Maximum Dry Density	1642 kg/m ³
Optimum Moisture Content	21.7 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1551 kg/m ³
Initial Moisture Content	23.4 %
Relative Density	94.4 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.7 %
Moisture Content in top 25 mm	27.7 %
Immersion Period	92 h

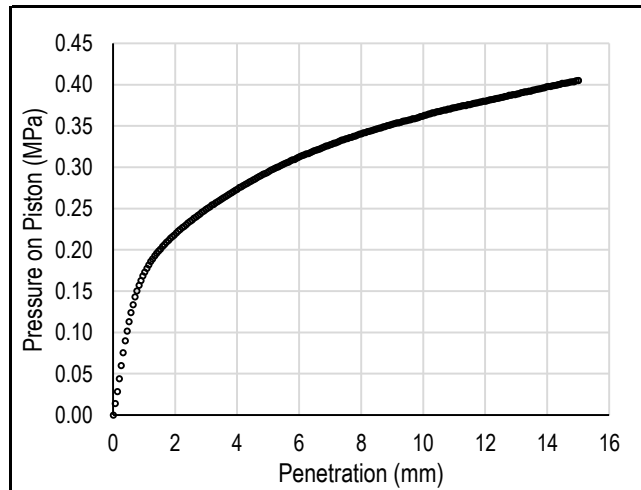
CBR Results

CBR at 2.54 mm	3.4 %
CBR at 5.08 mm	2.9 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.13	0.13
1.27	0.19	0.19
1.91	0.22	0.22
2.54	0.24	0.24
3.18	0.25	0.25
3.81	0.27	0.27
4.45	0.28	0.28
5.08	0.30	0.30
7.62	0.34	0.34
10.16	0.36	0.36
12.70	0.39	0.39

Load/Penetration Curve



Comments:



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California Bearing Ratio Test Data Sheet
ASTM D1883-16

Project No.	0035-082-00-401	Source	Various test holes
Client	Morrison Hershfield	Material	Intermediate Plasticity Clay
Project	Erin Street	Sample Date	01/10/2019
Sample #	R19-211 Intermediate Plasticity Clay	Test Date	03/11/2019
		Technician	BMH

Proctor Results (ASTM D698)

Maximum Dry Density	1638 kg/m ³
Optimum Moisture Content	21.1 %
Material Retained on 19 mm Sieve	0.0 %

CBR Sample Compaction

Dry Density	1545 kg/m ³
Initial Moisture Content	24.5 %
Relative Density	94.3 % SPMD

Soaking Results

Surcharge	4.54 kg
Swell	0.5 %
Moisture Content in top 25 mm	29.0 %
Immersion Period	96 h

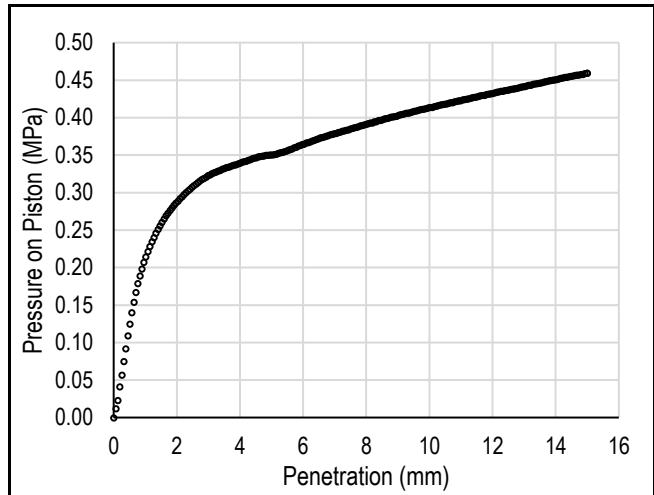
CBR Results

CBR at 2.54 mm	4.5 %
CBR at 5.08 mm	3.4 %
Zero Correction	0 mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.15	0.15
1.27	0.24	0.24
1.91	0.28	0.28
2.54	0.31	0.31
3.18	0.33	0.33
3.81	0.34	0.34
4.45	0.35	0.35
5.08	0.35	0.35
7.62	0.39	0.39
10.16	0.42	0.42
12.70	0.44	0.44

Load/Penetration Curve



Comments:

Appendix C

Photographs of Pavement Core Samples



Photo 1: Pavement Core Sample at Test Hole TH19-01



Photo 2: Pavement Core Sample at Test Hole TH19-02



Photo 3: Pavement Core Sample at Test Hole TH19-03



Photo 4: Pavement Core Sample at Test Hole TH19-04



Photo 5: Pavement Core Sample at Test Hole TH19-05



Photo 6: Pavement Core Sample at Test Hole TH19-06



Photo 7: Pavement Core Sample at Test Hole TH19-07



Photo 8: Pavement Core Sample at Test Hole TH19-08



Photo 9: Pavement Core Sample at Test Hole TH19-09



Photo 10: Pavement Core Sample at Test Hole TH19-10



Photo 11: Pavement Core Sample at Test Hole TH19-11



Photo 12: Pavement Core Sample at Test Hole TH19-12



Photo 13: Pavement Core Sample at Test Hole TH19-13



Photo 14: Pavement Core Sample at Test Hole TH19-14



Photo 15: Pavement Core Sample at Test Hole TH19-15



Photo 16: Pavement Core Sample at Test Hole TH19-16



Photo 17: Pavement Core Sample at Test Hole TH19-17



Photo 18: Pavement Core Sample at Test Hole TH19-18



Photo 19: Pavement Core Sample at Test Hole TH18-19



Photo 20: Pavement Core Sample at Test Hole TH19-20



Photo 21: Pavement Core Sample at Test Hole TH19-21



Photo 22: Pavement Core Sample at Test Hole TH19-22



Photo 23: Pavement Core Sample at Test Hole TH19-23



Photo 24: Pavement Core Sample at Test Hole TH19-24



Photo 25: Pavement Core Sample at Test Hole TH19-25