APPENDIX 'A'

GEOTECHNICAL REPORT

Quality Engineering | Valued Relationships

Morrison Hershfield

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements

Roadway Information Package

Prepared for:

Morrison Hershfield
1-59 Scurfield Boulevard
Winnipeg, MB R3Y 1V2
Attention: Mr. Bill Ebenspanger, P. Eng

Project Number:
0035 079 00

Date:
October 24, 2019
Final Report

www.trekgeotechnical.ca
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Quality Engineering | Valued Relationships

October 24, 2019 Our File No. 0035 079 00

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

RE: Sub-Surface Investigation Report for Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements

TREK Geotechnical Inc. is pleased to submit our information package for the roadway sub-surface investigations for the Replacement of Existing Culvert at Sherwin Road over Omand's Creek and Associated Regional Street Improvements.

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:

Michael Van Helden, Ph.D., P. Eng.
Geotechnical Engineer,
Tel: 204.975.9433

cc: Jashandeep Singh Bhullar, EIT (TREK Geotechnical)

Revision History

Revision No.	Author	Issue Date	Description
0	JSB	October 24, 2019	Draft Report

Authorization Signatures

Prepared By:

for Jashandeep Singh Bhullar, EIT

PROVINCE OF MANITOBA
2019/10/24
M.J.
VAN HELDEN
Member
24729
REGISTERED PROFESSIONAL ENGINEER

ENGINEERS
GEOSCIENTISTS
MANITOBA
Certificate of Authorization
TREK GEOTECHNICAL INC.
No. 4877 Date: Oct. 24, 2019

Reviewed By:

Michael Van Helden, 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 Replacement of Existing Culvert at Sherwin Road over Omand's Creek and Associated Regional Street Improvements project. 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 subsurface investigation included of pavement coring and drilling of 13 shallow road test holes and 2 deep test holes at the existing culvert (which contain supplemental information on pavements and subgrade). The test hole locations are shown on Figure 01 to Figure 05 (attached).

Road test holes (THs) 19-01 to 19-13 were drilled between September 3, 2019 and September 5, 2019. Two additional deep test holes (THs 19-14 and 19-15) were drilled on September 5 and 6, 2019 for the structure replacement. The pavement structure (asphalt and/or concrete) was cored by Jashandeep Singh Bhullar of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. All shallow 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 except for TH19-04 which was drilled to 3.4 m below ground. Deep test holes were drilled to depths greater than 20 m. The sub-surface conditions were observed during drilling and other pertinent information such as groundwater and drilling conditions were also recorded. investigation. Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were visually classified and transported to TREK's material testing laboratory for further testing. Core samples were also retrieved and logged at TREK's material testing laboratory.

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

The laboratory testing program for the roadway 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. 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.

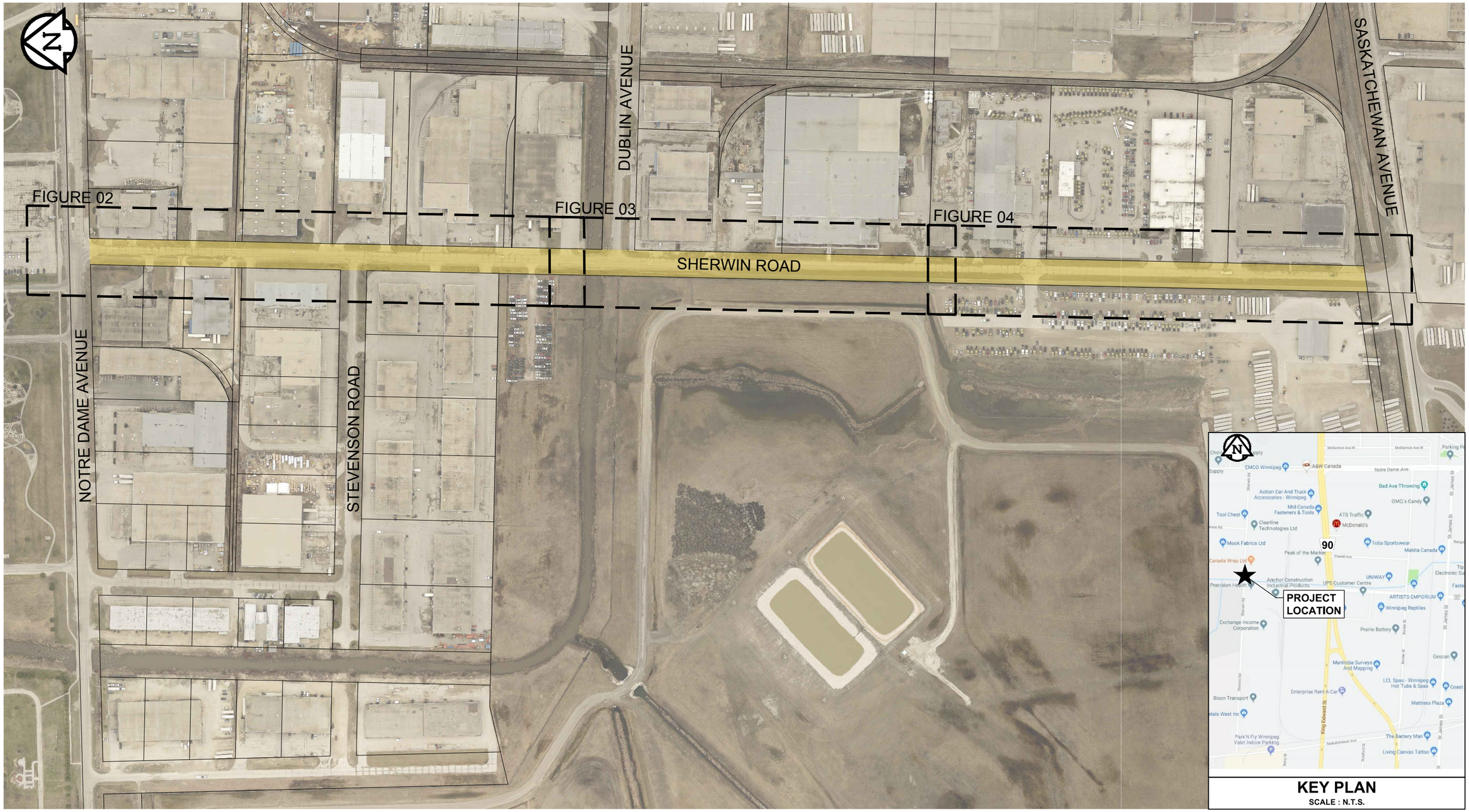
3.0 Closure

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



0 50 100 150 m
SCALE = 1 : 3 500 (279 mm x 432 mm)

NOTES:
1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016

Figure 01
TEST HOLE LOCATION PLAN

Z:\Projects\0035 Morrison Hershfield\0035 079 00 Sherwin Road Bridge over Omands Creek\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\FIG 02_2019-10-09_SHERWIN RD TH_0_A_DW_0035-079-00.dwg, 10/10/2019 2:39:44 PM
ANSI full bleed B (11.00 x 17.00 Inches)

0035 079 00
Morrison Hershfield
Sherwin Road Bridge over Omands Creek

0 10 20 30 40 50 m
SCALE = 1 : 1 250 (279 mm x 432 mm)

LEGEND: TEST HOLE (TREK, 2019)

NOTES:
1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016
2. GPS COORDINATES OBTAINED FROM HANDHELD GPS DEVICE.

Figure 02
TEST HOLE LOCATION PLAN

Z:\Projects\0035 Morrison Hershfield\0035 079 00 Sherwin Road Bridge over Omands Creek\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\FIG 02_2019-10-02_SHERWIN RD TH_0_A_DW_0035-079-00.dwg, 10/9/2019 9:26:27 AM
ANSI full bleed B (11.00 x 17.00 Inches)

0 10 20 30 40 50 m
SCALE = 1 : 1 000 (279 mm x 432 mm)

LEGEND: TEST HOLE (TREK, 2019)

NOTES:
1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016
2. GPS COORDINATES OBTAINED FROM HANDHELD GPS DEVICE.

Figure 03
TEST HOLE LOCATION PLAN

Z:\Projects\0035 Morrison Hershfield\0035 079 00 Sherwin Road Bridge over Omands Creek\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\FIG 02_2019-10-02_SHERWIN RD TH_0_A_DW_0035-079-00.dwg, 10/2/2019 9:04:24 AM
ANSI full bleed B (11.00 x 17.00 Inches)

ANSI full bleed B (11.00 x 17.00 Inches)
Z:\Projects\0035 Morrison Hershfield\0035 079 00 Sherwin Road Bridge over Omands Creek\3 Survey and Dwg\3.4 CAD\3.4.3 Working Folder\FIG 02_2019-10-02_SHERWIN RD TH_0_A_DW_0035-079-00.dwg, 10/2/2019 9:05:58 AM

0 10 20 30 40 50 m
SCALE = 1 : 1 250 (279 mm x 432 mm)

LEGEND: TEST HOLE (TREK, 2019)

NOTES:
1. AERIAL PHOTO FROM CITY OF WINNIPEG 2016
2. GPS COORDINATES OBTAINED FROM HANDHELD GPS DEVICE.

