APPENDIX 'A'

GEOTECHNICAL REPORT



WSP Canada Group Ltd 2018 Regional Street Package (PW File #: C-05)

Prepared for:

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

Project Number: 0395 004 00

Date:

March 14, 2018 Final Report



Quality Engineering | Valued Relationships

March 14, 2018

Our File No. 0395 004 00

Marcus Wong, B.Sc. (C.E.), P.Eng. WSP Canada Group Ltd. 111-93 Lombard Ave. Winnipeg, MB R3B

RE: Sub-Surface Investigation Report for 2018 Regional Street Package (PW File #: C-05)

TREK Geotechnical Inc. is pleased to submit our report for the sub-surface investigations for the 2018 Regional Street Package (PW File #: C-05).

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

Sincerely,

TREK Geotechnical Inc. Per:

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

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



Revision History

Revision No.	Author	Issue Date	Description
0	AFK	March 14, 2018	Final Report

Authorization Signatures

Prepared By:

Angela Figer-Kliewer C.Tech.

reparea by:





Reviewed By:

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



Table of Contents

Letter of Transmittal

Revision History and Authorization Signatures

1.0	Introduction1
2.0	Road Investigation and Laboratory Program1
3.0	Closure

List of Figures

Figure 01	Test Hole Location Plan – York Avenue
Figure 02	Test Hole Location Plan – Memorial Blvd.
Figure 03	Pavement Core Location Plan – Memorial Blvd.
Figure 04	Pavement Core Location Plan – Colony Street

List of Appendices

Appendix A	Test Hole Logs, Summary Table, Lab Data & Pavement Core
	Photographs – York Avenue

- Appendix B Test Hole Logs, Summary Table, Lab Data & Pavement Core Photographs – Memorial Blvd.
- Appendix C Summary Table & Pavement Core Photographs Memorial Blvd.
- Appendix D Summary Table & Pavement Core Photographs Colony Street



1.0 Introduction

This report summarizes the results of the road investigation completed for the 2018 Regional Street Package C-05 project. The streets included York Avenue, Memorial Blvd. and Colony Street. The information collected describes the pavement structure of the existing road as well as the soil stratigraphy beneath the pavement structure at select locations.

2.0 Road Investigation and Laboratory Program

The investigation included coring of pavement or a combination of coring and drilling of test holes. WSP selected the investigation locations as shown on Figure 01 to Figure 04 (attached) and the table below summarizes the investigation program per street.

Street	# of Locations	Investigation
York Avenue – Memorial Blvd to Osbourne Street.	2	Pavement Cores and Test Holes
Memorial Blvd – St. Mary Avenue to Broadway Avenue	8	Pavement Cores and Test Holes
Memorial Blvd – Portage Avenue to St. Mary Avenue	6	Pavement Cores Only
Colony Street – Ellice Avenue to Portage Avenue	6	Pavement Cores Only

Road Investigation Program

The road investigation was conducted between February 12, 2018 and February 15, 2018. The pavement structure (asphalt or concrete) was cored by Harsimran Singh of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The test holes were drilled to a depth of 3.0 m below road surface by Paddock 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 Harsimran Singh of TREK. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples retrieved during the sub-surface investigation were transported to TREK's material testing laboratory for further testing. Core samples were also retrieved and logged at TREK's material testing laboratory.

The laboratory testing program consisted of moisture content determination, Atterberg limits, and grain size analysis (mechanical sieve and hydrometer methods) on select samples between 0.5 and 1.0 m below pavement. Information gathered for each street is included in separate appendices (Appendices A to D). The information provided in the Appendices includes test hole logs, laboratory testing summary tables and results, and photos of the concrete cores.

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



3.0 Closure

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

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

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



Figures



Test Hole Plan









0395 004 00 WSP GROUP CANADA LTD. Regional Streets C-05 _ Memorial Boulevard



003





3/8/2018

0395 004 00 (Colony St.)

à 8



Appendix A

York Avenue, between Osbourne St. North and Memorial Blvd.

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

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

GEOT

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.

Ma	ajor Div	isions	USCS Classi- fication	Symbols	Typical Names		Laboratory Classif	fication C	riteria		ş				
	raction	gravel no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines		$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	^{n 4;} C _c = <u> </u>	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		ieve size	5 #4	o #10	to #40	200
sieve size	vels of coarse f	Clean (Little or	GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	urve, 200 sieve nbols*	Not meeting all gradatio	on requiren	nents for GW	ە	STM S	#10	#401	#500	¥
s No. 200	Gra than half o	vith fines sciable of fines)	GM		Silty gravels, gravel-sand-silt mixtures	r than No. g dual syn	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	ticle Siz	٩			+	
ained soils larger thar	(More	Gravel w (Appre amount	GC		Clayey gravels, gravel-sand-silt mixtures	wel from g ion smalle ilows: W, SP SM, SC ts requirin	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Par		Ľ	, 8	25	
Coarse-Gr naterial is	action	sands no fines)	SW	***** ****	Well-graded sands, gravelly sands, little or no fines	nd and gra ines (fracti sified as fo sw, GP, S GM, GC, thine case	$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	^{n 6;} C _c =	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		шш	2 UU tO 4 7		.075 to 0.4	c / N.N >
n half the r	nds of coarse fr an 4 75 mi	Clean (Little or	SP		Poorly-graded sands, gravelly sands, little or no fines	ages of sa entage of 1 s are class cent srcent	Not meeting all gradatio	on requiren	nents for SW				. 0	0	
(More thai	Sal Sal Saller th	vith fines sciable of fines)	SM		Silty sands, sand-silt mixtures	le percent of on perc rained soil than 5 per than 12 per than 12 per than 2 percent.	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	lai	5			100	Clay
	(More	Sands w (Appre amount	SC		Clayey sands, sand-clay mixtures	Determir dependir coarse-g Less More 6 to 1	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Mate	ואומר	Sand	Mediu	Fine Citt or	oll oi
e size)	, As		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	80 Plasticity	Plasticity	/ Chart			e Sizes		-	i i i	
. 200 sieve	ts and Cla	Liquid limit sss than 50	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	70 - 60 -	an 0.425 mm		,U LI . A LINE	e	TM Sieve	> 12 in 2 in to 12	2	3/4 in. to 3 #4 to 3/4	15 2 14
soils er than No	Si		OL	==	Organic silts and organic silty clays of low plasticity	- 00 (%) 00 (%)		CH CH		rticle Siz	ASI	+	_		_
e-Grained al is small	ski	t 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts					Pa	m	300 200	222	to 75	n 10
Fine the materi	ts and Cla	Liquid limi ater than (СН		Inorganic clays of high plasticity, fat clays	20-			MH OR OH		L	75 1		191 4 75) F
than half	N	gre	OH		Organic clays of medium to high plasticity, organic silts		ML OR OL 16 20 30 40 50 LIQUID LI	60 70 _IMIT (%)	80 90 100 110		5	ers	3_		-
(More	Highly	Organic Soils	Pt	<u>6 76 76</u> <u>70 77 7</u>	Peat and other highly organic soils	Von Post Class	sification Limit a	Strong co and often	lour or odour, fibrous texture	Mate	ואומוכ	Bould	Grave	Coarse	

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)	63	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:

	<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 cor	nesive soil can be related to its c	consistency as follows:

Descriptive TermsSPT (N) (Blows/300 mm)Very soft< 2</td>Soft2 to 4Firm4 to 8Stiff8 to 15Very stiff15 to 30Hard> 30

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

Descriptive Terms	Undrained Shear <u>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



TREK	
GEOTECHNICAL	

Sub-Surface Log

Client		WSP Canada	Goun	l td			Project Number:	0305	.004-0	0							
Proioc	-t Name	2018 Region	al Stree	ets C-05 (Vork A			l ocation:		ITM N-5527770 E-632917								
Contr	actor	Paddock Dril	ling I td	I	<u>vej</u>		Ground Elevation		f Pav	ement	L-0323	17					
Metho	nd.	125mm Solid St		r. Acker MP8 Truck	Mount		Date Drilled	2018	Fehri	iarv 14							
	Sampla					Shalby Tuba (T)							ro(C)				
	Sample	Type.					Spiil Spoon (3										
	Particle	Size Legend:		Fines	Clay	Silt	Sand .		Gra	vel	b°d (Cobbles		Bould	ers		
(m)	Soil Symbol			MATER	IAL DES	CRIPTION		Sample Type	Sample Number	16 17 Pa 0 20 PL 0 20	(kN/m ³ (kN/m ³ article Siz 40 6 . MC 40 6) 9 20 21 9 (%) 0 80 100 LL 0 80 100	0 S O I O 0 50	Tength Test T Torva Ocket ⊠Qu Field V 100	$\frac{(kPa)}{\sqrt{pe}}$ ne \triangle Pen. Φ ane \bigcirc 150 20		
ł		JUNGRETE - 20	nini c	UNICK													
۲ ۲ ۹ ۰		CLAY (FILL) - sil - brown, fro SILT AND CLAY - brown - frozen, mo	ty, sano zen, mo - trace bist and	dy, some gravel oist and soft whe sand I soft when thaw	en thawe	d, high plasticity			G01								
		- intermedia	ite plas	ticity					000								
									GU2		•						
									G03								
									G04								
_		CLAY - silty, trac	e sand	to 2.7 m													
.5-		- frozen to 1 - high plasti	.5 m, n city	noist and stiff wł	nen thaw	ed			G05					¢			
		trace silt inclusi	ons (<	5 mm diam.), tra	ace oxida	tion, very stiff bel	ow 1.8 m		G06		•						
0 - - -																	
.5-		stiff below 2.7 r	'n														
		- 3un μ ο ιυw 2.7 Ι							G07		•		<u>^</u> •				
<u></u>		END OF TEST H 1) No seepage c 2) Test hole bac 3) Test hole loca South of North c	IOLE A r sloug kfilled v ted at ´ urb.	NT 3.0 m IN CLA hing. vith auger cuttin 17 m East of Yo	Y gs, bentc rk Ave ar	nite chips, sand a d Osborne Stree	and cold patch aspha t intersection, 3.5 m	lt.									

