

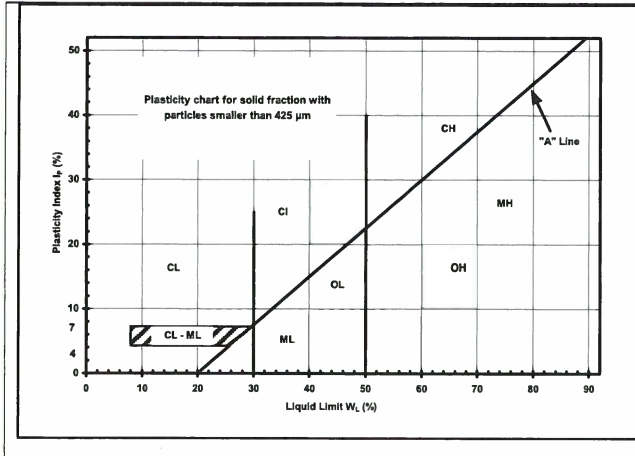
APPENDIX 'G'

GEOTECHNICAL REPORT

EXPLANATION OF FIELD & LABORATORY TEST DATA

Description		UMA Log Symbols	USCS Classification	Laboratory Classification Criteria					
				Fines (%)	Grading	Plasticity	Notes		
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_u > 4$ $1 < C_c < 3$	Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4 < W_p < 7$ $C_u = \frac{D_{60}}{D_{10}}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey gravels, clayey sandy gravels		GC	> 12			Atterberg limits above "A" line or $W_p < 7$
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_u > 6$ $1 < C_c < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey sands, sand-clay mixtures		SC	> 12			Atterberg limits above "A" line or $W_p < 7$
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L < 50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML		These criteria not used to classify subgrade. Refer to City of Winnipeg specifications for geotechnical investigation requirements for Public Works projects (September 2015)		
		$W_L > 50$	Inorganic silts of high plasticity		MH				
	CLAYS (Above 'A' line negligible organic content)	$W_L < 30$	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL			Based upon Plasticity Chart	
		$30 < W_L < 50$	Inorganic clays and silty clays of medium plasticity		CI				
		$W_L > 50$	Inorganic clays of high plasticity, fat clays		CH				
	ORGANIC SILTS & CLAYS (Below 'A' line)	$W_L < 50$	Organic silts and organic silty clays of low plasticity		OL				
		$W_L > 50$	Organic clays of high plasticity		OH				
	HIGHLY ORGANIC SOILS	Peat and other highly organic soils		Pt	Von Post Classification Limit	Strong colour or odour, and often fibrous texture			
	Asphalt		Till		AECOM				
	Concrete		Bedrock (Undifferentiated)						
	Fill		Bedrock (Limestone)						

When the above classification terms are used in this report or test hole logs, the designated fractions may be visually estimated and not measured.



FRACTION	SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
	Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50 and
	Fine	19	4.75	
Sand	Coarse	4.75	2.00	20-35 "y" or "ey" *
	Medium	2.00	0.425	
	Fine	0.425	0.075	
Silt (non-plastic) or Clay (plastic)	< 0.075 mm		10-20	some
1-10 trace				

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material
 COBBLES: 76mm to 300mm diameter
 BOULDERS: >300mm diameter

These criteria not used to classify subgrade. Refer to City of Winnipeg specifications for geotechnical investigations for Public Works projects (September 2015)

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

- q_u - undrained shear strength (kPa) derived from unconfined compression testing.
- T_v - undrained shear strength (kPa) measured using a torvane
- pp - undrained shear strength (kPa) measured using a pocket penetrometer.
- L_v - undrained shear strength (kPa) measured using a lab vane.
- F_v - undrained shear strength (kPa) measured using a field vane.
- γ - bulk unit weight (kN/m³).
- SPT - Standard Penetration Test. Recorded as number of blows (N) from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 51 mm O.D. Raymond type sampler 0.30 m into the soil.
- DPPT - Drive Point Pentrometer Test. Recorded as number of blows from a 63.5 kg hammer dropped 0.76 m (free fall) which is required to drive a 50 mm drive point 0.30 m into the soil.
- w - moisture content (W_L, W_P)

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

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 – 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N – BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense

F2. SEWER TELEVISION GUIDELINES FOR PUBLIC WORKS PROJECTS (JANUARY 2009)