Figure 04
TEST HOLE LOCATION PLAN

Appendix A

Test Hole Logs

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

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

Major Divisions			USCS Classification	Symbols	Typical Names
Coarse-Grained soils (More than half the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than 4.75 mm)	Clean gravel (Little or no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines
			GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravel with fines (Appreciable amount of fines)	GM		Silty gravels, gravel-sand-silt mixtures
			GC		Clayey gravels, gravel-sand-silt mixtures
	Sands (More than half of coarse fraction is smaller than 4.75 mm)	Clean sands (Little or no fines)	SW		Well-graded sands, gravelly sands, little or no fines
			SP		Poorly-graded sands, gravelly sands, little or no fines
		Sands with fines (Appreciable amount of fines)	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sand-clay mixtures
Fine-Grained soils (More than half the material is smaller than No. 200 sieve size)	Silts and Clays (Liquid limit less than 50)		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity
			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

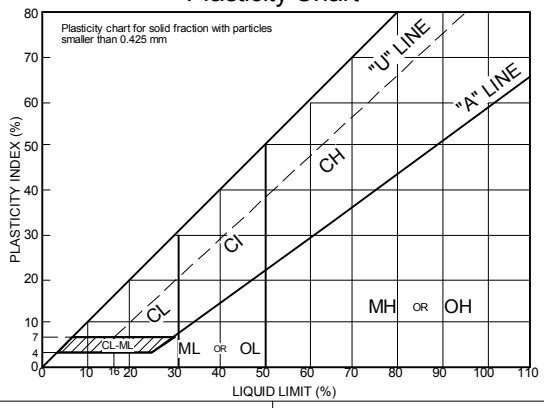
Laboratory Classification Criteria

Determine percentages of sand and gravel from grain size curve, depending on percentage of fines (fraction smaller than No. 200 sieve) coarse-grained soils are classified as follows:

Less than 5 percent..... GW, GP, SW, SP
More than 12 percent..... GM, GC, SM, SC
6 to 12 percent..... Borderline case4s requiring dual symbols*

$C_U = \frac{D_{60}}{D_{10}}$ greater than 4; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		
Not meeting all gradation requirements for GW		
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	
Atterberg limits above "A" line or P.I. greater than 7		
$C_U = \frac{D_{60}}{D_{10}}$ greater than 6; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		
Not meeting all gradation requirements for SW		
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	
Atterberg limits above "A" line or P.I. greater than 7		

Plasticity Chart



Von Post Classification Limit	Strong colour or odour, and often fibrous texture

Particle Size

	ASTM Sieve sizes	mm
	#10 to #4	2.00 to 4.75
	#40 to #10	0.425 to 2.00
	#200 to #40	0.075 to 0.425
	< #200	< 0.075

Material

Sand	Coarse
	Medium
	Fine
Silt or Clay	

Particle Size

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

Material

Boulders	
Cobbles	
Gravel	Coarse
	Fine

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

Other Symbol Types

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

EXPLANATION OF FIELD AND LABORATORY TESTING

LEGEND OF ABBREVIATIONS AND SYMBOLS

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

▽ Water Level at Time of Drilling

▼ Water Level at End of Drilling

▼ Water Level After Drilling as Indicated on Test Hole Logs

FRACTION OF SECONDARY SOIL CONSTITUENTS ARE BASED ON THE FOLLOWING TERMINOLOGY

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

TERMS DESCRIBING CONSISTENCY OR COMPACTION CONDITION

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

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

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

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

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

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

Sub-Surface Log

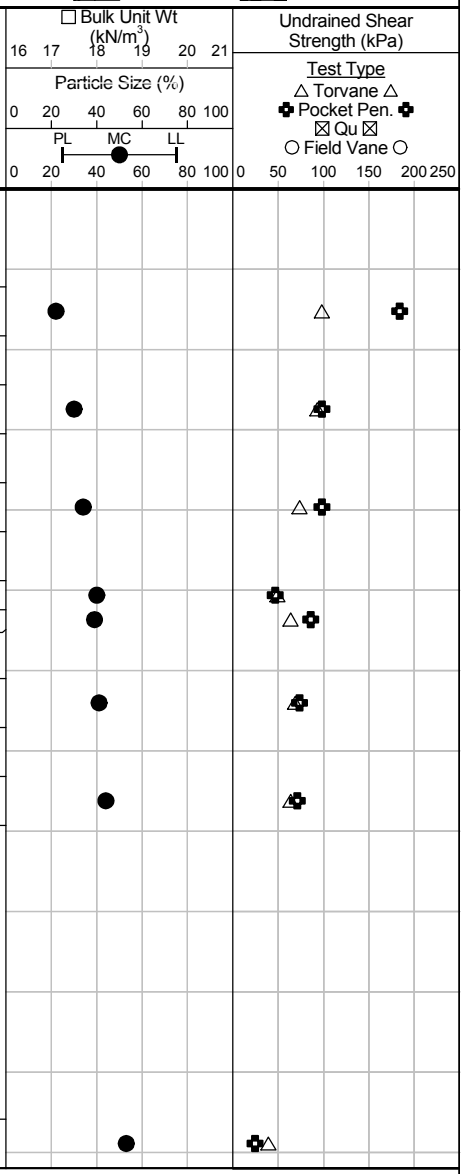
Test Hole TH19-01

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530838N, 628422E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (30 mm thick)		
		CONCRETE (200 mm thick)		
		CLAY - silty - black - moist, very stiff - high plasticity		G47
0.5		- trace gravel (diam. < 25 mm) at 0.5 m. - brown and stiff below 0.5 m.		G48
1.0				G49
		- some silt laminations at 1.2 m.		G50
		- trace silt inclusions (diam. < 15 mm) and greyish brown below 1.3 m.		G51
1.5		- trace gravel (diam. < 5 mm) at 1.6 m.		G52
2.0				G53
2.5		- soft below 2.3 m.		
3.0				G54



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

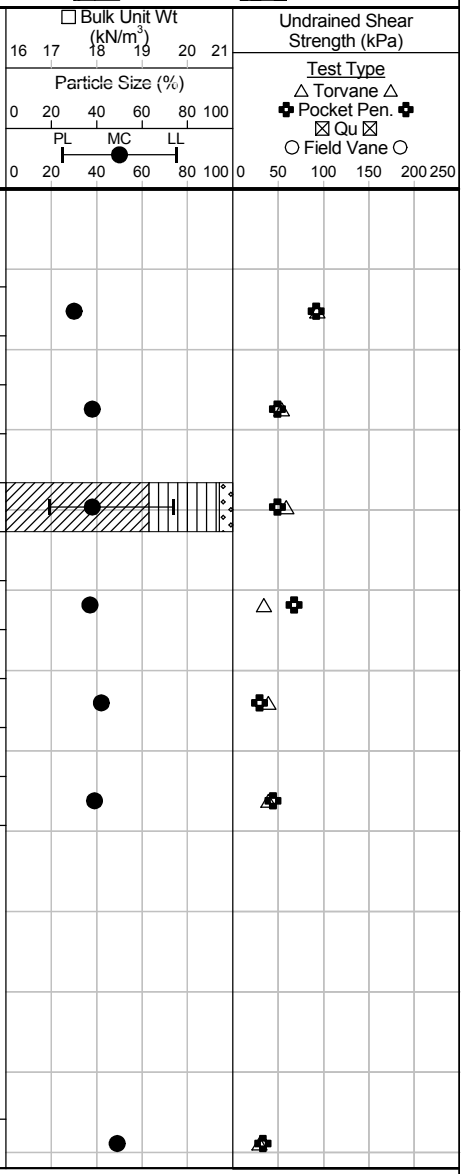
Test Hole TH19-02

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530754N, 628417E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (50 mm thick)		
		CONCRETE (225 mm thick)		
		CLAY (FILL) - silty, trace silt inclusions (diam. <20 mm), trace gravel (diam. <20 mm) - brownish grey - moist, very stiff - high plasticity		G55
0.5		- firm below 0.6 m.		G56
1.0				G57
				G58
1.5		- trace organics below 1.3 m. - soft below 1.5 m.		G59
				G60
2.0				
2.5				
3.0		CLAY - trace silt inclusions (diam. <20 mm), brown, moist, soft, high plasticity		G61



END OF TEST HOLE AT 3.0 m IN CLAY.

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

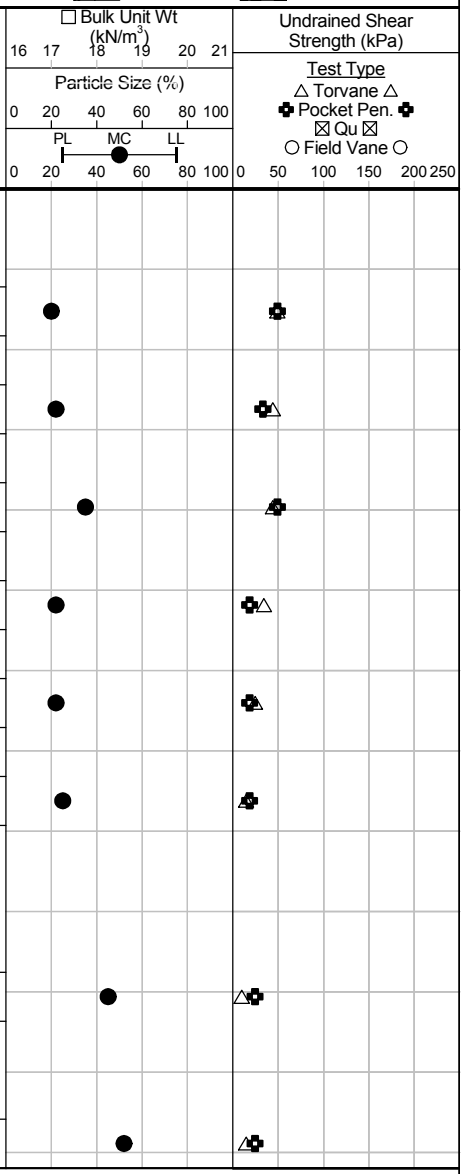
Test Hole TH19-03

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530652N, 628418E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (35 mm thick)		
		CONCRETE (200 mm thick)		
		CLAY (FILL) - silty, trace silt inclusions (diam. < 20 mm), trace gravel - greyish light brown - moist, firm - intermediate plasticity		G39
0.5		- no trace gravel and soft below 0.9 m.		G40
1.0		- high plasticity below 1.0 m.		G41
		- light brown and intermediate plasticity below 1.2 m.		G42
1.5				G43
		- greyish brown below 1.8 m.		G44
2.0				
2.5		CLAY - trace silt - greyish brown - moist, soft - high plasticity		G45
3.0				G46



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

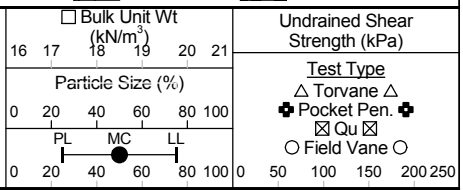
Test Hole TH19-04

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530546N, 628411E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (50 mm thick)		
		CONCRETE (200 mm thick)		
		CLAY (FILL) - silty, trace silt inclusions (diam. < 10 mm), trace gravel (diam. < 30 mm) - brownish grey - moist, firm to stiff - high plasticity		G62
0.5				G63
		- firm to stiff below 0.8 m.		
1.0				G64
				G65
1.5				G66
		- soft below 1.8 m.		G67
2.0				
2.5		CLAY - trace silt inclusions (diam. < 5 mm) - dark brown - moist, soft to firm - high plasticity		G68
3.0				
				G69



END OF TEST HOLE AT 3.3 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.3 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