	-
GEOTECHNICAL	X

GE	EOT	<u>ECHNIC</u>	IAL												
Clier	nt:	WSP Canada	a Goup Ltd.			Project Number:	0395-	-004-0	00						
Proje	ect Nam	e: 2018 Region	al Streets C-05 (York Ave)		Location:	UTM	N-55	2777	4, E-63	2935				
Cont	tractor:	Paddock Dril	ling Ltd.			Ground Elevation:	Тор о	of Pav	emer	nt					
Meth	nod:	125mm Solid Ste	em Auger, Acker MP	3 Truck Mount		Date Drilled:	2018	Febru	ary 1	14					
	Sample	е Туре:	Grab (G)		Shelby Tube (T)	Split Spoon (S	SS)	Sp	olit Ba	arrel (S	B)	Core	e (C)		
	Particle	e Size Legend:	Fines	Clay	Silt	Sand		Gra	vel	5	Cobb	les '	В	oulder	s
Depth (m)	Soil Symbol		M	ATERIAL DESC	RIPTION		Sample Type	Sample Number	16 1 0 2 0 2	Bulk (kN 7 18 Particle 0 40 PL M PL M 40 40	Unit Wt /m ³) 19 2 Size (%) 60 8 1C LL 60 8	20 21 30 100 30 100 0	Undr Stre D D P C F 50 1	ained S ength (k est Typ Forvane ocket Pe Z Qu Z ield Van 00 150	hear Pa) ≘ ≏ ∆ en. Ф e O 0 20025
		CLAY (FILL) - sil - brown, fro. SILT AND CLAY - brown - frozen to 1 - intermedia CLAY - silty, trac - grey - moist, stiff - high plasti - high plasti - trace silt inclusi - trace silt inclusi - firm below 2.7 the END OF TEST H 1) No seepage c 2) Test hole bac 3) Test hole bac 3) Test hole loca North of South c	Ity, sandy, some <u>zen, moist and so</u> / - trace sand 1.5 m, moist and ate plasticity ze sand to 2.7 m ficity ions (< 5 mm dia m HOLE AT 3.0 m Il or sloughing. kfilled with auger ated at 23 m Wes- urb.	gravel oft when thawed soft to firm when m.) below 1.8 m N CLAY cuttings, bentot t of York Ave ar	high plasticity h thawed	and cold patch asphal evard intersection, 1	t. m	G08 G09 G10 G11 G12 G13 G13 G13							
ТН 83 ІН ГОС5 м ГОС5 И	ged By:	Harsimran Sinc	gh	Reviewe	d By: N.J Ferre	ira	F	Projec	t End	gineer:	Nelso	on Ferre	eira		



Regional Street Package C-05 Sub-Surface Investigation York Avenue

-		Paveme	ent Surface	Pavement Str	ucture Material		Sample	Depth (m)	Moisture		Grain Siz	e Analysis	3	At	terberg L	imits
No.	Test Hole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Subgrade Description	Top (m)	Bottom (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
		Asphalt	N/A	Concrete	203		1									
						CLAY (FILL)	0.2	0.3	19	16	34	27	24	18	57	39
	632917 E					SILT AND CLAY	0.6	0.8	34							
	Located 17 m East of					SILT AND CLAY	0.9	1.1	26							
1118-01	York Ave. and Osborne					SILT AND CLAY	1.2	1.3	25							
	St. intersection, 3.5 m					CLAY	1.5	1.6	28							
	South of North Curb.					CLAY	1.8	0.3 19 16 34 27 24 18 57 39 0.8 34 $ 1.1$ 26 $ 1.3$ 25 $ 1.6$ 28 $ 2.0$ 33 $ 2.9$ 47 $ 0.4$ 22 $ 0.4$ 22 $ -$								
						CLAY	2.7	2.9	47					Plastic Liquid 18 57 18 57 18 57 10 10 10 10		
		Asphalt	N/A	Concrete	254											
	UTM: 5527774 N.					CLAY (FILL)	0.2	0.4	22							
	632935 E					SILT AND CLAY	0.7	0.8	25	0	7	60	32	14	35	21
TU10 02	Located 23 M West of					SILT AND CLAY	1.0	1.1	28							
1010-02	York Ave. and Memorial					SILT AND CLAY	1.2	1.4	36							
	Bivd. intersection, 1.0 m North of South curb.					CLAY	1.6	1.7	42							
						CLAY	1.9	2.0	34							
						CLAY	2.7	2.9	54							
							Ī	1								
							Ī	1								
							Ī	1								
							I									



Project No.	0395-004-00
Client	WSP Canada Group Ltd.
Project	2018 Regional Streets C-05 (York Ave)
Sample Date	14-Feb-18
Test Date	2-Mar-18

HS

Test Date Technician

-						
Test Pit	TH18-01	TH18-01	TH18-01	TH18-01	TH18-01	TH18-01
Depth (m)	0.2 - 0.3	0.6 - 0.8	0.9 - 1.1	1.2 - 1.3	1.5 - 1.6	1.8 - 2.0
Sample #	G01	G02	G03	G04	G05	G06
Tare ID	H46	P40	E59	W88	F35	N26
Mass of tare	8.5	8.6	8.6	8.5	8.7	8.7
Mass wet + tare	570.5	475.7	271.8	189.4	305.7	300.9
Mass dry + tare	479.5	358.1	217.7	153.6	240.2	227.9
Mass water	91.0	117.6	54.1	35.8	65.5	73.0
Mass dry soil	471.0	349.5	209.1	145.1	231.5	219.2
Moisture %	19.3%	33.6%	25.9%	24.7%	28.3%	33.3%

-						
Test Pit	TH18-01	TH18-02	TH18-02	TH18-02	TH18-02	TH18-02
Depth (m)	2.7 - 2.9	0.2 - 0.4	0.7 - 0.8	1.0 - 1.1	1.2 - 1.4	1.6 - 1.7
Sample #	G07	G08	G09	G10	G11	G12
Tare ID	E70	Z43	W79	H66	F44	AB71
Mass of tare	8.8	8.4	8.5	8.4	8.6	6.7
Mass wet + tare	274.5	555.4	412.4	304.6	199.7	280.3
Mass dry + tare	189.4	456.3	330.8	239.7	160.0	200.1
Mass water	85.1	99.1	81.6	64.9	39.7	80.2
Mass dry soil	180.6	447.9	322.3	231.3	151.4	193.4
Moisture %	47.1%	22.1%	25.3%	28.1%	26.2%	41.5%

Test Pit	TH18-02	TH18-02		
Depth (m)	1.9 - 2.0	2.7 - 2.9		
Sample #	G13	G14		
Tare ID	H90	F149		
Mass of tare	8.6	8.4		
Mass wet + tare	372.3	228.4		
Mass dry + tare	279.7	151.1		
Mass water	92.6	77.3		
Mass dry soil	271.1	142.7		
Moisture %	34.2%	54.2%		



Project No.	0395-004-00					
Client	WSP					
Project	2018 Regional Str	eets C-05 (York Av	/e)			
Test Hole	TH18-01					
Sample #	G01					
Depth (m)	0.2-0.3					
Sample Date	14-Feb-18				Liquid Limit	57
Test Date	6-Mar-18				Plastic Limit	18
Technician HS					Plasticity Index	39
Liquid Limit			•			
Irial #	(1))	1	2	3		
Number of Blow	(S (N)	17	29	33		
Mass Wet Soil +	Tare (g)	24.073	27.976	23.071		
Mass Dry Soil +	l are (g)	20.358	23.020	19.860		
Mass Tare (g)		14.092	14.183	14.047		
Mass Water (g)	、	3.715	4.956	3.211		
Mass Dry Soil (g	l)	6.266	8.837	5.813		
Moisture Conter	nt (%)	59.288	56.082	55.238		
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Plasticity Chart for smaller than 0.429	or solid fraction w 5 mm	ith particles	CH CH MH or O 60 70	Line	100 110
				IIT (%)		

Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	20.777	22.192			
Mass Wet Soil + Tare (g)	19.807	20.989			
Mass Dry Soil + Tare (g)	14.445	14.225			
Mass Water (g)	0.970	1.203			
Mass Dry Soil (g)	5.362	6.764			
Moisture Content (%)	18.090	17.785			



Project No.	0395-004-00					
Client	WSP					
Project	2018 Regional Str	eets C-05 (York Av	ve)			
Test Hole	TH18-02					
Sample #	G09					
Depth (m)	0.7-0.8					
Sample Date	14-Feb-18				Liquid Limit	35
Test Date	6-Mar-18				Plastic Limit	14
Technician	HS				Plasticity Index	21
Liquid Limit						
Trial #		1	2	3		
Number of Blows (N)		17	21	30		
Mass Wet Soil + Tare (g)		21.514	21.254	23.566		
Mass Dry Soil +	Tare (g)	19.551	19.390	21.181		
Mass Tare (g)		14.225	14.233	14.082		
Mass Water (g)		1.963	1.864	2.385		
Mass Dry Soil (g)		5.326	5.157	7.099		
Moisture Content (%)		36.857	36.145	33.596		
 08 70 70 60 70 60 70 <	Plasticity Chart for smaller than 0.429	or solid fraction w 5 mm	rith particles	CH MH or O 60 70 nit (%)	Line "A" Line H 80 90	100 110
			•	、 <i>,</i>		

Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	22.020	20.435			
Mass Wet Soil + Tare (g)	21.096	19.716			
Mass Dry Soil + Tare (g)	14.228	14.457			
Mass Water (g)	0.924	0.719			
Mass Dry Soil (g)	6.868	5.259			
Moisture Content (%)	13.454	13.672			



Project No. Client Project	0395-004-00 WSP Canada Group Ltd. 2018 Regional Streets C-05 (York Ave)			
Test Hole	TH18-01			
Sample #	G01			
Depth (m)	0.2 - 0.3	Gravel	15.9%	
Sample Date	14-Feb-18	Sand	33.7%	
Test Date	6-Mar-18	Silt	26.7%	
Technician	HS	Clay	23.8%	



29.74

27.61

25.25

22.64

18.86

0.0045

0.0033 0.0024

0.0017

0.0010



Project No. Client Project	0395-004-00 WSP Canada Group Ltd. 2018 Regional Streets C-05 (York Ave)		
Test Hole	TH18-02		
Sample #	G09		
Depth (m)	0.7 - 0.8	Gravel	0.0%
Sample Date	14-Feb-18	Sand	7.4%
Test Date	6-Mar-18	Silt	60.2%
Technician	HS	Clay	32.4%



39.30

34.21

31.04

30.72

0.0033

0.0024

0.0017

0.0010





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



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

Our Project No. 0395 004 00 March 2018



Appendix B

Memorial Blvd, between St Mary Ave. and Broadway Ave.