- F2.1 The Consultant is required to assess the extent of Closed Circuit Television (CCTV) inspection for all combined, wastewater, land drainage and storm relief sewers to confirm any sewer repairs required in the right-of-way within the limits of the street renewal.
- F2.2 The criteria provided are general guidelines and are not intended to replace sound municipal engineering judgement specific to the individual Project scope and/or location.
- F2.3 The available sewer televising information is contained within the City of Winnipeg's Sewer Management System (SMS) application.
- F2.4 Confirm televising requirements with Project Manager.
- F2.5 CCTV inspection general guidelines:
- (a) Confirm CCTV requirements with Water & Waste Department for sewers 1050 mm and larger in diameter;
 - (b) Televising if no previous CCTV inspections have been completed;
 - (c) Re-televising sewers in Categories A/B/C/X with a Structural Performance Grade (SPG) of 3 or higher that have not been televised in the previous 5 years;
 - (d) Sewers located more than two metres from the curb line (i.e. not located under pavement) do not need to be re-televised if previous CCTV inspection data exist. If a sewer repair or renewal requiring excavation is noted, contact the WWD;
 - (e) On all street reconstructions, regardless of location of the sewer (within the right-of-way);
 - (f) If the street exhibits obvious distress at/along the underground plant;
 - (g) Of all CB leads to be reused, as part of a street reconstruction or major rehabilitation.
- F2.6 For any uncertain situations and/or locations, contact the Project Manager.
- F2.7 The Consultant is required to coordinate the sewer-televising contract and communicate the results to the Water & Waste Department. Any repairs or other activities deemed necessary from these inspections must be coordinated with the Water & Waste Department.

F3. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (OCTOBER 2008)

- F3.1 Fieldwork
- (a) Clear all underground services at each test-hole location.
 - (b) As this street project is greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon Site conditions – confirm with the Project Manager.
 - (c) Record location of test-hole (offset from curb, distance from cross street and house number).
 - (d) Drill 150 mm-diameter cores in pavement.
 - (e) Drill 125 mm-diameter test-holes into fill materials and subgrade.
 - (f) If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.
 - (g) Test-holes shall be drilled to depth of 2 m \pm 150 mm below surface of the pavement.
 - (h) Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).
 - (i) Measure and record pavement section exposed in the test-hole (thickness of concrete or asphalt and different types of pavement structure materials).

- (j) Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).
- (k) Log soil profile for the subgrade.
- (l) Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials – 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the test-hole.
- (m) Make note of any water seepage into the test-hole.
- (n) Backfill test-hole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.
- (o) Return core sample from the pavement and soil samples to the laboratory.

F3.2 Lab Work

- (a) Test all soil samples for moisture content.
- (b) Photograph core samples recovered from the pavement surface.
- (c) Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.
- (d) Prepare test-hole logs and classify subgrade (based on hydrometer) as follows:
 - < 30% silt - classify as clay
 - 30% - 50% silt - classify as silty clay
 - 50% - 70% silt - classify as clayey silt
 - > 70% silt - classify as silt
- (e) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-01
LOCATION: Fidler Avenue, Inside Lane, 46 m E of Mt Royal Rd, 1.04 m S of N curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS	UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT - 20 mm							
		CONCRETE - 100 mm							
		SAND and GRAVEL FILL - 75 mm							
		CLAY - gravelly, some silt, trace sand - dark brown, frozen to 0.3 m - trace gravel, dry to moist, stiff below 0.3 m	<input checked="" type="checkbox"/>	G1					
			<input checked="" type="checkbox"/>	G2					
			<input checked="" type="checkbox"/>	G3					
			<input checked="" type="checkbox"/>	G4					
			<input checked="" type="checkbox"/>	G5					
			<input checked="" type="checkbox"/>	G6					
			<input checked="" type="checkbox"/>	G7					
		SAND - silty, trace clay - light brown, dry to moist							
		END OF TEST HOLE AT 2.13 m IN CLAY							
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.							

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT. 3/21/18



LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Elliott Drumright	COMPLETION DATE: 12/1/17
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-02
LOCATION: Fidler Avenue, Inside Lane, 150 m E of Mt Royal Rd, 0.90 m S of N curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●				
0		ASPHALT - 30 mm CONCRETE - 200 mm									
		SAND and GRAVEL FILL - 50 mm									
		CLAY - some silt, trace sand - dark brown, dry to moist, firm to stiff, - high plasticity		G8							
		- brown below 0.6 m - (G2): LL = 74%, PL = 24%		G9	45					(G9): Gravel: 0%, Sand: 8%, Silt: 23%, Clay: 69%	
				G10							
				G11	55						
				G12							
				G13	65						
				G14							
		END OF TEST HOLE AT 2.13 m IN CLAY									
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.									