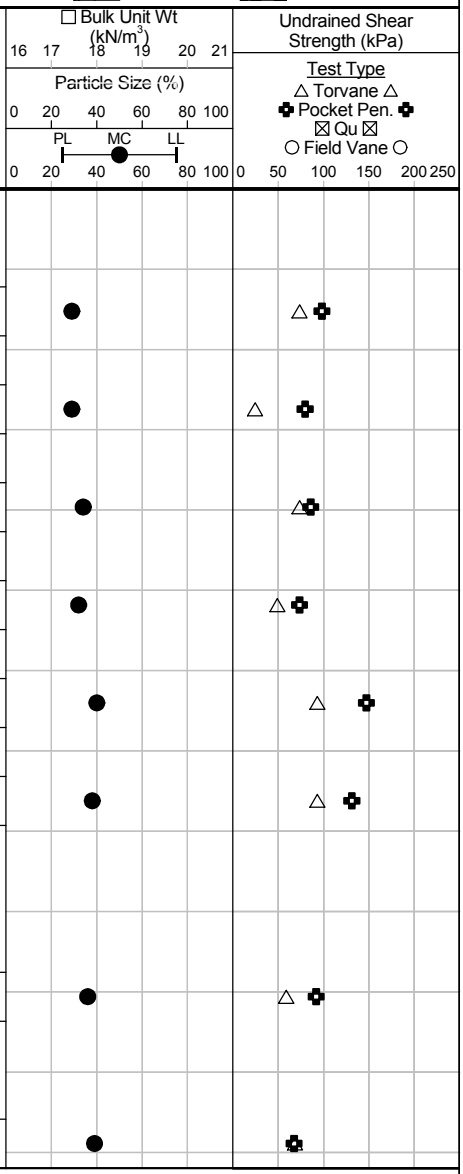
Test Hole TH19-05

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530448N, 628414E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (20 mm thick)		
		CONCRETE (200 mm thick)		
		CLAY (FILL) - silty, trace organics - brownish grey - moist, firm to stiff - high plasticity		G31
0.5				G32
1.0				G33
		- no trace organics, grey and firm below 1.3 m.		G34
1.5		- black and very stiff below 1.5 m.		G35
		- trace sulphate precipitates and trace gravel (diam. < 15 mm) at 1.8 m. - grey and stiff below 1.8 m.		G36
2.0				
2.5		CLAY - trace silt inclusions (diam.< 5 mm), trace sulphate precipitates (diam.< 5 mm) - greenish brown - moist, stiff - high plasticity		G37
3.0				G38



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

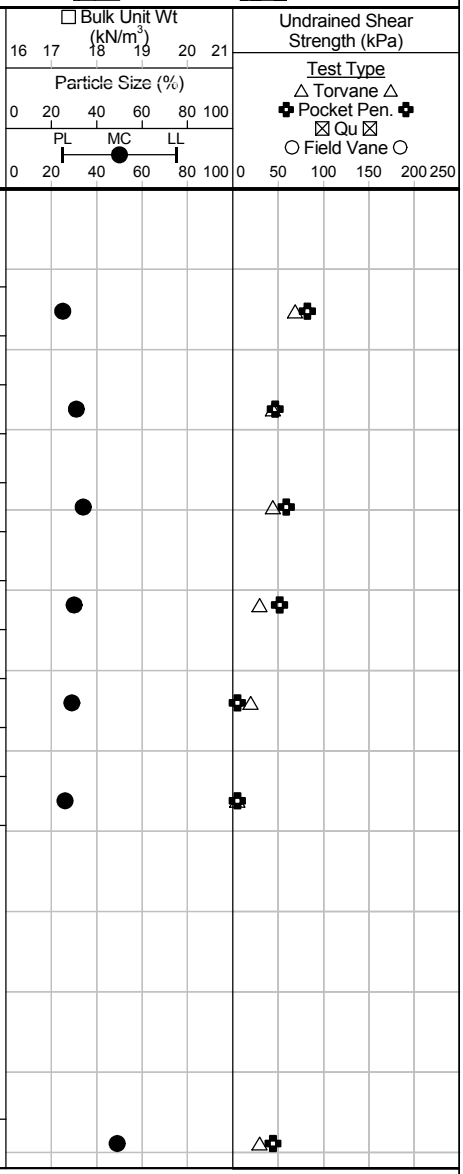
Test Hole TH19-06

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530328N, 628407E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (40 mm thick)		
		CONCRETE (180 mm thick)		
		CLAY - trace silt laminations, trace sand, trace black clay - brown - moist, stiff - high plasticity		G70
0.5		- no trace sand and firm to stiff below 0.6 m.		G71
1.0		- trace oxidation at 0.9 m.		G72
				G73
1.5		SILT AND CLAY - light brown - wet, very soft - low plasticity		G74
				G75
2.0				
2.5				
		CLAY - trace silt - greyish brown - wet, firm - high plasticity		G76
3.0				



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:

1) Seepage observed at 1.5 m.
2) No sloughing oobserved.
2) Test hole backfilled with bentonite chips and auger cuttings.
3) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

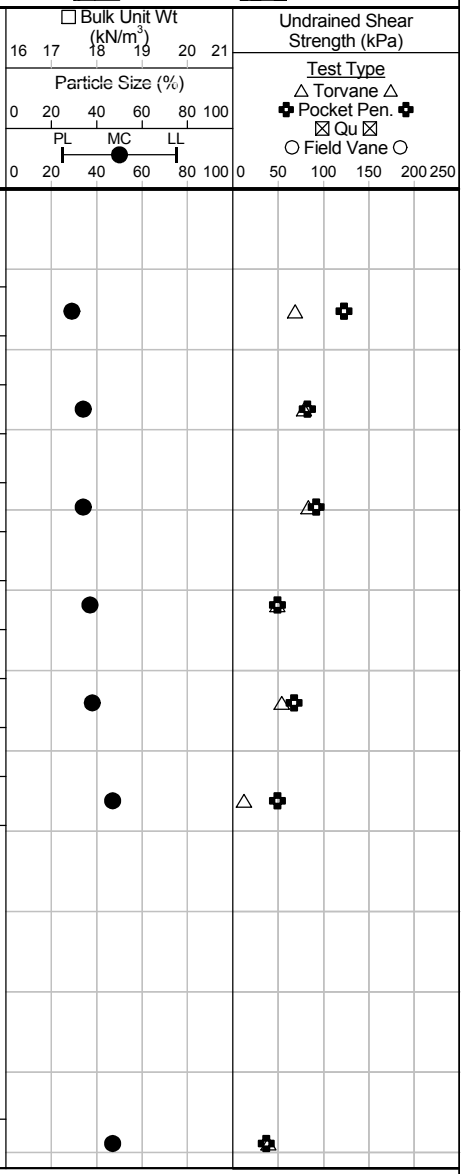
Test Hole TH19-07

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530242N, 628410E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (40 mm thick)		
		CONCRETE (205 mm thick)		
		CLAY - trace silt inclusions (diam. < 5 mm), trace organics - blackish grey - moist, stiff to very stiff - high plasticity		G24
0.5		- no trace organics and stiff below 0.6 m.		G25
1.0				G26
		- brownish grey and firm to stiff below 1.2 m.		G27
1.5		- trace sulphate precipitates (diam. < 10 mm) at 1.6 m.		G28
				G29
2.0				
2.5		- greyish brown and firm below 2.4 m.		
3.0				G30



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

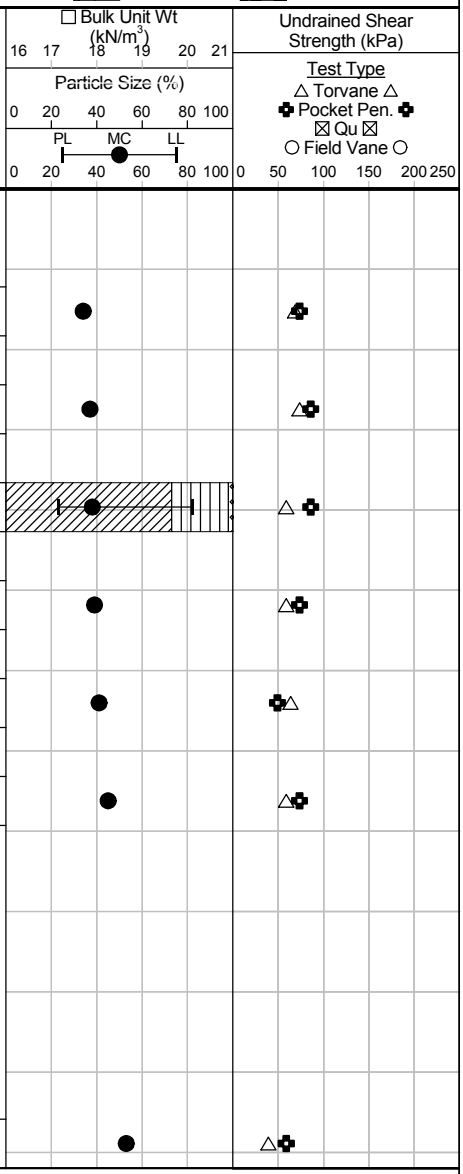
Test Hole TH19-08

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530143N, 628402E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (50 mm thick)		
		CONCRETE (190 mm thick)		
		CLAY - trace silt inclusions (diam. < 20 mm), trace orgnaics - blackish grey - moist, firm to stiff - high plasticity		G77
0.5		- trace gravel (diam. < 30 mm) at 0.5 m. - trace sand at 0.6 m.		G78
1.0				G79
		- no trace organics, brown and stiff below 1.2 m.		G80
1.5		- trace gravel (diam. < 5 mm) at 1.6 m .		G81
		- greyish brown and firm to stiff below 1.9 m.		G82
2.0				
2.5				
		- dark brown below 2.7 m.		
3.0				G83



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

Test Hole TH19-09

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5530044N, 628405E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (25 mm thick)		
		CONCRETE (205 mm thick)		
		CLAY - trace silt inclusions (diam. < 5 mm), trace organics - blackish grey - moist, stiff to very stiff - high plasticity		G16
0.5		- no trace organics, light brown and stiff below 0.6 m.		G17
1.0		- trace gravel (diam. < 10 mm) at 0.9 m.		G18
				G19
1.5				G20
		- firm below 1.8 m.		G21
2.0				
2.5				G22
		- greyish brown below 2.4 m.		G23
3.0				