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

EXPLANATION OF FIELD AND LABORATORY TESTING

GENERAL NOTES

GEOT

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.

Ma	ajor Div	isions	USCS Classi- fication	Symbols	Typical Names		Laboratory Classif	fication C	riteria		ş				
	raction	gravel no fines)	GW		Well-graded gravels, gravel-sand mixtures, little or no fines	$\begin{array}{c} \text{Vell-graded gravels, gravel-sand} \\ \text{ixtures, little or no fines} \end{array} \qquad $							o #10	to #40	200
sieve size	vels of coarse f	Clean (Little or	GP		Poorly-graded gravels, gravel-sand mixtures, little or no fines	urve, 200 sieve nbols*	Not meeting all gradatio	on requiren	nents for GW	ە	STM S	#10	#401	#500	¥
s No. 200	Gra than half o	vith fines sciable of fines)	GM		Silty gravels, gravel-sand-silt mixtures	r than No. g dual syn	Atterberg limits below "A line or P.I. less than 4	'A"	Above "A" line with P.I. between 4 and 7 are border-	ticle Siz	٩			+	
ained soils larger thar	(More	Gravel w (Appre amount	GC		Clayey gravels, gravel-sand-silt mixtures	wel from g ion smalle ilows: W, SP SM, SC ts requirin	Atterberg limits above "A line or P.I. greater than 7	'A" 7	line cases requiring use of dual symbols	Par		Ľ	, g	25	
Coarse-Gr naterial is	action	sands no fines)	SW	***** *****	Well-graded sands, gravelly sands, little or no fines	nd and gra ines (fracti sified as fo sw, GP, S GM, GC, thine case	$C_{U} = \frac{D_{60}}{D_{10}}$ greater than	^{n 6;} C _c =	$\frac{(D_{30})^2}{(10 \times D_{60})^2}$ between 1 and 3		шш	2 UU tO 4 7		.075 to 0.4	c/U.U >
n half the r	nds of coarse fr an 4 75 mi	Clean (Little or	SP		Poorly-graded sands, gravelly sands, little or no fines	ages of sa entage of 1 s are class cent srcent	Not meeting all gradatio	on requiren	nents for SW				. 0	0	
(More thai	Sal Sal Saller th	vith fines sciable of fines)	SM		Silty sands, sand-silt mixtures	le percent of on perc rained soil than 5 per than 12 per than 12 per than 2 percent.	Atterberg limits below "A line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are border-	lai	5				Clay	
	(More	Sands w (Appre amount	SC		Clayey sands, sand-clay mixtures	Determir dependir coarse-g Less More 6 to 1	Atterberg limits above "A line or P.I. greater than 7	line cases requiring use of dual symbols	Mate	ואומר	Sand	Mediu	Fine Citt or	oll oi	
e size)	, As		ML		Inorganic silts and very fine sands, rock floor, silty or clayey fine sands or clayey silts with slight plasticity	80 Plasticity	Plasticity	/ Chart			e Sizes		-	i i i	
. 200 sieve	ts and Cla	Liquid limit sss than 50	CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	70 - 60 -	an 0.425 mm		,U LI . A LINE	e	TM Sieve	> 12 in 2 in to 12	2	3/4 in. to 3 #4 to 3/4	15 2 14
soils er than No	Si		OL	==	Organic silts and organic silty clays of low plasticity	- 00 (%) 00 (%)		CH CH		rticle Siz	ASI	+	_		_
e-Grained al is small	ski	t 50)	MH		Inorganic silts, micaceous or distomaceous fine sandy or silty soils, organic silts					Pa	m	300 200	222	to 75	P 10
Fine the materi	the material ts and Clays Luquid limit sater than 50		Inorganic clays of high plasticity, fat clays	20 10 10 10 10 10 10 10 10 10 10 10 10 10		20- 10- OF MH OR OH		MH OR OH		L	75 1		191 4 75) F	
than half	N	gre	OH		Organic clays of medium to high plasticity, organic silts		ML OR OL 16 20 30 40 50 LIQUID LI	60 70 _IMIT (%)	80 90 100 110		5	ers	3_		-
(More	Highly	Organic Soils	Pt	<u>6 76 76</u> <u>70 77 7</u>	Peat and other highly organic soils	ils Von Post Classification Limit Strong colour or odour, and often fibrous texture				Mate	ואומוכ	Bould	Grave	Coarse	

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)	63	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:

	<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 cor	nesive soil can be related to its c	consistency as follows:

Descriptive TermsSPT (N) (Blows/300 mm)Very soft< 2</td>Soft2 to 4Firm4 to 8Stiff8 to 15Very stiff15 to 30Hard> 30

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

Descriptive Terms	Undrained Shear <u>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



C PR	
GEOTECHN	ICAL

GEO	T	<u>echnic</u>	AL														
Client:		WSP Canada	a Goup	Ltd.			Project Number:	0395-	004-0	00							
Project N	Name	: 2018 Region	al Stree	ets C-05 (N	lemorial Boule	/ard)	Location:	UTM	N-55	2776	62, E-	63297	9				
Contract	tor:	Paddock Dril	ling Ltd				Ground Elevation:	Top o	f Pav	emei	nt						
Method:		125mm Solid St	em Auge	r, Acker MP8	Truck Mount		Date Drilled:	2018	Febru	uary ⁻	14						
Sar	mple	Туре:		Grab (G)		Shelby Tube (T)	Split Spoon (S	SS) 🔽	Sp	olit Ba	arrel	(SB) [Co	re (C)			
Par	rticle	Size Legend:		Fines	Clay	Silt	र्रेःः Sand		Gra	vel	5	2 C	obbles		Bould	ders	
Depth (m) Soil Symbol	soll symbol			MA	ATERIAL DESC		Sample Type	Sample Number	16 1 0 2 0 2	□ Bi 17 1 Partic 20 4 PL 20 4	ulk Unit (kN/m ³) 18 19 cle Size 10 60 MC 40 60	Wt 20 21 - (%) 80 100 LL 80 100 (ndraine Strengtl △ Torv Pocke ⊠ Q Field 100	ed She <u>h (kPa</u> <u>Type</u> ane ∆ t Pen. u ⊠ Vane (150	ar) • O 20025	
-0.5-		CONCRETE - 20 CLAY (FILL) - si - brown, fro	00 mm Ity, som zen, mo	thick ne sand, tra pist and sol	ice gravel ft when thawed	, intermediate pl	asticity		G15)						
	S S S S S	SILT AND CLAY - brown - frozen to - intermedia stiff below 0.9 i	′ - trace I.5 m, n ate plas m	sand noist and s ticity	oft when thawe	d			G16	-	•						
									G17 G18		•						
									G19	-	•						
-2.0-		- grey - moist, stiff - high plasti	city	iciusions (<	, to min diam.				G20								
-3.0-		firm below 2.7	m						G21	-		•		0			
	E 1 2 3 1	ND OF TEST H) No seepage o) Test hole bac) Test hole loca .2 m West of E	HOLE A or sloug kfilled v ated at 4 ast curb	T 3.0 m IN hing. vith auger o 42 m South 5.	CLAY cuttings, bentor of Memorial B	nite chips, sand a oulevard and Yc	and cold patch asphal rk Avenue intersectio	it. n,			1	<u>,</u> 1					1
Logged E	By:	Harsimran Sing	gh		Reviewe	d By: N.J Ferre	ira	F	Projec	t En	ginee	er: Ne	elson Fer	reira			

TREK	
GEOTECHNICAL	

GE	: O T	ECHNIC	AL																	
Clien	nt:	WSP Canada	Goup	Ltd.				Р	roject Numbe	er: _0	395-	004-(00							
Proje	ect Nam	e: 2018 Regiona	I Stree	ets C-05 (M	emorial Bo	ouleva	rd)	L	ocation:	<u> </u>	ТМ	N-55	2770)9, E-6	63299	8				
Cont	ractor:	Paddock Drilli	ng Ltd					G	round Elevat	ion: _T	ор о	f Pav	eme	nt						
Meth	od:	125mm Solid Ste	m Augei	, Acker MP8	Truck Mount			D	ate Drilled:	_2	018	Febru	uary	14						
	Sampl	е Туре:		Grab (G)		Sh	elby Tube (T)		Split Spoo	on (SS)		S S	plit B	arrel ((SB) [Core (0	C)		
	Particl	e Size Legend:		Fines	Cla	ay	Silt		Sanc	1		Gra	ivel	67		obbles		Во	ulders	6
Depth (m)	Soil Symbol			MA	TERIAL D)ESCR	IPTION				Sample Type	Sample Number	16 0 2 0 2	Dartic 20 41 Pl 20 41 PL 20 41	1100000000000000000000000000000000000	20 2 (%) 80 10 LL 80 10	21 00 00 0 5	Undra <u>Strer</u> △ To ● Poo ○ Fie 50 10	ined Sl ngth (kl orvane ket Pe I Qu ⊠ Id Van 0 150	near Pa) 2 2 0 0 200 250
ł	2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	CONCRETE - 20	0 mm ⁻	thick																
		CLAY (FILL) - silt	y, som	e sand, tra	ce gravel						-									
ŀ		- brown, froz	en, mo	oist and sof	t when tha	awed, i	ntermediate p	lastic	ity			G22	1							
-0 5-		- brown	- liace	Sanu	6							OLL								
2		- frozen to 1. - intermedial	5 m, n e plas	ticity	ott when th	nawed							4							
ή- 												G23		•			•			
												G24	-	•			•			
												G25	-	•			•			
		- trace silt inclusion	ons (<	10 mm dia	m.), firm be	elow 1	.5 m					G26		•			2	4		
		- stiff below 1.8 m	1									G27		•				•		
		CLAY - silty, trace	e silt in	clusions (<	10 mm dia	am.)					1									
		- grey - moist, firm - high plastic	ity																	
												G28			•		4			
		END OF TEST H 1) No seepage or 2) Test hole back 3) Test hole locat	OLE A sloug filled v ed at b	T 3.0 m IN hing. <i>v</i> ith auger c ouilding #21	CLAY cuttings, be 19 (Southb	entonit	e chips, sand lane), 3 m Ea	and o	cold patch as West curb.	phalt.										
Logg	jed By:	Harsimran Sing	h		_ Revie	ewed E	By: _N.J Ferr	eira			F	Projec	ct En	ginee	r: <u>N</u>	elson F	erreira	a		