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

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

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

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

END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

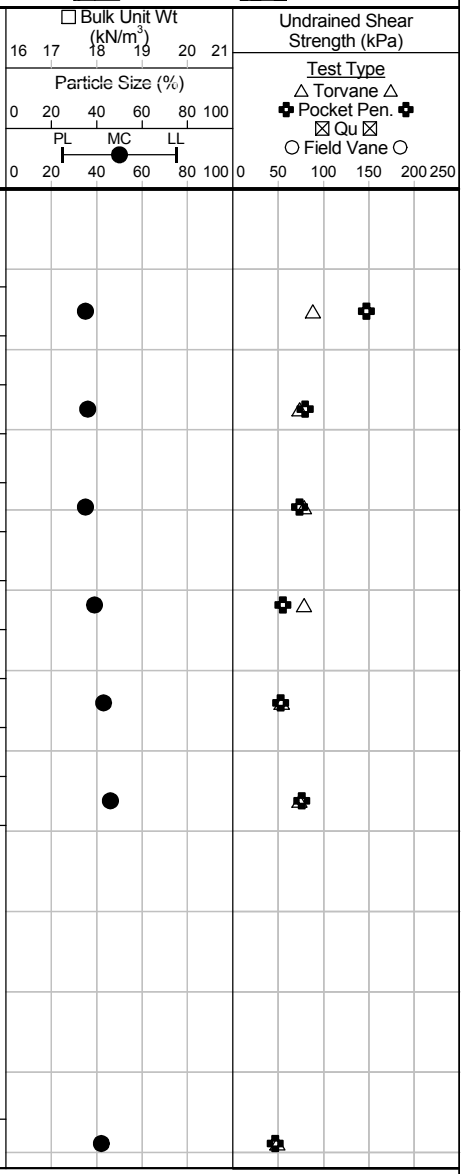
Test Hole TH19-10

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5529933N, 628398E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (50 mm thick)		
		CONCRETE (190 mm thick)		
		CLAY - trace silt inclusions (diam. < 20 mm), trace organics - blackish grey - moist, very stiff - high plasticity		G91
0.5		- no trace organics, trace gravel (diam. < 20 mm), brownish grey and stiff below 0.6 m.		G92
1.0		- no trace gravel below 0.9 m.		G93
				G94
1.5		- trace sulphate precipitates (diam. < 15 mm) at 1.5 m. - firm below 1.5 m.		G95
				G96
2.0				
2.5		- greyish dark brown below 2.4 m.		
3.0				G97



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

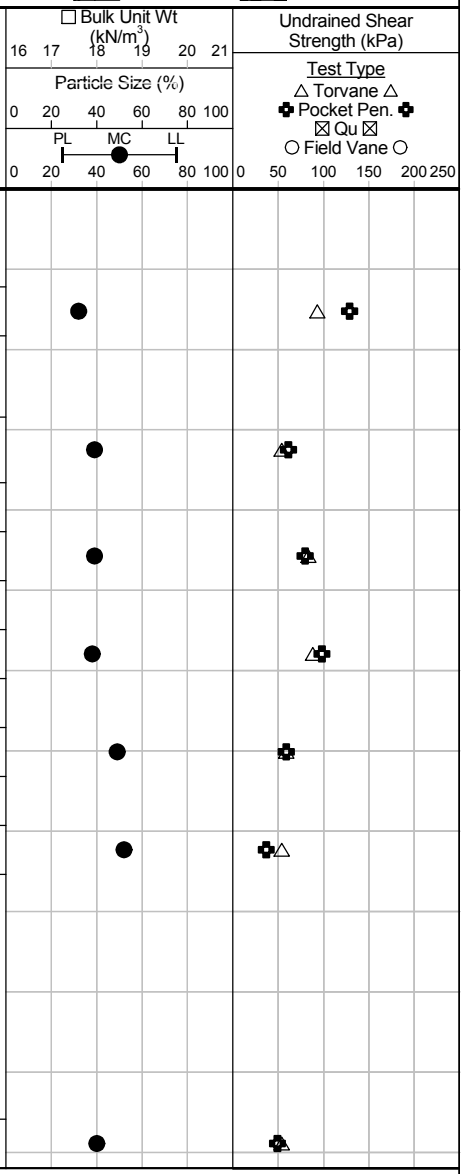
Test Hole TH19-11

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5529843N, 628402E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (150 mm thick)		
		CONCRETE (150 mm thick)		
		CLAY - trace silt inclusions (diam. < 30 mm), trace organics - blackish grey - moist, very stiff - high plasticity		G09
0.5				
		- stiff below 0.8 m.		G10
1.0				
		- no trace organics, brownish grey below 1.1 m.		G11
				G12
1.5				
		- firm below 1.7 m.		G13
2.0		- trace gravel inclusions (diam. < 15 mm) at 2.0 m.		G14
2.5				
3.0				G15



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

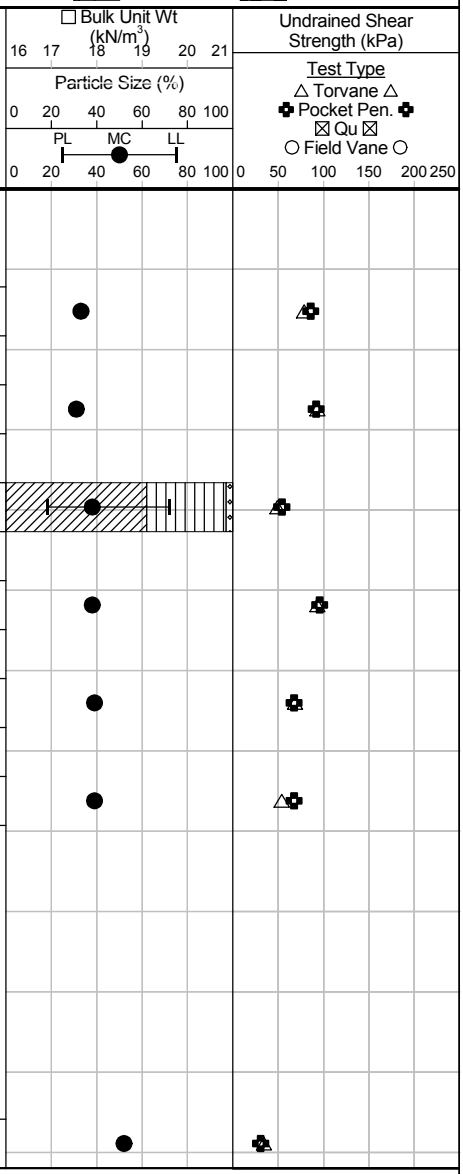
Test Hole TH19-12

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5529739N, 628394E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125mm Solid Stem Auger, Acker MP8 Truck Mount	**Date Drilled:**	September 5, 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
		ASPHALT (55 mm thick)		
		CONCRETE (200 mm thick)		
		CLAY - trace silt, trace organics - blackish grey - moist, stiff - high plasticity		G84
0.5				G85
1.0		SILT AND CLAY - brown, moist, soft , high plasticity		G86
		CLAY - trace silt inclusions (diam. < 10 mm) - brownish grey - moist, firm to stiff - high plasticity		G87
1.5				G88
		- trace sand at 1.8 m.		G89
2.0				
2.5				
		- soft below 2.7 m.		
3.0				G90



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

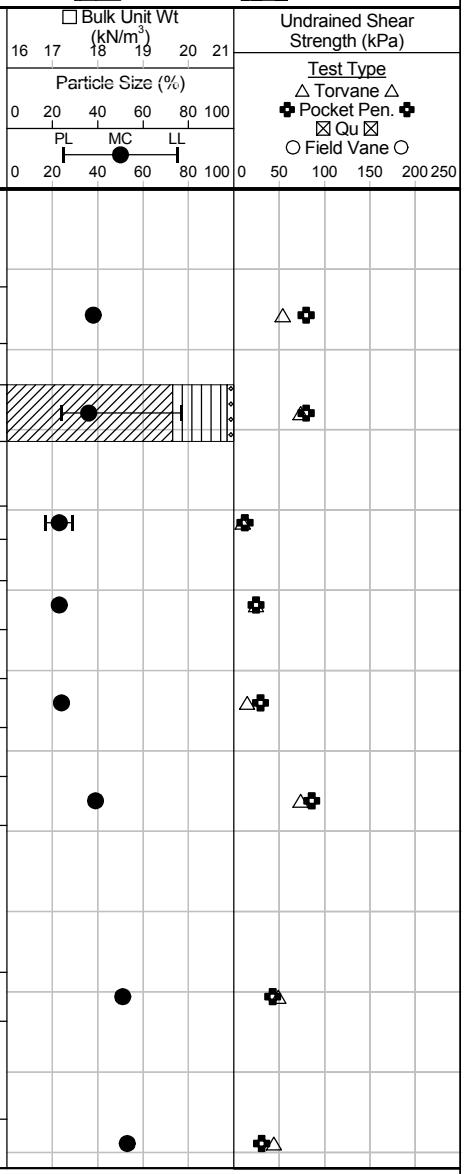
Test Hole TH19-13

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM-14U, 5529675N, 628398E
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	Top of Pavement
Method:	125 mm Solid Stem Auger	**Date Drilled:**	September 5, 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
		ASPHALT (35 mm thick)		
		CONCRETE (185 mm thick)		
		ORGANIC CLAY - trace silt - blackish grey - moist, stiff - high plasticity		G01
0.5				G02
1.0		SILT AND CLAY- trace sand - brown - moist, soft - low to intermediate plasticity		G03
				G04
1.5				G05
		CLAY - trace silt inclusions (diam. < 15 mm), trace gravel (diam. < 15 mm) - grey - moist, stiff - high plasticity		G06
2.0				
2.5		- trace sulphate precipitates at 2.4 m. - firm below 2.4 m.		G07
3.0				G08



END OF TEST HOLE AT 3.0 m IN CLAY

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Test hole dry and open to 3.0 m below ground surface immediately after drilling.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with the asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

SUB-SURFACE LOG LOGS 2019-09-16 SHERWIN ROAD TEST HOLES 0_A_JSB 0035-079-00.GPJ TREK GEOTECHNICAL.GDT 10/24/19

Sub-Surface Log

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM N-5530379, E-628408
Contractor:	TREK Geotechnical	**Ground Elevation:**	235.10 m
Method:	125 mm Dia. SSA, HQ Coring, ACKER SS	**Date Drilled:**	September 11, 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

Backfill Legend: Bentonite | Cement | Drill Cuttings | Filter Pack Sand | Grout | Slough