	57	
	R	ΕK
GEOTE	СНИ	ICAL

GE	EOT	ECHNIC	AL																
Clier	nt:	WSP Canada	a Goup Ltd.			Project Number:	0395-	-004-(00										
Proje	ect Nam	e: 2018 Regiona	al Streets C-05 (Mer	norial Boule	vard)	Location:	UTM	N-55	52766	63, E-	63302	2							
Cont	ractor:	Paddock Drilli	ing Ltd.			Ground Elevation	ation: <u>Top of Pavement</u> 2018 February 14												
Meth	nod:	125mm Solid Ste	em Auger, Acker MP8 Tru	ck Mount		Date Drilled:													
	Sampl	е Туре:	Grab (G)		Shelby Tube (T)	Split Spoon (SS)	< s	plit B	arrel	(SB) [Co	ore (C)						
	Particl	e Size Legend:	Fines	Clay	Silt	Sand		Gra	avel	5	2 C	obbles		Bould	ers				
Depth (m)	Soil Symbol		MATI	ERIAL DES	CRIPTION		Sample Type	Sample Number	16 0 : 0 :	D B 17 1 Partie 20 4 PL 20 4	ulk Unit (kN/m ³) 18 19 cle Size 40 60 MC 40 60	Wt 20 21 (%) 80 100 LL 80 100	U : (0 50	ndraine Strength <u>Test</u> △ Torva Pocket ⊠ Qu) Field \ 100	d Shea <u>(kPa)</u> <u>ype</u> ane ∆ Pen. 4 J ⊠ /ane C 150 2	ar • • • • •			
ł	4 4 4 4 4 4 4 4 4	CONCRETE - 20	5 mm thick																
		CLAY (FILL) - silt - black, froze CLAY - silty, trace	ty, some sand, trace en, moist and soft w e sand	gravel hen thawed	, intermediate pla	sticity		G29		•									
-0.5-		- black, froze - moist	en .,																
		- nign plastic	city					G30		•									
-1.0-		SILT AND CLAY	- trace sand					G31		•									
		- brown - frozen to 1 - intermedia	.5 m, moist and soft te plasticity	when thaw	ed			G32	-	•									
		SILT - some clay - brown - moist, soft - low plastici	, trace sand					G33		•									
-2.0-		SILT AND CLAY - brown - moist, firm - intermediat	- trace sand te plasticity					G34					4						
-2.5-																			
		- stiff below 2.7 n	n					G35			•		4						
		END OF TEST H 1) No seepage or 2) Test hole back 3) Test hole locat East of West curl	IOLE AT 3.0 m IN S r sloughing. cfilled with auger cut ted at 50 m North of b.	ILT AND CL tings, bento Memorial E	AY nite chips, sand a Boulevard and Bro	and cold patch aspha badway intersection, 4	 1 m				·								
Loge	ged By:	Harsimran Sing	h	Reviewe	d By: <u>N.J Ferre</u>	ira		Projec	ct En	ginee	er: _N	elson Fe	rreira						

TREK
GEOTECHNICAL

Sub-Surface Log

GE	E O T	ECHNIC	AL														
Clien	it:	WSP Canada	Goup Ltd.			Project Number:	: 0395-004-00										
Proje	ect Nam	e: 2018 Regiona	al Streets C-05 (M	emorial Boule	vard)	Location:	UTM N-5527656, E-633046										
Cont	ractor:	Paddock Drilli	ing Ltd.			Ground Elevation:	on: _Top of Pavement										
Meth	od:	125mm Solid Ste	m Auger, Acker MP8	Truck Mount		Date Drilled:	2018 February 14										
	Sampl	е Туре:	Grab (G)		Shelby Tube (T)	Split Spoon (S	SS) 🕨	< s	olit Ba	rrel (SB)	С	ore (C	C)				
	Particl	e Size Legend:	Fines	Clay	Silt	Sand		Gra	vel	52	Cobbles	•	Boulders				
Depth (m)	Soil Symbol		MA	TERIAL DESC	CRIPTION		Sample Type	Sample Number	16 17 0 20 F 0 20	Bulk Ur (kN/m, 18 Particle Siz 40 6 40 6 40 40 6	hit Wt 3) 20 2' ze (%) 50 80 100 LL 50 80 100	0 0 5	Undrai Stren <u>Tes</u> C To Pocl O Fiel 0 100	ned She gth (kPa st Type rvane ∠ ket Pen. Qu ⊠ d Vane 0 150	ar ۱) • • • • • • • • • • • • • • • • • •		
		CONCRETE - 22 CLAY (FILL) - silt - brown, froz SILT AND CLAY - brown - frozen to 1. - intermediat	5 mm thick y, some sand, tra ten, moist and sof - trace sand .5 m, moist when te to high plasticit	ce gravel t when thawed thawed y	I, intermediate pl	asticity		G36 G37		•							
								G38 G39		•							
		- firm below 1.5 n - stiff below 1.9 m	n					G40 G41		•			10				
		CLAY - silty, trace - grey - moist, stiff - high plastic	e silt inclusions (< sity	10 mm diam.))			G42									
		END OF TEST H 1) No seepage or 2) Test hole back 3) Test hole locat m East of West c	OLE AT 3.0 m IN r sloughing. filled with auger c ted at 30 m North urb.	CLAY suttings, bento of Memorial B	nite chips, sand a oulevard and Bro	and cold patch aspha badway intersection, 4	lt. 4.5										
Logg	ed By:	Harsimran Sing	h	Reviewe	d By: N.J Ferre	ira		Projec	t Eng	ineer:	Nelson Fe	erreira	l				

C PR	
GEOTECHN	ICAL

GE	E O T (<u>ECHNI</u>	CAL													
Clien	it:	WSP Canad	a Goup Ltd				Project Number:	0395-	004-0	0						
Proje	ect Name	e: 2018 Region	al Streets C	C-05 (Mem	norial Boule	/ard)	Location:	UTM N-5527698, E-633025								
Cont	ractor:	Paddock Dri	lling Ltd.				Ground Elevation:	Top o								
Meth	od:	125mm Solid St	em Auger, Acl	ker MP8 Tru	ck Mount		Date Drilled:	2018								
	Sample	Type:	Gra	ab (G)		Shelby Tube (T)	Split Spoon (S	SS) 💌	Sp	lit Barre	el (SB)	Сог	e (C)			
	Particle	Size Legend:	Fin	nes	🕖 Clay	Silt	Sand		Grav	/el	j∑] c	obbles	В	oulder	s	
Depth (m)	Soil Symbol	CONCRETE - 2	15 mm thicl	MATE k	RIAL DESC	RIPTION		Sample Type	Sample Number	□ 16 17 Pa 0 20 PL 0 20	Bulk Unit (kN/m ³) 18 19 tticle Size 40 60 MC 40 60	Wt 20 21 - 2 (%) 80 100 LL 80 100 (Und Str	rained S ength (k rest Typ Torvane ocket Pe S Qu S ield Var 100 15	hear Pa) <u>e</u> ⇒ △ ⇒ △ ⇒ △ ⇒ △ ⇒ △ ⇒ ○ 0 200 25	
 - 0.5-		CLAY (FILL) - si - black, froz - intermedia	lty, some sa zen, moist a ate plasticity	and, trace and soft wh y	gravel nen thawed				G43		•					
		CLAY - silty, trac - grey - frozen, mo - high plast	ce silt inclus pist and stiff icity	sions (< 10 f when tha) mm diam.) wed				G44				4			
-1.0- - - - - - - - - - - - -		- brown below 1	.2 m						G45 G46	•			^ •			
	- {	SILT - clayey, tra - brown - moist, sof - low plastic	ace sand t city						G47	•						
-2.0-									G48	•						
 - -2.5-		CLAY - silty, trad - grey - moist, stif - high plast	ce silt inclus f icity	sions (< 10) mm diam.)	, trace oxidation										
 - 									G49		•			B		
		END OF TEST I 1) No seepage (2) Test hole bac 3) Test hole loca	HOLE AT 3. or sloughing kfilled with ated at build	.0 m IN CL g. auger cutt ding #219	AY ings, bentoi (Northbound	nite chips, sand a d lane), 4 m East	and cold patch asphal of West curb.	t.						1		
Logg	jed By:	Harsimran Sin	gh		Reviewee	J By: _N.J Ferre	ira	P	Projec	t Engine	eer: <u>N</u>	elson Fer	reira			

		FRE	K	S	ub-Su	face Lo	g				Test H	ole 1	FH18	i-08 1 of 1
Clier Proj Con Meth	EOT nt: eect Nam tractor: hod: Sampl Particl	ECHNIN WSP Canad Paddock Dr 125mm Solid S e Type: e Size Legend:	da Goup Ltd. nal Streets C-05 (illing Ltd. Stem Auger, Acker MP Grab (G Fines	Memorial Boulev 8 Truck Mount) Clay	Project Number: Location: Ground Elevation: Date Drilled: Split Spoon (S	0395- UTM : Top c 2018 SS)	oulders							
Depth (m)	Soil Symbol		Ν	IATERIAL DESC	RIPTION		Sample Type	Sample Numb	16 17 Parti 0 20 4 PL 0 20 4	18 19 cle Size (9 40 60 MC 40 60	20 21 %) 80 100 LL 4 80 100 0		est Typ Forvane cket Pe ⊠ Qu ⊠ eld Van 00 150	<u>~a)</u> <u>≥</u> n. ∲ e ⊖) 200 250
REETS C-05 MEMORIAL BLVD_0395-004-00_0_A HS.GPJ_TREK GEOTECHNICAL GDT_18-3-13 		SILT AND CLA - brown - frozen to - intermed - stiff, trace silt - stiff, trace silt CLAY - silty, tra - grey - moist, sti	Y - trace sand 1.5 m, moist and iate plasticity 2 m inclusions (< 5 m inclusions ff	soft when thawe m diam.) below 1 (< 10 mm diam.)	.5 m			G50 G51 G52 G53 G54 G55						
0GS MIT FONT LOGS 2018-03-08_LOCAL 5		- nigh plas END OF TEST 1) No seepage 2) Test hole ba 3) Test hole loc 2 m West of Ea	HOLE AT 3.0 m I or sloughing. ckfilled with auger ated at 35 m Sou ist curb.	N CLAY r cuttings, bentor th of Memorial B	nite chips, sand a oulevard and Yo	and cold patch aspha rk Avenue intersectic	llt.	G56				•		
	ged By:	Harsimran Sir	ngh	Reviewed	d By: _N.J Ferre	ira	F	Project	Enginee	er: <u>Ne</u> l	son Ferre	ira		

GE		RE	K		Su	ıb-Sur	face Log	g			Test	Hole 1	Г Н18-09 1 of 1					
Client:		WSP Canada	a Goup Ltd.				Project Number:	0395-	004-00									
Project	Name:	2018 Regiona	al Streets C-0	<u>5 (Memoria</u>	l Boulevar	d)	Location:	UTM	N-552	7849, E-6	32934							
Contra	ctor:	Paddock Drill	ing Ltd.				Ground Elevation:	on: Top of Pavement										
Method	:	125mm Solid Ste	em Auger, Acker	MP8 Truck Mo	unt		Date Drilled:	2018	Februa	ry 14								
S	ample T	ype:	Grab	(G)	Sh	elby Tube (T)	Split Spoon (S	5S) 💌	Spli	t Barrel (S	6B) 🚺 Co	ore (C)						
P	article S	ize Legend:	Fines		Clay	Silt	Sand		Grave		Cobbles	В	Boulders					
Depth (m)	Soil Symbol			MATERIA	L DESCRI	PTION		Sample Type	Sample Number	□ Bulk 6 17 18 Particle 20 40 PL 1 20 40	(Unit Wt V/m ³) ≥ Size (%) 60 80 100 MC LL €0 80 100	Undra Stre 	ained Shear ngth (kPa) <u>est Type</u> forvane ∆ cket Pen. Ф ⊠ Qu ⊠ eld Vane ⊖ 00 150 20025					
	AS CC	SPHALT - 75 m ONCRETE - 21	nm thick I5 mm															
-0.5- E	CL	AY (FILL) - sil - grey - frozen to 1 - intermedia	ty, some sand .5 m, moist a te plasticity	d, some grav	vel, trace on thawed	organics			G57	•								
									G58 G59	•								
	- s	tiff below 1.2 r	n															
									G60	•		△ ◊						
									G61	•								
									G62 -									
									G63)							
	EN 1) 2) 3) 1.4	ID OF TEST H No seepage o Test hole bacl Test hole loca I m East of We	IOLE AT 3.0 f r sloughing. (filled with au ted at 75 m N est curb.	m IN CLAY I ger cuttings lorth of Men	FILL , bentonite norial Boul	e chips, sand a evard and Yor	nd cold patch asphal k Avenue intersectior	 t. ı,										
	d By: _⊢	larsimran Sing	Jh	R	eviewed B	y: <u>N.J Ferrei</u>	ra	F	roject	Engineer:	Nelson Fe	erreira						

	EOT	FRE		S	ub-Su	rface Lo	g			Tes	t Hole	e TH1	8-10 1 of 1				
Clie	ent:	WSP Canad	da Goup Ltd.			Project Number:	0395-00	04-00									
Proj	ject Nam	e: 2018 Regio	nal Streets C-05 (N	lemorial Boulev	ard)	Location:	UTM N	-55278	21, E-632	953							
Con	ntractor:	Paddock Dr	illing Ltd.			Ground Elevation: Top of Pavement											
Met	hod:	125mm Solid S	Stem Auger, Acker MP8	Truck Mount		Date Drilled:	2018 February 14										
	Sample	е Туре:	Grab (G)	S	Split Spoon (Split Spoon (SS) Split Barrel (SB) Core (C)											
	Particle	e Size Legend:	Fines	Clay	Sand Gravel Cobbles Bould												
Depth (m)	(III) Soil Symbol		M	ATERIAL DESC	RIPTION		Sample Type	Sample Number 0 0	□ Bulk U (kN/r 17 18 Particle S 20 40 PL MC 20 40	Jnit Wt n ³) 19 20 2 ize (%) 60 80 10 C LL 60 80 10		ndrained <u>Strength (</u> <u>Test Ty</u> △ Torvar Pocket F ⊠ Qu) Field Va 100 1	Shear (kPa) pe △ Pen. ● Ane ○ 50 200 250				
ł.	A 4 4	ASPHALT - 55	mm thick														
- - - - - - 0.5		CLAY (FILL) - s - grey - frozen, m - intermed	silty, some sand, so noist and soft when iate plasticity	me gravel, trace thawed	e organics		G	64	•								
TECHNICAL.GDT 18-3-13							G	665	•								
GPJ TREK GEO		- stiff below 1.2	m				G	67	•		2	4 0					
.;⊢1.5 ± √		ORGANIC CLA	Y (TOPSOIL) - silt	y, trace sand													
0		- black - moist, sti	ff				G	68		•							
5-004-		- high plas	sticity														
8 0 1 2 0								260				•					
-2.5 2.5 		CLAY - silty - grey - moist, firi - high plas	m ticity														
5018-03-08 FO		END OF TEST					G	570			0						
IH LOGS MIT FONT LOGS		1) No seepage 2) Test hole ba 3) Test hole loc 1 m West of Ea	or sloughing. ckfilled with auger canted at 35 m Nor ast curb.	cuttings, benton h of Memorial B	ite chips, sand a Boulevard and Y	and cold patch aspha ork Avenue intersecti	llt. ion,										
	ged By:	_Harsimran Sir	ngh	Reviewed	By: <u>N.J Ferre</u>	ira	Pro	oject Er	ngineer:	Nelson F	erreira						



Regional Street Package C-05 Sub-Surface Investigation Memorial Blvd.

Test Hole		Paveme	ent Surface	Pavement Str	ucture Material		Sample I	Depth (m)	Moisture		Grain Siz	e Analysis	6	Atterberg Limits		
No.	Test Hole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Subgrade Description	Top (m)	Bottom (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
		Asphalt	N/A	Concrete	254											
						CLAY (FILL)	0.4	0.5	14							
TH18-03	632979 E					SILT AND CLAY	0.7	0.8	28							
	Located 42 m South of					SILT AND CLAY	1.0	1.1	38							
	Memorial Blvd. and York					SILT AND CLAY	1.2	1.4	27							
	Ave. intersection, 1.2 m					SILT AND CLAY	1.6	1.7	36							
	wet of East curb.					CLAY	1.9	2.0	41							
						CLAY	2.7	2.9	48							
		Asphalt	N/A	Concrete	203	CLAY (FILL)	-	-	-							
						SILT AND CLAY	0.3	0.5	42							
	UTM: 5527709 N,					SILT AND CLAY	0.6	0.8	35							
TU40.04	632998 E					SILT AND CLAY	0.9	1.1	35							
TH18-04	(Southbound Lane) 3.0					SILT AND CLAY	1.2	1.3	29							
	m East of West curb.					SILT AND CLAY	1.5	1.6	27							
						SILT AND CLAY	1.8	2.0	27							
						CLAY	2.7	2.9	49							
		Asphalt	N/A	Concrete	203											
	UTM: 5527662 N					CLAY (FILL)	0.2	0.4	31							
	633022 E					CLAY	0.6	0.8	35							
	Located 50 m North of					SILT AND CLAY	0.9	1.1	29							
1110-05	Memorial Blvd and					SILT AND CLAY	1.2	1.3	34							
	Broadway intersection,					SILT	1.5	1.6	22							
	4.0 m East of West curb.					SILT AND CLAY	1.8	2.0	39							
						SILT AND CLAY	2.7	2.9	40							
		Asphalt	N/A	Concrete	227											
	LITM: FEOTRER N					CLAY (FILL)	0.2	0.3	13							
	633046 E					SILT AND CLAY	0.7	0.8	29							
TU40.00	Located 30 m North of					SILT AND CLAY	1.0	1.1	28							
1110-06	Memorial Blvd. and					SILT AND CLAY	1.2	1.4	29							
	Broadway intersection,					SILT AND CLAY	1.6	1.7	24							
	4.5 III East of West Curb.					SILT AND CLAY	1.9	2.0	23							
						CLAY	2.7	2.9	49							


Regional Street Package C-05 Sub-Surface Investigation Memorial Blvd.

T		Paveme	ent Surface	Pavement Str	ucture Material		Sample	Depth (m)	Moisture		Grain Siz	e Analysis	3	At	terberg Li	mits
No.	Test Hole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Subgrade Description	Top (m)	Bottom (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic	Liquid	Plasticity Index
		Asphalt	N/A	Concrete	203											
						CLAY (FILL)	0.2	0.3	13							
	UTM: 5527698 N,					CLAY	0.7	0.8	29	0	2	24	75	21	74	53
TU10 07	633025 E					CLAY	1.0	1.1	28							
1010-07	(Northbound lane), 4.0 m					CLAY	1.2	1.4	29							
	East of West curb.					SILT	1.6	1.7	24							
						SILT	1.9	2.0	23							
						CLAY	2.7	2.9	49							
		Asphalt	N/A	Concrete	227											
	UTM: 5527761 N					CLAY (FILL)	0.4	0.5	30	2	12	32	54	14	37	23
	632999 E					SILT AND CLAY	0.7	0.8	32	0	4	57	39	15	37	23
TU40.00	Located 35 m South of					SILT AND CLAY	1.0	1.1	37							
TH18-08 Ave.	Memorial Blvd. and York					SILT AND CLAY	1.2	1.4	38							
	Ave. intersection, 2.0 m West of East curb.					SILT AND CLAY	1.6	1.7	32							
						SILT AND CLAY	1.9	2.0	44							
						CLAY	2.7	2.9	52							
		Asphalt	N/A	Concrete	229											
	UTM: 5527940 N					CLAY (FILL)	0.3	0.5	26							
	632934 E					CLAY (FILL)	0.7	0.9	32							
TU10.00	Located 75 m North of					CLAY (FILL)	1.0	1.2	35							
1010-09	Memorial Blvd and York					CLAY (FILL)	1.3	1.5	35							
	Ave. intersection, 1.4 m					CLAY (FILL)	1.6	1.8	42							
	East of west curb.					CLAY (FILL)	1.9	2.1	41							
						CLAY (FILL)	2.7	2.9	43							
		Asphalt	55	Concrete	249											
	LITM: 5507004 N					CLAY (FILL)	0.3	0.5	23							
	632953 E					CLAY (FILL)	0.7	0.8	28							
TU40.40	Located 35 m North of					CLAY (FILL)	1.0	1.1	35							
TH18-10	Memorial Blvd. and York					CLAY (FILL)	1.3	1.5	37							
	Ave. intersection, 1.0 m					ORGANIC CLAY (TOPSOIL)	1.6	1.7	63							
	vvest of East curb.					CLAY	1.9	2.1	49							
						CLAY	2.7	2.9	44							