Elevation (m)	Depth (m)	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)
235.1		ASPHALT (35 mm thick)				
234.9		CONCRETE (200 mm thick)				
	0.5	CLAY (FILL) - trace sand, trace silt inclusions (diam. < 10 mm), trace gravel (diam. < 25 mm)	Grab	G131		
		- brownish grey	Grab	G132		
	1.0	- moist, firm to stiff	Grab	G133		
		- high plasticity	Grab	G134		
	1.5		Shelby Tube	T135		
	2.0		Grab	G136		
	2.5					
			Grab	G137		
	3.0	- grey below 2.9 m.	Grab	G138		
	3.5					
231.3						
	4.0	CLAY - trace silt, trace gravel (diam. < 30 mm)	Grab	G139		
		- brown				
		- moist, firm to stiff				
	4.5	- high plasticity				
			Shelby Tube	T140		
230.1	5.0	TRANSITION ZONE BELOW 5.0 m.	Grab	G141		
	5.5					
229.3						
	6.0	SILT (TILL) - trace clay, trace gravel	Grab	G142		
		- brownish grey				
		- moist, firm to stiff	Split Spoon	SS143		16
		- intermediate plasticity				
	6.5		Grab	G144		
	7.0					
	7.5	- reddish brown below 7.3 m.	Grab	G145		
	8.0					
		- brownish grey below 8.2 m.	Grab	G146		
	8.5					
	9.0					
			Split Spoon	SS147		39
	9.5					

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

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

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

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

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

Test Hole TH19-14

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)
	10.5							
	11.0					G148		
	11.5							
222.9	12.0							
	12.5			SAND (TILL) - trace silt - brown - moist, very dense becoming dense with depth - no to low plasticity - granite and limestone coubles and boulders below 12.5 m.		SS149		50 / 128mm
	13.0							
	13.5					C150		
	14.0							
	14.5							
	15.0							
	15.5					SS151		68
	16.0							
	16.5							
	17.0							
	17.5							
	18.0							
	18.5					SS152		41
215.9	19.0							
	19.5			DOLOMITE (Red River formation, Upper Fort Garry) - chert nodules, calcareous - cream to light grey, hard, R3-R4 - brecciated, vuggy		C153		
	20.0					C154	23	
	20.5							
	21.0							
	21.5					C155	30	
	22.0			- vuggy layers, horizontal fractures and fractures at 60 degrees to				

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

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

PL MC LL: 0 20 40 60 80 100

Undrained Shear Strength (kPa): 0 50 100 150 200 250

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

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

Elevation (m)	Depth (m)	Soil Symbol	Standpipe	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)
	22.5			the core axis below 22.1 m.				
	23.0			- cherty dolomite and minor subhorizontal fractures below 22.95 m.		C156	66	
	23.5							
	24.0							
	24.5					C157	86	
	25.0							
209.6				- dolomite with subhorizontal thin clay seams at 25.05 m. - white to pink, hard and minor vugs below 25.2 m.				

Bulk Unit Wt (kN/m³): 16 17 18 19 20 21
Particle Size (%): 0 20 40 60 80 100
PL MC LL: 0 20 40 60 80 100
Undrained Shear Strength (kPa): 0 50 100 150 200 250
Test Type: △ Torvane △ ✤ Pocket Pen. ✤ ☒ Qu ☒ ○ Field Vane ○

END OF TEST HOLE AT 25.4 m IN DOLOMITE BEDROCK.

Notes:
1) No seepage observed.
2) No sloughing observed.
3) Switched to HWT casing and HQ coring below 12.6 m.
4) SP19-14 installed in TH19-14A located approx. 1 m South-west of the test hole.
5) Test hole backfilled with bentonite chips and auger cuttings.
6) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

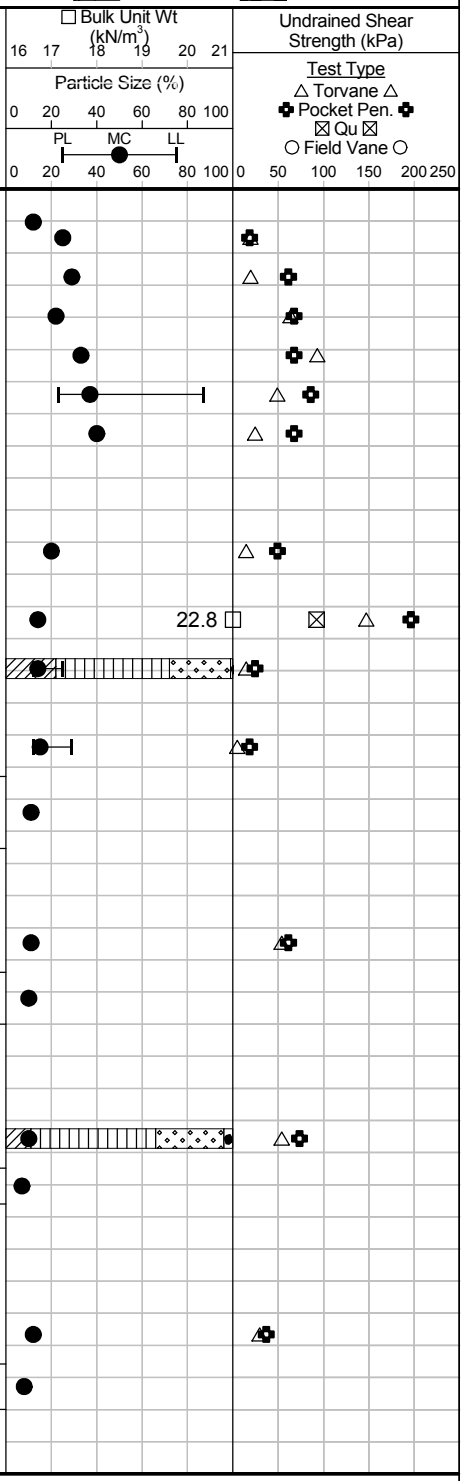
Test Hole TH19-15

Client:	Morrison Hershfield	**Project Number:**	0035-079-00
Project Name:	Sherwin Road Bridge Over Omands Creek	**Location:**	UTM N-5530379, E-628408
Contractor:	TREK Geotechnical Inc.	**Ground Elevation:**	235.05 m
Method:	Acker Track Mount, 125 mm SSA	**Date Drilled:**	September 6, 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

Elevation (m)	Depth (m)	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)
235.0		ASPHALT (30 mm thick)				
234.8		CONCRETE (210 mm thick)				
	0.5	CLAY (FILL) - silty, trace sand, trace gravel (diam. < 25 mm) - dark brown to grey - moist, stiff - high plasticity	Grab	G98		
			Grab	G99		
			Grab	G100		
	1.0		Grab	G101		
			Grab	G102		
233.5	1.5	CLAY - trace silt inclusions (diam. < 5 mm), trace sand, trace gravel (diam. < 20 mm) - dark brown - moist, stiff - high plasticity	Grab	G103		
	2.0		Grab	G104		
	2.5					
232.3		- TRANSITION ZONE BELOW 2.7 m.	Grab	G105		
	3.0					
			Shelby Tube	T106		
231.4	3.5	SILT (TILL) - trace to some clay, trace sand, trace gravel (diam. < 30 mm) - light brown - moist, compact - low plasticity	Grab	G107		
	4.0					
	4.5		Grab	G108		
		- trace clay below 4.6 m.	Split Spoon	SS109		11
	5.0					
	5.5					
	6.0		Grab	G110		
		- compact to dense below 6.0 m.	Split Spoon	SS111		12
	6.5					
	7.0					
	7.5		Grab	G112		
			Split Spoon	SS113		16
	8.0					
	8.5					
	9.0		Grab	G114		
			Split Spoon	SS115		15
	9.5					

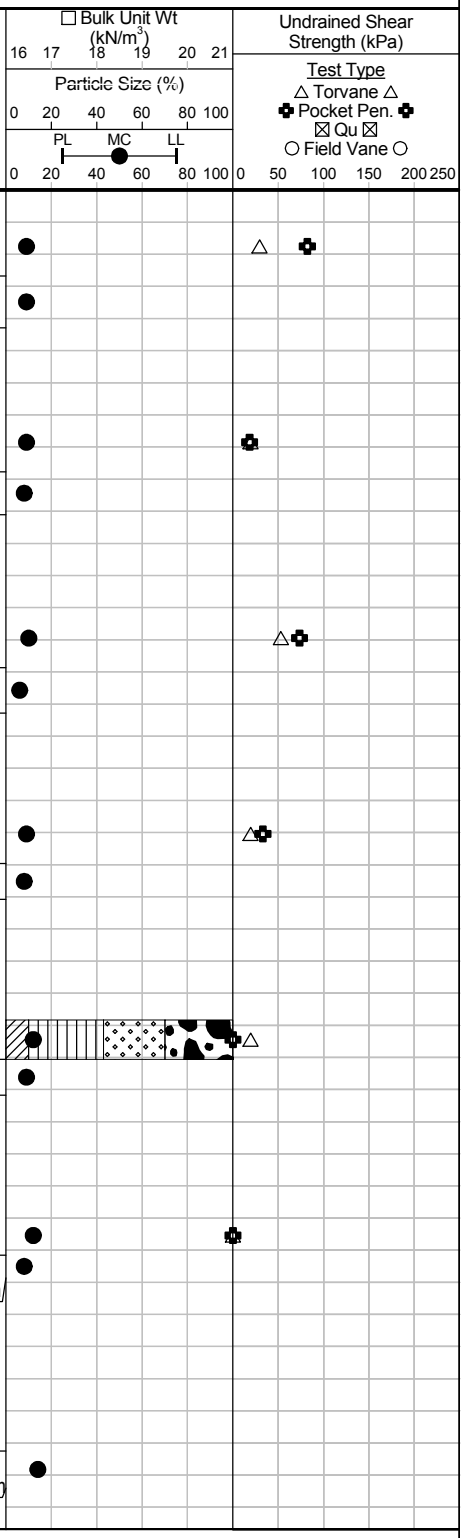


Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Sub-Surface Log

Test Hole TH19-15

Elevation (m)	Depth (m)	Soil Symbol	MATERIAL DESCRIPTION	Sample Type	Sample Number	RQD (%)	SPT (N)
	10.5				G116		
	11.0		- compact below 10.7 m.		SS117		17
	11.5						
	12.0				G118		
	12.5				SS119		15
	13.0						
	13.5				G120		
	14.0		- no clay, no plasticity and very dense below 13.7 m. - trace limestone gravel at 13.7 m.		SS121		53
	14.5						
219.8	15.0				G122		
	15.5		SANDY SILT (TILL) - brown - damp, very dense - no to low plasticity		SS123		68
	16.0						
218.6	16.5		SANDY SILT - trace gravel - light brown - wet, very dense - no plasticity		G124		
	17.0				SS125		105
	17.5						
216.8	18.0				G126		
	18.5		SAND (TILL) - silty, trace gravel - brown - moist, very dense - no plasticity		SS127 C128		142 / 24mm
	19.0						
215.2	19.5						
	20.0		SAND - poorly graded, fine grained, trace to some gravel, brown, wet, very loose, no plasticity - limestone cobble at 20.3 m.		SS129 C130		51 / 137mm
214.6							



END OF TEST HOLE AT 20.5 m IN SAND.