Troject	
Project	2018 Regional Streets C-05 (Memorial Blvd.)
Client	WSP Canada Group Ltd.
Project No.	0395-004-00

2-Mar-18

HS

Test Date Technician

Test Pit	TH18-03	TH18-03	TH18-03	TH18-03	TH18-03	TH18-03
Depth (m)	0.4 - 0.5	0.7 - 0.8	1.0 - 1.1	1.2 - 1.4	1.6 - 1.7	1.9 - 2.0
Sample #	G15	G16	G17	G18	G19	G20
Tare ID	F100	E75	Z139	Z24	AB60	W54
Mass of tare	8.4	8.7	8.6	8.5	6.6	8.3
Mass wet + tare	488.4	303.8	279.8	212.4	298.8	228.0
Mass dry + tare	430.1	238.5	204.5	169.7	221.7	164.6
Mass water	58.3	65.3	75.3	42.7	77.1	63.4
Mass dry soil	421.7	229.8	195.9	161.2	215.1	156.3
Moisture %	13.8%	28.4%	38.4%	26.5%	35.8%	40.6%

-						
Test Pit	TH18-03	TH18-04	TH18-04	TH18-04	TH18-04	TH18-04
Depth (m)	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8	0.9 - 1.1	1.2 - 1.3	1.5 - 1.6
Sample #	G21	G22	G23	G24	G25	G26
Tare ID	F13	W12	AA18	F130	A6	W85
Mass of tare	8.5	8.4	7.0	8.9	8.3	8.6
Mass wet + tare	341	275.5	422.4	286.5	269	371
Mass dry + tare	232.6	196.3	314.1	215.1	210.5	293.0
Mass water	108.4	79.2	108.3	71.4	58.5	78.0
Mass dry soil	224.1	187.9	307.1	206.2	202.2	284.4
Moisture %	48.4%	42.2%	35.3%	34.6%	28.9%	27.4%

Test Pit	TH18-04	TH18-04	TH18-05	TH18-05	TH18-05	TH18-05
Depth (m)	1.8 - 2.0	2.7 - 2.9	0.2 - 0.4	0.6 - 0.8	0.9 - 1.1	1.2 - 1.3
Sample #	G27	G28	G29	G30	G31	G32
Tare ID	Z103	E111	H25	F58	Z09	C26
Mass of tare	8.1	8.6	8.3	8.6	8.5	8.7
Mass wet + tare	308.7	308.5	378.7	250.2	327.1	317.2
Mass dry + tare	245.6	210.3	290.9	187.0	255.2	238.3
Mass water	63.1	98.2	87.8	63.2	71.9	78.9
Mass dry soil	237.5	201.7	282.6	178.4	246.7	229.6
Moisture %	26.6%	48.7%	31.1%	35.4%	29.1%	34.4%



Project No.	0395-004-00
Client	WSP Canada Group Ltd.
Project	2018 Regional Streets C-05 (Memorial Blvd.)
Sample Date	14-Feb-18

2-Mar-18

HS

Test Date Technician

-						
Test Pit	TH18-05	TH18-05	TH18-05	TH18-06	TH18-06	TH18-06
Depth (m)	1.5 - 1.6	1.8 - 2.0	2.7 - 2.9	0.2 - 0.3	0.7 - 0.8	1.0 - 1.1
Sample #	G33	G34	G35	G36	G37	G38
Tare ID	N42	AC05	H79	C12	C18	F152
Mass of tare	8.6	6.9	8.0	8.6	8.7	8.5
Mass wet + tare	294.4	370.1	324.5	267.2	210.8	184.7
Mass dry + tare	242.3	268.7	233.9	237.0	165.2	146.4
Mass water	52.1	101.4	90.6	30.2	45.6	38.3
Mass dry soil	233.7	261.8	225.9	228.4	156.5	137.9
Moisture %	22.3%	38.7%	40.1%	13.2%	29.1%	27.8%

-						
Test Pit	TH18-06	TH18-06	TH18-06	TH18-06	TH18-07	TH18-07
Depth (m)	1.2 - 1.4	1.6 - 1.7	1.9 - 2.0	2.7 - 2.9	0.3 - 0.5	0.6 - 0.8
Sample #	G39	G40	G41	G42	G43	G44
Tare ID	AB43	K9	P10	N97	N14	Z126
Mass of tare	6.8	8.8	8.4	8.6	8.5	8.7
Mass wet + tare	267.5	294.8	265.5	411.4	222.3	385.6
Mass dry + tare	208.7	239.3	217.0	278.9	159.7	290.2
Mass water	58.8	55.5	48.5	132.5	62.6	95.4
Mass dry soil	201.9	230.5	208.6	270.3	151.2	281.5
Moisture %	29.1%	24.1%	23.3%	49.0%	41.4%	33.9%

Test Pit	TH18-07	TH18-07	TH18-07	TH18-07	TH18-07	TH18-08
Depth (m)	0.9 - 1.1	1.2 - 1.3	1.5 - 1.6	1.7 - 1.8	2.7 - 2.9	0.4 - 0.5
Sample #	G45	G46	G47	G48	G49	G50
Tare ID	W70	E24	Z84	N12	A32	F52
Mass of tare	8.4	8.6	8.5	8.4	8.7	8.5
Mass wet + tare	282.6	290.1	328.6	321.6	301.8	455.1
Mass dry + tare	215.1	226.1	268.8	260.0	214.5	352.6
Mass water	67.5	64.0	59.8	61.6	87.3	102.5
Mass dry soil	206.7	217.5	260.3	251.6	205.8	344.1
Moisture %	32.7%	29.4%	23.0%	24.5%	42.4%	29.8%



Project No.	0395-004-00
Client	WSP Canada Group Ltd.
Project	2018 Regional Streets C-05 (Memorial Blvd.)
Sample Date	14-Feb-18

2-Mar-18

HS

Test Date Technician

Test Pit	TH18-08	TH18-08	TH18-08	TH18-08	TH18-08	TH18-08
Depth (m)	0.7 - 0.8	1.0 - 1.1	1.2 - 1.4	1.6 - 1.7	1.9 - 2.0	2.7 - 2.9
Sample #	G51	G52	G53	G54	G55	G56
Tare ID	Z74	F55	E11	H17	W24	W28
Mass of tare	8.6	8.5	8.6	8.8	8.4	8.5
Mass wet + tare	420.8	317.9	217.8	246.0	250.0	269.7
Mass dry + tare	320.9	234.9	160.2	188.7	176.3	180.1
Mass water	99.9	83.0	57.6	57.3	73.7	89.6
Mass dry soil	312.3	226.4	151.6	179.9	167.9	171.6
Moisture %	32.0%	36.7%	38.0%	31.9%	43.9%	52.2%

Test Pit	TH18-09	TH18-09	TH18-09	TH18-09	TH18-09	TH18-09
Depth (m)	0.3 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.6 - 1.8	1.9 - 2.1
Sample #	G57	G58	G59	G60	G61	G62
Tare ID	H36	Z106	AB56	A102	E69	D11
Mass of tare	8.8	8.4	6.7	8.4	8.4	9.0
Mass wet + tare	369.8	290.7	254.3	290.6	378.3	357.0
Mass dry + tare	294.3	222.3	190.4	217.2	268.6	256.6
Mass water	75.5	68.4	63.9	73.4	109.7	100.4
Mass dry soil	285.5	213.9	183.7	208.8	260.2	247.6
Moisture %	26.4%	32.0%	34.8%	35.2%	42.2%	40.5%

Test Pit	TH18-09	TH18-10	TH18-10	TH18-10	TH18-10	TH18-10
Depth (m)	2.7 - 2.9	0.3 - 0.5	0.7 - 0.9	1.0 - 1.2	1.3 - 1.5	1.6 - 1.8
Sample #	G63	G64	G65	G66	G67	G68
Tare ID	F89	F9	N02	F79	N69	F151
Mass of tare	8.3	9.1	8.4	8.9	8.9	8.5
Mass wet + tare	247.2	463.2	290.9	281.3	225.1	228.8
Mass dry + tare	175.5	378.9	229.4	210.3	166.2	144.0
Mass water	71.7	84.3	61.5	71.0	58.9	84.8
Mass dry soil	167.2	369.8	221.0	201.4	157.3	135.5
Moisture %	42.9%	22.8%	27.8%	35.3%	37.4%	62.6%



Project No.	0395-004-00
Client	WSP Canada Group Ltd.
Project	2018 Regional Streets C-05 (Memorial Blvd.)
Sample Date	14-Feb-18
Test Date	2-Mar-18
Technician	HS

Test Pit	TH18-10	TH18-10		
Depth (m)	1.9 - 2.1	2.7 - 2.9		
Sample #	G69	G70		
Tare ID	Z77	Z102		
Mass of tare	8.4	8.4		
Mass wet + tare	252.2	295.4		
Mass dry + tare	172.4	207.9		
Mass water	79.8	87.5		
Mass dry soil	164.0	199.5		
Moisture %	48.7%	43.9%		

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



Project No.	0395-004-00					
Client	WSP					
Project	2018 Regional Str	eets C-05 (Memor	ial Blvd.)			
	TU10.00					
Communication						
Sample #	<u>G44</u>					
Deptn (m)	0.6-0.8					
Sample Date	14-Feb-18				Liquid Limit	74
Test Date	6-Mar-18				Plastic Limit	21
Technician	DS				Plasticity Index	53
Liquid Limit						
Trial #		1	2	3		
Number of Blow	/s (N)	17	23	33		
Mass Wet Soil +	· Tare (g)	20.864	19.799	20.249		
Mass Drv Soil +	Tare (g)	17.992	17.362	17.681		
Mass Tare (g)		14.238	14.077	14.147		
Mass Water (g)		2.872	2.437	2.568		
Mass Dry Soil (c	a)	3.754	3.285	3.534		
Moisture Conte	nt (%)	76.505	74.186	72.666		
 0 70 0 0	Plasticity Chart fo smaller than 0.42	pr solid fraction w	rith particles	CH MH or O	Line "A" Line H	
10 -	CL · ML	ML	or OL			
0	10 20	30 4	Liquid Lin	60 70 nit (%)	80 90	100 110

Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	20.488	20.214			
Mass Wet Soil + Tare (g)	19.402	19.183			
Mass Dry Soil + Tare (g)	14.231	14.204			
Mass Water (g)	1.086	1.031			
Mass Dry Soil (g)	5.171	4.979			
Moisture Content (%)	21.002	20.707			



Client WSP	
Project 2018 Regional Streets C-05 (Memorial Blvd.)	
Sample # 650	
Denth (m) 0405	
Semple Deta 14 Ech 19	mit 27
Sample Date 14-rep-10 Liquid Li	mit 14
Test Date 0-Mai-10 Plastic Li	
	index 23
Liquid Limit	
Trial # 1 2 3	
Number of Blows (N) 15 23 33	
Mass Wet Soil + Tare (g) 23.334 27.807 24.646	
Mass Dry Soil + Tare (g) 20.747 24.065 21.895	
Mass Tare (g) 14.230 14.145 14.282	
Mass Water (g) 2.587 3.742 2.751	
Mass Dry Soil (g) 6.517 9.920 7.613	
Moisture Content (%) 39.696 37.722 36.136	
Plasticity Chart for solid fraction with particles smaller than 0.425 mm	ine 90 100 110

Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	22.548	24.210			
Mass Wet Soil + Tare (g)	21.500	22.999			
Mass Dry Soil + Tare (g)	14.376	14.308			
Mass Water (g)	1.048	1.211			
Mass Dry Soil (g)	7.124	8.691			
Moisture Content (%)	14.711	13.934			



Client WSP Project 2018 Regional Streets C-05 (Memorial Blvd.) Test Hole TH18-08 Sample # G51 Depth (m) 0.7-0.8 Sample Date 14-Feb-18 Test Date 6-Mar-18 Plastic Limit 15 Treat # 1 2 3 Liquid Limit 15 22 31 Mumber of Blows (N) 15 22 31 Mass Vet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 14.275 14.098 14.306 Mass Tare (g) 14.275 14.098 14.306 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 % 60 70 9 9 % 60 7 7 9 % 60 7 7 9 % 60 7 0 7 %	Project No.	0395-004-00					
Project 2018 Regional Streets C-05 (Memorial Blvd.) Test Hole TH18-08 Sample # G51 Depth (m) 0.7-0.8 Sample Date 14-Feb-18 Explore This Feb-18 Test Date 6-Mar-18 Test Date 6-Mar-18 Test Date 6-Mar-18 Test Date 6-Mar-18 Test Date 1 Trial # 1 2 Number of Blows (N) 15 22 Mass Wet Soil + Tare (g) 21.362 21.543 Mass Tare (g) 14.275 14.098 Mass Tare (g) 14.275 14.098 Mass Dry Soil (g) 7.087 7.445 Mass Dry Soil (g) 7.087 7.445 Moisture Content (%) 38.606 37.690 % 60 70 % 60 7.091 % 60 7.091 % 60 7.090 % 60 7.091 %	Client	WSP					
Test Hole TH18-08 Sample # G51 Depth (m) 0.7-0.8 Sample Date 14-Feb-18 Test Date 6-Mar-18 Test Date 6-Mar-18 Test Date 14-Feb-18 Test Date 6-Mar-18 HS Plastic Limit 15 Liquid Limit 1 2 3 Trial # 1 2 3 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 24.098 24.349 27.998 Mass Tare (g) 14.275 14.098 14.306 Mass Vater (g) 2.736 2.806 3.672 Mass Vater (g) 0.708 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 % Mailer than 0.425 mm Miler than 0.425 mm Miler OH % Miler than 0.425 mm Miler OH Miler than 0.425 mm	Project	2018 Regional Str	eets C-05 (Memor	ial Blvd.)			
Sample # G51 Depth (m) 0.7-0.8 Sample Date 14-Feb-18 Test Date 6-Mar-18 Technician HS Liquid Limit 15 Trial # 1 2 3 Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Tare (g) 14.275 14.098 14.306 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 0 60 70 - 9 10.020 Moisture Content (%) 38.606 37.690 36.647 0 70 - 60 - - - 10.020 Moisture Content (%) 38.606 37.690 36.647 - 0 0 - - - - - - 10	Test Hole	TH18-08					
Depth (m) 0.7-0.8 Sample Date 14-Feb-18 Test Date 6-Mar-18 Technician HS Liquid Limit 15 Trial # 1 2 3 Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Tare (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 % 90 7.087 7.445 10.020 % 91 92.50 36.647 10.020 % 92 30 10.025 10.020 % 92 92 10.025 10.020 % 92 92 10.025 10.020 % 92 93 <t< th=""><th>Sample #</th><th>G51</th><th></th><th></th><th></th><th></th><th></th></t<>	Sample #	G51					
Sample Date Test Date Technician Liquid Limit 37 Plastic Limit 37 Plastic Limit 37 Plastic Limit 37 Plastic Limit 37 Plastic Limit 37 Plastic Limit 15 Plasticity Index 23 Liquid Limit Trial # 1 2 3 Image: colspan="2">1 Trial # 1 2 3 Image: colspan="2">1 Number of Blows (N) 15 22 31 Image: colspan="2">1 Mass Wet Soil + Tare (g) 21.362 21.543 24.326 Image: colspan="2">1 Mass Tare (g) 14.275 14.098 14.306 Image: colspan="2">1 Mass Dry Soil (g) 7.087 7.445 10.020 Image: colspan="2">Mass Dry Soil (g) Moisture Content (%) 38.606 37.690 36.647 Image: colspan="2">Image: colspan="2" Image: colspan="2" Image: colspan="2" Image: colspan="2" Image: colspan="2" Image: colspan="2" Image:	Depth (m)	0.7-0.8					
Test Date Technician 6-Mar-18 HS Plastic Limit 23 Liquid Limit 1 2 3 Trial # 1 2 3 Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.543 24.326 14.275 Mass Dry Soil + Tare (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 % 60 70 60 7.640 % 60 7.090 36.647 10.020 % 90 38.606 37.690 36.647 % 90 30 10.425 mm 10.425 mm % 90 90 36.647 10.425 mm	Sample Date	14-Feb-18				Liquid Limit	37
Technician HS Plasticity Index 23 Liquid Limit Trial # 1 2 3	Test Date	6-Mar-18				Plastic Limit	15
Liquid Limit Trial # 1 2 3 Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 Plasticity Chart for solid fraction with particles smaller than 0.425 mm Vur Line CM Vur Line MH or OH	Technician	HS				Plasticity Index	23
Liquid Limit 1 2 3 Trial # 1 2 3 Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 Øo 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm 90 Øo 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm Mill or OH	Liquid Limit						
Number of Blows (N) 15 22 31 Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 % 60 70	Trial #		1	2	3		
Mass Wet Soil + Tare (g) 24.098 24.349 27.998 Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 Mass Solution (g) Plasticity Chart for solid fraction with particles smaller than 0.425 mm Multiple Mass Solution (g) Ch Multiple Multiple Mass Solution (g) Multiple Multiple Multiple Mass Solution (g) Multiple Multiple Multiple Mass Solution (g) Multiple Multiple Multiple Moisture Content (%) Multiple Multiple Multiple Mass Solution (g) Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple Multiple	Number of Blow	/s (N)	15	22	31		
Mass Dry Soil + Tare (g) 21.362 21.543 24.326 Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 80 70 9 9 14.275 mm 80 70 9 38.606 37.690 36.647 80 70 9 9 14.275 mm 10.020 80 70 38.606 37.690 36.647 80 70 9 10.125 mm 10.020 80 70 9 10.125 mm 10.020 90 40 10.425 mm 10.125 mm 10.125 mm 90 30 20 0 0 0 90 30 20 0 0 0 91 10 10 10 10 10 92 10 10 10 10 10 93 20 10	Mass Wet Soil +	Tare (g)	24.098	24.349	27.998		
Mass Tare (g) 14.275 14.098 14.306 Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 80 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm	Mass Dry Soil +	Tare (g)	21.362	21.543	24.326		
Mass Water (g) 2.736 2.806 3.672 Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 80 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm Ime 80 70 Cth Ime 80 70 Million Million 80 70 Million Million Million 80 70 Million Million Million	Mass Tare (g)	(0)	14.275	14.098	14.306		
Mass Dry Soil (g) 7.087 7.445 10.020 Moisture Content (%) 38.606 37.690 36.647 80 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm 80 70 Ch 80 70 Ch <th< th=""><th>Mass Water (g)</th><th></th><th>2.736</th><th>2.806</th><th>3.672</th><th></th><th></th></th<>	Mass Water (g)		2.736	2.806	3.672		
Moisture Content (%) 38.606 37.690 36.647 80 70 Plasticity Chart for solid fraction with particles smaller than 0.425 mm	Mass Dry Soil (g	3)	7.087	7.445	10.020		
80 70 70 70 80 70 80 70 80 70 80 60 50 40 40 30 20 70 80 70 80 70 70 70 70 70 70 70 70 70 70 70 70 70	Moisture Conter	nt (%)	38.606	37.690	36.647		
10 - CL-ML ML or OL ML or OL 0 10 10 10 10 10 10 10 10 10 10 10 10 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Plasticity Chart for smaller than 0.42s	or solid fraction w 5 mm	ith particles	CH CH MH or O 60 70 nit (%)	Line	100 110

Plastic Limit

Trial #	1	2	3	4	5
Mass Tare (g)	21.335	20.991			
Mass Wet Soil + Tare (g)	20.377	20.143			
Mass Dry Soil + Tare (g)	14.024	14.148			
Mass Water (g)	0.958	0.848			
Mass Dry Soil (g)	6.353	5.995			
Moisture Content (%)	15.079	14.145			