Notes:
1) Power auger refusal at 18.4 m in SAND (TILL).
2) Switched to HWT casing and HQ coring below 18.4 m.
3) Seepage observed at 15.0 m in SILT (TILL) and below 16.5 m in SANDY SILT.
3) No sloughing observed.
4) Test hole backfilled with bentonite chips and auger cuttings.
5) Test hole top sealed with asphalt cold patch.

Logged By: Jashan Bhullar **Reviewed By:** Nelson Ferreira **Project Engineer:** Michael Van Helden

Appendix B

Soil Sample laboratory Results and Summary Table

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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
TH19-01	UTM : 5530838 N, 628422 E Located in Northbound lane, 1.6 m West of East Curb and opposite of 2070 Notre Dame Avenue on Sherwin Road	Asphalt	30	Concrete	200	Clay	0.3	0.5	22							
						Clay	0.6	0.8	30							
						Clay	0.9	1.1	34							
						Clay	1.2	1.3	40							
						Clay	1.3	1.4	39							
						Clay	1.5	1.7	41							
						Clay	1.8	2.0	44							
						Clay	2.9	3.0	55							
TH19-02	UTM : 5530754 N, 628417 E Located in Southbound lane, 0.9 m East of West curb and opposite to 1240 Sherwin Road	Asphalt	50	Concrete	225	Clay (Fill)	0.3	0.5	30							
						Clay (Fill)	0.6	0.8	38							
						Clay (Fill)	0.9	1.1	38	64	31	6	0	19	74	55
						Clay (Fill)	1.2	1.4	37							
						Clay (Fill)	1.5	1.7	42							
						Clay (Fill)	1.8	2.0	39							
						Clay	2.9	3.0	49							
TH19-03	UTM : 5530652 N, 628418 E Located in Northbound lane, 1.5 m West of East curb and opposite to 1221 Sherwin Road	Asphalt	35	Concrete	200	Clay (Fill)	0.3	0.5	20							
						Clay (Fill)	0.6	0.8	22							
						Clay (Fill)	0.9	1.1	35							
						Clay (Fill)	1.2	1.4	22							
						Clay (Fill)	1.5	1.7	22							
						Clay (Fill)	1.8	2.0	25							
						Clay	2.4	2.6	45							
						Clay	2.9	3.0	52							
TH19-04	UTM : 5530546 N, 628411 E Located in Southbound lane, 1 m East of West curb and opposite to 1200 Sherwin Road	Asphalt	50	Concrete	200	Clay (Fill)	0.3	0.5	20							
						Clay (Fill)	0.6	0.8	25							
						Clay (Fill)	0.9	1.1	29							
						Clay (Fill)	1.2	1.4	35							
						Clay (Fill)	1.5	1.7	31							
						Clay (Fill)	1.8	2.0	32							
						Clay	2.4	2.6	54							
						Clay	3.2	3.4	47							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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 : 5530448 N, 628414 E Located in Northbound lane, 1 m West of East Curb and opposite to 1155 Sherwin Road	Asphalt	20	Concrete	200	Clay (Fill)	0.3	0.5	29							
						Clay (Fill)	0.6	0.8	29							
						Clay (Fill)	0.9	1.1	34							
						Clay (Fill)	1.2	1.4	32							
						Clay (Fill)	1.5	1.7	40							
						Clay (Fill)	1.8	2.0	38							
						Clay	2.4	2.6	36							
						Clay	2.9	3.0	39							
TH19-06	UTM : 5530328 N, 628407 E Located in Southbound lane, 0.9 m East of West curb and opposite to 1830 Dublin Avenue on Sherwin Road	Asphalt	40	Concrete	180	Clay	0.3	0.5	25							
						Clay	0.6	0.8	31							
						Clay	0.9	1.1	34							
						Clay	1.2	1.4	30							
						Silt and Clay	1.5	1.7	29							
						Silt and Clay	1.8	2.0	26							
						Clay	2.9	3.0	49							
TH19-07	UTM : 5530242 N, 628410 E Located in Northbound lane, 2.2 m West of East curb and opposite to 1093 Sherwin Road	Asphalt	40	Concrete	205	Clay	0.3	0.5	29							
						Clay	0.6	0.8	34							
						Clay	0.9	1.1	34							
						Clay	1.2	1.4	37							
						Clay	1.5	1.7	38							
						Clay	1.8	2.0	47							
						Clay	2.9	3.0	47							
TH19-08	UTM : 5530143 N, 628402 E Located in Southbound lane, 1 m East of West curb and opposite to 1093 Sherwin Road	Asphalt	50	Concrete	190	Clay	0.3	0.5	34							
						Clay	0.6	0.8	37							
						Clay	0.9	1.1	38	25	73	2	0	23	82	59
						Clay	1.2	1.4	39							
						Clay	1.5	1.7	41							
						Clay	1.8	2.0	45							
						Clay	2.9	3.0	53							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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
TH19-09	UTM : 5530044 N, 628405 E Located in Northbound lane, 2.3 m West of East Curb and opposite to 1063 Sherwin Road	Asphalt	25	Concrete	180	Clay	0.3	0.5	32							
						Clay	0.6	0.8	33							
						Clay	0.9	1.1	35							
						Clay	1.2	1.4	41							
						Clay	1.5	1.7	46							
						Clay	1.8	2.0	55							
						Clay	2.4	2.6	53							
						Clay	2.9	3.0	49							
TH19-10	UTM : 5529933 N, 628398 E Located in Southbound lane, 1.3 m East of West curb and opposite to 1051 Sherwin Road	Asphalt	50	Concrete	190	Clay	0.3	0.5	35							
						Clay	0.6	0.8	36							
						Clay	0.9	1.1	35							
						Clay	1.2	1.4	39							
						Clay	1.5	1.7	43							
						Clay	1.8	2.0	46							
						Clay	2.9	3.0	42							
TH19-11	UTM : 5529843 N, 628402 E Located in Northbound lane, 1.5 m West of East curb and opposite to 1001 Sherwin Road	Asphalt	150	Concrete	150	Clay	0.3	0.5	32							
						Clay	0.7	0.9	39							
						Clay	1.1	1.2	39							
						Clay	1.4	1.5	38							
						Clay	1.7	1.8	49							
						Clay	2.0	2.1	52							
						Clay	2.9	3.0	40							
TH19-12	UTM : 5529739 N, 628394 E Located in Southbound lane, 0.95 m East of West curb and opposite to 975 Sherwin Road	Asphalt	55	Concrete	200	Clay	0.3	0.5	33							
						Clay	0.6	0.8	31							
						Silt and Clay	0.9	1.1	38	62	35	3	0	18	72	54
						Clay	1.2	1.4	38							
						Clay	1.5	1.7	39							
						Clay	1.8	2.0	39							
						Clay	2.9	3.0	52							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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 : 5529739 N, 628398 E Located in Northbound lane, 1.5 m West of East Curb and opposite to 975 Sherwin Road	Asphalt	35	Concrete	185	Clay (Organic)	0.3	0.5	38							
						Clay (Organic)	0.6	0.8	36	73	24	3	0	77	24	53
						Silt and Clay	0.9	1.1	23					17	29	12
						Silt and Clay	1.2	1.4	23							
						Silt and Clay	1.5	1.7	24							
						Clay	1.8	2.0	39							
						Clay	2.4	2.6	51							
						Clay	2.9	3.0	53							
TH19-14	UTM : 5530420 N, 628409 E Located in Southbound lane, 1 m East of West Curb and opposite to 1151 Sherwin Road	Asphalt	35	Concrete	200	Clay (Fill)	0.3	0.5	31							
						Clay (Fill)	0.6	0.8	25							
						Clay (Fill)	0.9	1.1	31							
						Clay (Fill)	1.2	1.4	19							
						Clay (Fill)	1.5	2.1	29							
						Clay (Fill)	2.1	2.3	38							
						Clay (Fill)	2.7	2.9	36							
						Clay (Fill)	2.9	3.0	21							
TH19-15	UTM : 5530379 N, 628408 E Located in at the intersection of Dublin Ave and Sherwin Road, 0.45 m East of West Curb	Asphalt	30	Concrete	210	Clay (Fill)	0.2	0.3	12							
						Clay (Fill)	0.3	0.5	25							
						Clay (Fill)	0.6	0.8	29							
						Clay (Fill)	0.9	1.1	22							
						Clay (Fill)	1.2	1.4	33							
						Clay	1.5	1.7	37							
						Clay	1.8	2.0	40							
						Clay	2.7	2.9	20							