Project No. Client Project	0395-004-00 WSP Canada Group Ltd. 2018 Regional Streets C-05 (Memorial Blvd.)		
Test Hole	TH18-07		
Sample #	G44		
Depth (m)	0.6 - 0.8	Gravel	0.0%
Sample Date	14-Feb-18	Sand	1.7%
Test Date	6-Mar-18	Silt	23.8%
Technician	HS	Clay	74.5%



66.93

0.0010



Project No.	0395-004-00			
Client	WSP Canada Group Ltd.			
Project	2018 Regional Streets C-05 (Memorial Blvd.)			
Test Hole	TH18-08			
Sample #	G50			
Depth (m)	0.4 - 0.5	Gravel	1.7%	
Sample Date	14-Feb-18	Sand	12.3%	
Test Date	6-Mar-18	Silt	31.7%	
Technician	HS	Clay	54.3%	



52.07

48.37

0.0017

0.0010



Project No. Client Project	0395-004-00 WSP Canada Group Ltd. 2018 Regional Streets C-05 (Memorial Blvd.)		
Test Hole	TH18-08		
Sample #	G51		
Depth (m)	0.7 - 0.8	Gravel	0.0%
Sample Date	14-Feb-18	Sand	4.3%
Test Date	6-Mar-18	Silt	56.7%
Technician	HS	Clay	38.9%



35.17

0.0010

WSP Canada Group Limited 2018 Regional Streets C-05 (Memorial Boulevard)





Photo 1: Pavement Core Sample at Test Hole TH18-03



Photo 2: Pavement Core Sample at Test Hole TH18-04

WSP Canada Group Limited 2018 Regional Streets C-05 (Memorial Boulevard)





Photo 3: Pavement Core Sample at Test Hole TH18-05



Photo 4: Pavement Core Sample at Test Hole TH18-06





Photo 5: Pavement Core Sample at Test Hole TH18-07



Photo 6: Pavement Core Sample at Test Hole TH18-08





Photo 7: Pavement Core Sample at Test Hole TH18-09



Photo 8: Pavement Core Sample at Test Hole TH18-10



Appendix C

Memorial Blvd, between Portage Ave. and St. Mary's Ave.

Summary Table & Photographs of Pavement Core Samples

TR GEOTECHI	Regional Streets Package C-05 Road Investigation Memorial Blvd.				
		Pavement Surface		Pavement Structure Material	
Pavement Core No.	Pavement Core Location	Туре	Thickness (mm)	Туре	Thickness (mm)
PC18-01	16 m South of 450 Portage Ave (Impark parking), 2 m East of West Curb	Asphalt	95	Concrete	N/A
PC18-02	18-02 0.5 South of fire hydrant at Hudson Bay Company, 1.8 West of East curb		140	Concrete	N/A
PC18-03	90 m North of fire hydrant infront of Hudson Bay Company, 1 m West of East curb	Asphalt	N/A	Concrete	320
PC18-04	78 m North of fire hydrant at Winnipeg Art Gallery, 1.2 m West of East curb	Asphalt	145	Concrete	N/A
1010-04					
PC18-05	36 m South of fire hydrant at Winnipeg Art Gallery, 1.2 m East of West curb	Asphalt	65	Concrete	245
DC18.00	104 m South of fire hydrant at Winnipeg Art Gallery, 1.2 East of West curb	Asphalt	160	Concrete	160
PC18-06					
PC18-13	33 m North of York Ave and Memorial Boulevard intersection, 0.8 m East of West curb	Asphalt	85	Concrete	135
PC18-14	15 m South of 277 Memorial Boulevard emergency exit door, 3.8 m West of East curb	Asphalt	85	Concrete	195

WSP Canada Group Limited 2018 Regional Streets C-05 (Memorial Boulevard)





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



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





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



Photo 4: Pavement Core Sample at Pavement Hole PC18-04 Our Project No. 0395 004 00 March 2018





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



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





Photo 7: Pavement Core Sample at Pavement Hole PC18-13



Photo 8: Pavement Core Sample at Pavement Hole PC18-14



Appendix D

Colony Street, between Ellice Ave. and Portage Ave.

Summary Table & Photographs of Pavement Core Samples

Regional Streets Package C-05 Road Investigation Colony Street					
		Pavement Surface		Pavement Structure Material	
Pavement Core No.	Pavement Core Location	Туре	Thickness (mm)	Туре	Thickness (mm)
PC18-07	72 m North of fire hydrant located at the corner of Portage Ave and Colony Street, 1.3 m East of West curb	Asphalt	190	Concrete	N/A
PC18-08	138 m North of fire hydrant located at the corner of Portage Ave and Colony Street, 5 m West of East curb	Asphalt	65	Concrete	225
PC18-09	20 m North of fire hydrant located at the corner of Weibe Place and Colony Street, 1.5 m West of East curb	Asphalt	100	Concrete	200
5010.10	0.4 m North of fire hydrant located at the corner of Weibe Place and Colony Street, 1.3 m West of East curb	Asphalt	160	Concrete	170
PC18-10					
PC18-11	103 m South of fire hydrant located at the corner of Weibe Place and Colony Street, 7 m East of West curb	Asphalt	290	Concrete	N/A
PC18-12	28 m North of fire hydrant located at the corner of Weibe Place and Colony Street, 1.5 m East of West curb	Asphalt	N/A	Concrete	245





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



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





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



Photo 4: Pavement Core Sample at Pavement Hole PC18-10





Photo 5: Pavement Core Sample at Pavement Hole PC18-11



Photo 6: Pavement Core Sample at Pavement Hole PC18-12 Our Project No. 0395 004 00 March 2018



WSP Canada Group Ltd

2018 Regional Street Package (PW File #: C-05) Additional Pavement Investigation

Prepared for:

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

Project Number: 0395 004 00

Date:

April 19, 2018 Final Report



Quality Engineering | Valued Relationships

April 19, 2018

Our File No. 0395 004 00

Marcus Wong, B.Sc. (C.E.), P.Eng. WSP Canada Group Ltd. 111-93 Lombard Ave. Winnipeg, MB R3B

RE: Additional Pavement Investigation Report for 2018 Regional Street Package (PW File #: C-05)

TREK Geotechnical Inc. is pleased to submit our report for the additional pavement investigation for the 2018 Regional Street Package (PW File #: C-05).

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

Sincerely,

TREK Geotechnical Inc. Per:

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

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



Revision History

Revision No.	Author	Issue Date	Description
0	AFK	April 19, 2018	Final Report

Authorization Signatures

Prepared By:

hken

Angela Fidler-Kliewer C.Tech.



Reviewed By:

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

	ENGINEERS GEOSCIENTISTS
Certificat	MANITOBA Stathorization
TREK GEO No. 4877	TECHNICAL INC. Date: <u>Apr. 19,2018</u>



Table of Contents

Letter of Transmittal

Revision History and Authorization Signatures

1.0	Introduction1
2.0	Pavement Investigation
3.0	Closure

List of Figures

Figure 01 Pavement Core Location Plan – Memorial Blvd.

List of Appendices

Appendix A Summary Table & Pavement Core Photographs – Memorial Blvd.



1.0 Introduction

This report summarizes the results of the additional pavement investigation completed for the 2018 Regional Street Package C-05 project on Memorial Blvd. A previous road investigation was completed as part of this package and the results of which were submitted to WSP on April 14, 2018.

2.0 Pavement Investigation

The investigation included coring of the existing road pavement at 7 locations along Memorial Blvd between Portage Avenue and St. Mary Avenue. WSP selected the investigation locations as shown on Figure 01 (attached).

The pavement investigation was conducted between April 10, 2018 and April 11, 2018. The pavement structure (asphalt or concrete) was cored by Harsimran Singh of TREK Geotechnical Inc. (TREK) using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. Core samples were also retrieved and logged at TREK's material testing laboratory.

The information provided in Appendix A includes pavement core summary tables and photos of the pavement cores. Pavement core locations noted on the summary tables are based on their location relative to measured distances from the edge of pavement and distance from cross streets.

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,).

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

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



Figures



0395 004 00 WSP GROUP CANADA LTD. Regional Streets C-05 Memorial Boulevard

Pavement Core Plan





Appendix A

Memorial Blvd, between Portage Ave. and St. Mary's Ave.

Summary Table & Photographs of Pavement Core Samples

Regional Streets Package C-05 Pavement Investigation Memorial Blvd.					
				Pavement Structure Material	
Pavement Core No.	Pavement Core Location	Туре	Thickness (mm)	Туре	Thickness (mm)
PC18-15	Northbound, Jane, 32 m North of St. Mary Ave and Memorial Boulevard intersection, 2 m East of Median curb	Asphalt	150	Concrete	200
PC18-16	Northbound lane, 32 m North of St. Mary Ave and Memorial Boulevard intersection, 1.5 West of East curb	Asphalt	160	Concrete	180
PC18-17	Northbound lane, 68 m North of St. Mary Ave and Memorial Boulevard intersection, 5 m East of median curb	Asphalt	160	Concrete	140
PC18-18	Northbound Iane, 97 m North of St. Mary Ave and Memorial Boulevard intersection, 8 m East of median curb	Asphalt	140	Concrete	160
PC18-19	Northbound lane, 150 m North of St. Mary Ave and Memorial Boulevard intersection, 1.5 m West of East curb	Asphalt	190	Concrete	120
PC18-20	Northbound lane, 190 m North of St. Mary Ave and Memorial Boulevard intersection, 4.4 m East of median curb	Asphalt	200	Concrete	150
PC18-21	Northbound lane, 210 m North of St. Mary Ave and Memorial Boulevard intersection, 1.3 m East of median curb	Asphalt	180	Concrete	N/A

WSP Canada Group Limited 2018 Regional Streets C-05 (Memorial Boulevard)





Photo 1: Pavement Core Sample at Pavement Hole PC18-15



Photo 2: Pavement Core Sample at Pavement Hole PC18-16 Our Project No. 0395 004 00 April 2018




Photo 3: Pavement Core Sample at Pavement Hole PC18-17



Photo 4: Pavement Core Sample at Pavement Hole PC18-18 Our Project No. 0395 004 00 April 2018





Photo 5: Pavement Core Sample at Pavement Hole PC18-19



Photo 6: Pavement Core Sample at Pavement Hole PC18-20

Our Project No. 0395 004 00 April 2018





Photo 7: Pavement Core Sample at Pavement Hole PC18-21