Appendix C

Photographs of Pavement Core Samples

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

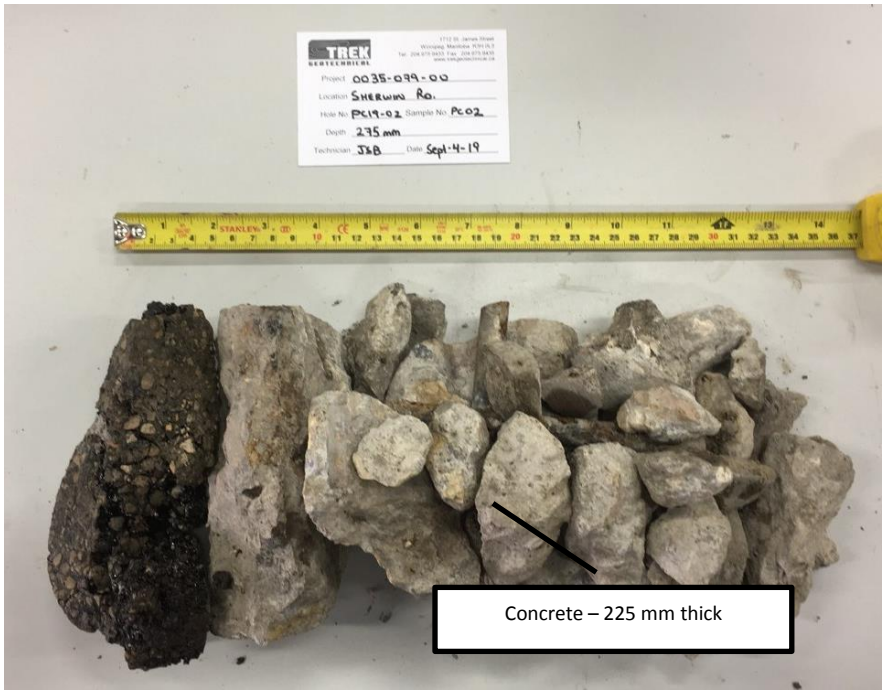


Photo 2: Pavement Core Sample at Test Hole TH19-02

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

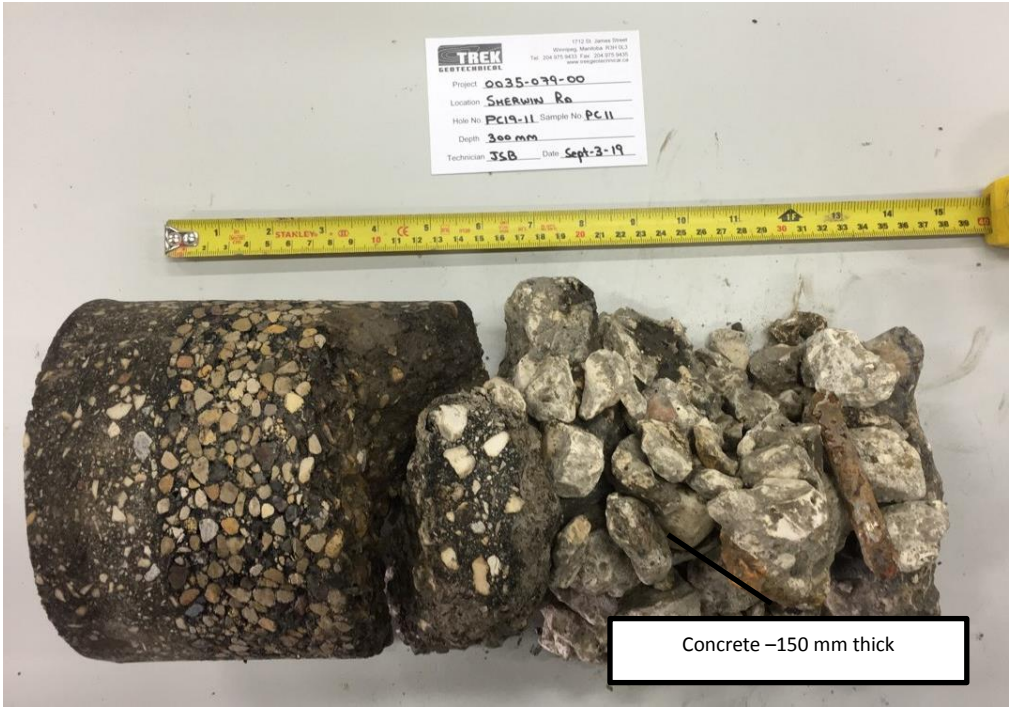


Photo 11: Pavement Core Sample at Test Hole TH19-11

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 SP19-14

MEMORANDUM

Quality Engineering | Valued Relationships

Date	November 18, 2019
To	Jashan Bhullar, TREK Geotechnical
From	Angela Fidler-Kliewer, TREK Geotechnical
Project No.	0035-079-00
Project	Sherwin Road Bridge Over Omands Creek
Subject	Laboratory Testing Results – Lab Req. R19-247
Distribution	Michael Van Helden

Attached are the laboratory testing results for the above noted project. This report contains Standard proctor and California Bearing Ration (CBR) test results on a mixture of various samples from between the depths of 0.3 m and 1.1 m .

Regards,

Angela Fidler-Kliewer, C.Tech.

Attach.

Review Control:

Prepared By: AFK	*Reviewed By:* AFK	*Checked By:* NJF

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

Lab Requisition

TREK GEOTECHNICAL
1712 St. James Street
Winnipeg, Manitoba R3H 0L3
T 204.975.9433 F 204.975.9435

PROJECT: Sherwin Rd. PROJECT NO:

CLIENT: Morrison Hershfield FIELD TECHNICIAN: Joshan Bhullar.

TEST HOLE NUMBER	SAMPLE NUMBER	Sample Start Depth (ft)	Sample End Depth (ft)	TARE NUMBER (LAB USE ONLY)	MOISTURE	VISUAL CLASS.	ATTERBERG LIMITS	HYDROMETER	GRADATION	STD. PROCTOR	UNCONFINED AND AUXILLARY TESTS				Soil Description/ Comments
TH19-01	447	1'	1'6"												CBR
	448	2'	2'6"												
	449	3'	3'6"												(Mix all the highlighted samples together)
TH19-06	470	1'	1'6"												
	471	2'	2'6"												
	472	3'	3'6"												
TH19-07	424	1'	1'6"												
	425	2'	2'6"												
	426	3'	3'6"												
TH19-08	477	1'	1'6"												
	478	2'	2'6"												
	479	3'	3'6"												
TH19-09	416	1'	1'6"												
	417	2'	2'6"												
	418	3'	3'6"												
TH19-10	491	1'	1'6"												
	492	2'	2'6"												
	493	3'	3'6"												
TH19-11	409	1'	1'6"												
	410	2'4"	3'												
	411	3'6"	4'												
TH19-12	484	1'	1'6"												
	485	2'	2'6"												

Total wet Sample → 173903.7 gms

REQUESTED BY: MVH REPORT TO: MVH

REQUISTION DATE: Nov 4, 19 DATE REQUIRED:

COMMENTS: One CBR Only.

REQUISITION NO. R19-247

SHEET ____ OF ____

Sept 30, 2015 DW

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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
TH19-01	UTM : 5530838 N, 628422 E Located in Northbound lane, 1.6 m West of East Curb and opposite of 2070 Notre Dame Avenue on Sherwin Road	Asphalt	30	Concrete	200	Clay	0.3	0.5	22							
						Clay	0.6	0.8	30							
						Clay	0.9	1.1	34							
						Clay	1.2	1.3	40							
						Clay	1.3	1.4	39							
						Clay	1.5	1.7	41							
						Clay	1.8	2.0	44							
						Clay	2.9	3.0	55							
TH19-02	UTM : 5530754 N, 628417 E Located in Southbound lane, 0.9 m East of West curb and opposite to 1240 Sherwin Road	Asphalt	50	Concrete	225	Clay (Fill)	0.3	0.5	30							
						Clay (Fill)	0.6	0.8	38							
						Clay (Fill)	0.9	1.1	38	64	31	6	0	19	74	55
						Clay (Fill)	1.2	1.4	37							
						Clay (Fill)	1.5	1.7	42							
						Clay (Fill)	1.8	2.0	39							
						Clay	2.9	3.0	49							
TH19-03	UTM : 5530652 N, 628418 E Located in Northbound lane, 1.5 m West of East curb and opposite to 1221 Sherwin Road	Asphalt	35	Concrete	200	Clay (Fill)	0.3	0.5	20							
						Clay (Fill)	0.6	0.8	22							
						Clay (Fill)	0.9	1.1	35							
						Clay (Fill)	1.2	1.4	22							
						Clay (Fill)	1.5	1.7	22							
						Clay (Fill)	1.8	2.0	25							
						Clay	2.4	2.6	45							
						Clay	2.9	3.0	52							
TH19-04	UTM : 5530546 N, 628411 E Located in Southbound lane, 1 m East of West curb and opposite to 1200 Sherwin Road	Asphalt	50	Concrete	200	Clay (Fill)	0.3	0.5	20							
						Clay (Fill)	0.6	0.8	25							
						Clay (Fill)	0.9	1.1	29							
						Clay (Fill)	1.2	1.4	35							
						Clay (Fill)	1.5	1.7	31							
						Clay (Fill)	1.8	2.0	32							
						Clay	2.4	2.6	54							
						Clay	3.2	3.4	47							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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 : 5530448 N, 628414 E Located in Northbound lane, 1 m West of East Curb and opposite to 1155 Sherwin Road	Asphalt	20	Concrete	200	Clay (Fill)	0.3	0.5	29							
						Clay (Fill)	0.6	0.8	29							
						Clay (Fill)	0.9	1.1	34							
						Clay (Fill)	1.2	1.4	32							
						Clay (Fill)	1.5	1.7	40							
						Clay (Fill)	1.8	2.0	38							
						Clay	2.4	2.6	36							
						Clay	2.9	3.0	39							
TH19-06	UTM : 5530328 N, 628407 E Located in Southbound lane, 0.9 m East of West curb and opposite to 1830 Dublin Avenue on Sherwin Road	Asphalt	40	Concrete	180	Clay	0.3	0.5	25							
						Clay	0.6	0.8	31							
						Clay	0.9	1.1	34							
						Clay	1.2	1.4	30							
						Silt and Clay	1.5	1.7	29							
						Silt and Clay	1.8	2.0	26							
						Clay	2.9	3.0	49							
TH19-07	UTM : 5530242 N, 628410 E Located in Northbound lane, 2.2 m West of East curb and opposite to 1093 Sherwin Road	Asphalt	40	Concrete	205	Clay	0.3	0.5	29							
						Clay	0.6	0.8	34							
						Clay	0.9	1.1	34							
						Clay	1.2	1.4	37							
						Clay	1.5	1.7	38							
						Clay	1.8	2.0	47							
						Clay	2.9	3.0	47							
TH19-08	UTM : 5530143 N, 628402 E Located in Southbound lane, 1 m East of West curb and opposite to 1093 Sherwin Road	Asphalt	50	Concrete	190	Clay	0.3	0.5	34							
						Clay	0.6	0.8	37							
						Clay	0.9	1.1	38	25	73	2	0	23	82	59
						Clay	1.2	1.4	39							
						Clay	1.5	1.7	41							
						Clay	1.8	2.0	45							
						Clay	2.9	3.0	53							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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
TH19-09	UTM : 5530044 N, 628405 E Located in Northbound lane, 2.3 m West of East Curb and opposite to 1063 Sherwin Road	Asphalt	25	Concrete	180	Clay	0.3	0.5	32							
						Clay	0.6	0.8	33							
						Clay	0.9	1.1	35							
						Clay	1.2	1.4	41							
						Clay	1.5	1.7	46							
						Clay	1.8	2.0	55							
						Clay	2.4	2.6	53							
						Clay	2.9	3.0	49							
TH19-10	UTM : 5529933 N, 628398 E Located in Southbound lane, 1.3 m East of West curb and opposite to 1051 Sherwin Road	Asphalt	50	Concrete	190	Clay	0.3	0.5	35							
						Clay	0.6	0.8	36							
						Clay	0.9	1.1	35							
						Clay	1.2	1.4	39							
						Clay	1.5	1.7	43							
						Clay	1.8	2.0	46							
						Clay	2.9	3.0	42							
TH19-11	UTM : 5529843 N, 628402 E Located in Northbound lane, 1.5 m West of East curb and opposite to 1001 Sherwin Road	Asphalt	150	Concrete	150	Clay	0.3	0.5	32							
						Clay	0.7	0.9	39							
						Clay	1.1	1.2	39							
						Clay	1.4	1.5	38							
						Clay	1.7	1.8	49							
						Clay	2.0	2.1	52							
						Clay	2.9	3.0	40							
TH19-12	UTM : 5529739 N, 628394 E Located in Southbound lane, 0.95 m East of West curb and opposite to 975 Sherwin Road	Asphalt	55	Concrete	200	Clay	0.3	0.5	33							
						Clay	0.6	0.8	31							
						Silt and Clay	0.9	1.1	38	62	35	3	0	18	72	54
						Clay	1.2	1.4	38							
						Clay	1.5	1.7	39							
						Clay	1.8	2.0	39							
						Clay	2.9	3.0	52							

Replacement of Existing Culvert at Sherwin Road Over Omand's Creek and Associated Regional Street Improvements
Sub-Surface Investigation
Sherwin Road

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 : 5529739 N, 628398 E Located in Northbound lane, 1.5 m West of East Curb and opposite to 975 Sherwin Road	Asphalt	35	Concrete	185	Clay (Organic)	0.3	0.5	38							
						Clay (Organic)	0.6	0.8	36	73	24	3	0	77	24	53
						Silt and Clay	0.9	1.1	23					17	29	12
						Silt and Clay	1.2	1.4	23							
						Silt and Clay	1.5	1.7	24							
						Clay	1.8	2.0	39							
						Clay	2.4	2.6	51							
						Clay	2.9	3.0	53							
TH19-14	UTM : 5530420 N, 628409 E Located in Southbound lane, 1 m East of West Curb and opposite to 1151 Sherwin Road	Asphalt	35	Concrete	200	Clay (Fill)	0.3	0.5	31							
						Clay (Fill)	0.6	0.8	25							
						Clay (Fill)	0.9	1.1	31							
						Clay (Fill)	1.2	1.4	19							
						Clay (Fill)	1.5	2.1	29							
						Clay (Fill)	2.1	2.3	38							
						Clay (Fill)	2.7	2.9	36							
						Clay (Fill)	2.9	3.0	21							
TH19-15	UTM : 5530379 N, 628408 E Located in at the intersection of Dublin Ave and Sherwin Road, 0.45 m East of West Curb	Asphalt	30	Concrete	210	Clay (Fill)	0.2	0.3	12							
						Clay (Fill)	0.3	0.5	25							
						Clay (Fill)	0.6	0.8	29							
						Clay (Fill)	0.9	1.1	22							
						Clay (Fill)	1.2	1.4	33							
						Clay	1.5	1.7	37							
						Clay	1.8	2.0	40							
						Clay	2.7	2.9	20							

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Standard Proctor Compaction Test

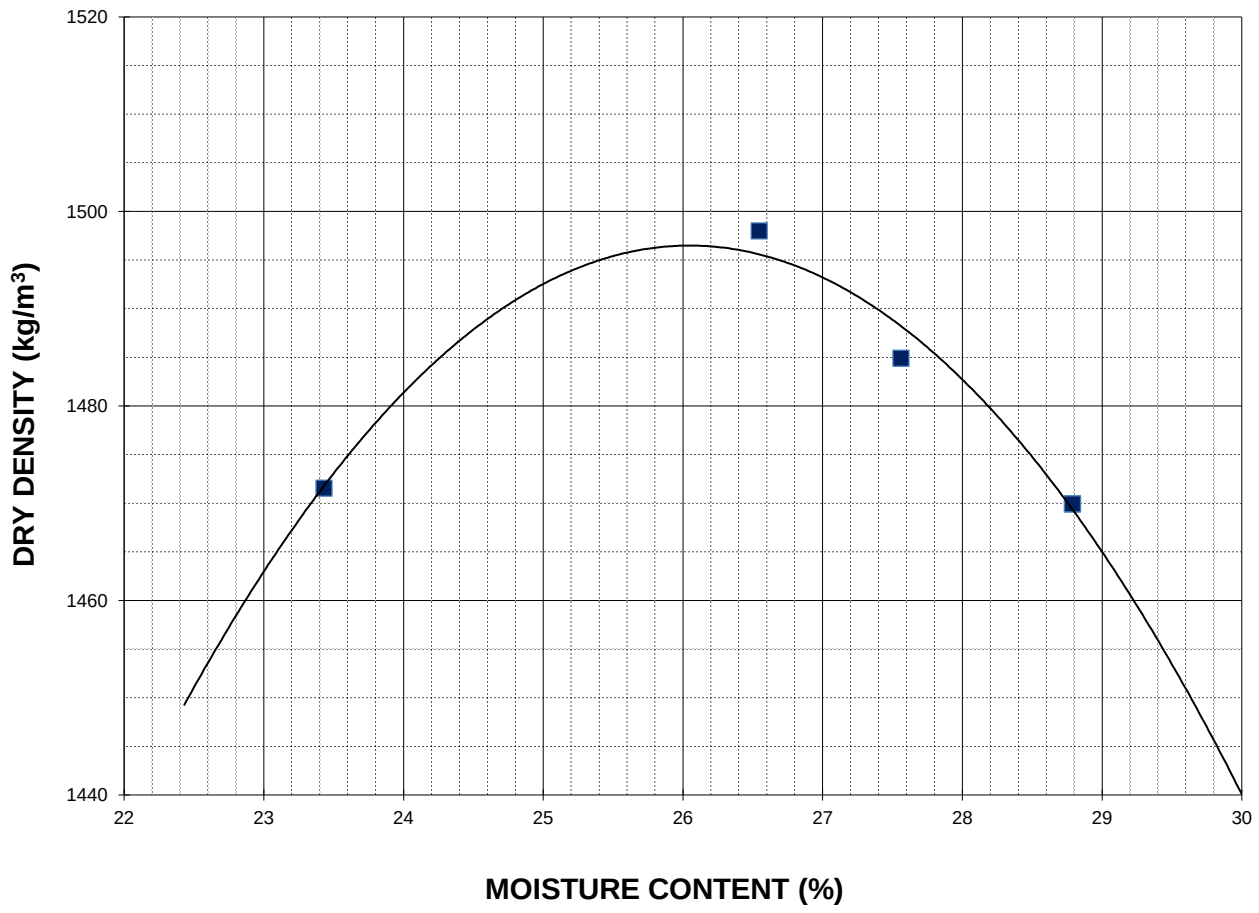
ASTM D698-12e2

Project No.	0035-079-00
Client	Morrison Hershfield
Project	Sherwin Road

Sample #	R19-247
Source	Road Test Holes
Material	Clay
Sample Date	05-Sep-19
Test Date	06-Nov-19
Technician	JSB

Maximum Dry Density (kg/m3)	1496
Optimum Moisture (%)	26.0

Trial Number	1	2	3	4	
Wet Density (kg/m^3)	1816	1896	1894	1893	
Dry Density (kg/m^3)	1472	1498	1485	1470	
Moisture Content (%)	23.4	26.5	27.6	28.8	



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California Bearing Ratio Test Data Sheet

ASTM D1883-16

Project No.	0035-079-00	**Source**	Road Test Holes
Client	Morrison Hershfield	**Material**	Clay
Project	Sherwin Road	**Sample Date**	05/09/2019
Sample #	Clay	**Test Date**	08/11/2019
		Technician	JSB

Proctor Results (ASTM D698)

Maximum Dry Density	1496	kg/m3
Optimum Moisture Content	26.0	%
Material Retained on 19 mm Sieve	0.0	%

CBR Sample Compaction

Dry Density	1433	kg/m3
Initial Moisture Content	29.0	%
Relative Density	95.8	% SPMDD

Soaking Results

Surcharge	4.54	kg
Swell	1.1	%
Moisture Content in top 25 mm	38.1	%
Immersion Period	96	h

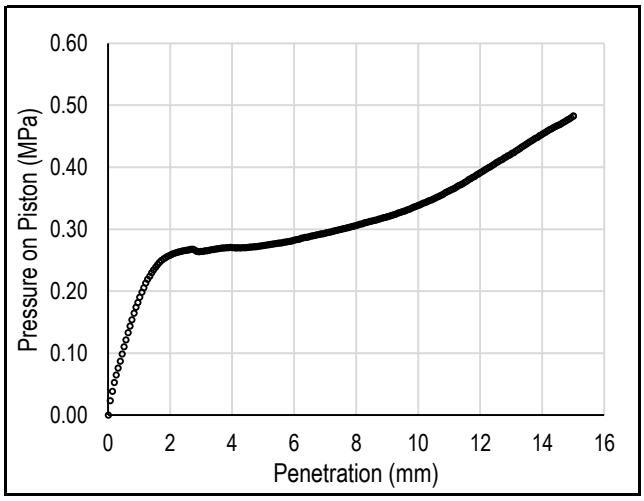
CBR Results

CBR at 2.54 mm	3.9	%
CBR at 5.08 mm	2.7	%
Zero Correction	0	mm

Test Data

Penetration (mm)	Measured Pressure (MPa)	Corrected Pressure (MPa)
0.64	0.13	0.13
1.27	0.22	0.22
1.91	0.26	0.26
2.54	0.27	0.27
3.18	0.27	0.27
3.81	0.27	0.27
4.45	0.27	0.27
5.08	0.27	0.27
7.62	0.30	0.30
10.16	0.34	0.34
12.70	0.41	0.41

Load/Penetration Curve



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