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT. 3/21/18



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REVIEWED BY: Elliott Drumright	COMPLETION DATE: 12/1/17
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-03
LOCATION: Fidler Avenue, Outside Lane, 37 m N of Fidler Ave S leg, 1.20 m W of E curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0		ASPHALT - 40 mm CONCRETE - 195 mm								
		CLAY - some silt - dark brown, dry to moist, firm to stiff - high plasticity - brown, silt inclusions < 2 mm diam. below 0.5 m		G15						
				G16						
				G17						
				G18						
				G19						
				G20						
				G21						
		END OF TEST HOLE AT 2.13 m IN CLAY								
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.								

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT. 3/21/18



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REVIEWED BY: Elliott Drumright	COMPLETION DATE: 12/1/17
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-04
LOCATION: Fidler Avenue, Inside Lane, 180 m E of Mt Royal Rd, 1.30 m E of W curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Becker	Dynamic Cone	Torvane	QU/2		
0		ASPHALT - 20 mm ASPHALT - 40 mm CONCRETE - 175 mm SAND and GRAVEL FILL - 40 mm CLAY - some silt - dark brown, dry to moist, firm to stiff - high plasticity - brown, silt inclusions < 2 mm diam. below 1.0 m									
				G22							
				G23							
				G24							
				G25							
				G26							
				G27							
				G28							
		END OF TEST HOLE AT 2.13 m IN CLAY									
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.									

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT 3/21/18



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PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-05
LOCATION: Fidler Avenue, Outside Lane, 63 m E of Mt Royal Rd, 1.40 m S of N curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0		ASPHALT - 23 mm CONCRETE - 185 mm								
		SAND and GRAVEL FILL - 40 mm								
		CLAY - some silt - dark brown, dry to moist, firm to stiff - high plasticity		G29	●					
				G30						
		- brown below 0.91 m		G31	●					
				G32						
				G33	●					
		SILT and SAND - trace clay - light brown, dry to moist, soft - low plasticity		G34						
				G35	●					
		END OF TEST HOLE AT 2.13 m IN CLAY								
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.								

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT 3/21/18



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PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-06
LOCATION: Woodhaven Boulevard, W lane, 116 m S of Portage Ave, 2.30 m E of W curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Becker	Dynamic Cone	Torvane	QU/2		
0		CONCRETE - 130 mm									
		SAND and GRAVEL FILL - 100 mm									
		CLAY - some silt, some sand, trace gravel, some organics - dark grey to black, moist, firm to stiff - high plasticity		G36							
		- (G37): LL = 66%, PL = 19%		G37						(G37): Gravel: 5%, Sand: 20%, Silt: 25%, Clay: 50%	
				G38							
				G39							
				G40							
				G41							
				G42							
		END OF TEST HOLE AT 2.13 m IN CLAY									
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.									

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT 3/21/18



LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
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PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-07
LOCATION: Woodhaven Boulevard, E lane, 161 m S of Portage Ave, 2.60 m W of E curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) Total Unit Wt (kN/m³)	+ Torvane + X QU/2 X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0		ASPHALT - 70 mm								
		SAND and GRAVEL FILL - 50 mm								
		CLAY - some silt to silty, some organics - dark grey to black, moist, firm to stiff - high plasticity		G43						
				G44						
				G45						
1		CLAY - some silt, trace sand - light brown, dry to moist, firm - high plasticity		G46						
				G47						
				G48						
2				G49						
		END OF TEST HOLE AT 2.13 m IN CLAY								
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.								

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT. 3/21/18



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PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-08
LOCATION: Woodhaven Boulevard, W lane, 12 m S of Woodhaven Cresc, 2.00 m E of W curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●				
0		ASPHALT - 100 mm									
		SAND and GRAVEL FILL - 80 mm									
		CLAY - trace silt, trace sand - dark brown, dry to moist, firm to stiff - high plasticity		G50							
		- (G51): LL = 75%, PL = 25%		G51	40					(G51): Gravel: 0%, Sand: 8%, Silt: 10%, Clay: 82%	
				G52							
		- brown, trace silt inclusions < 2 mm diam. below 1.1 m		G53	50						
				G54							
				G55	55						
				G56							
		END OF TEST HOLE AT 2.13 m IN CLAY									
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.									

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT. 3/21/18



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PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-09
LOCATION: Woodhaven Boulevard, E lane, 57 m N of Emo Ave, 1.40 m W of E curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						◆ SPT (Standard Pen Test) ◆ (Blows/300mm)	■ Total Unit Wt (kN/m ³)	+ Torvane +	× QU/2 ×		
0		ASPHALT - 130 mm									
		SAND and GRAVEL FILL - 40 mm									
		CLAY - some silt, trace to some sand, trace gravel, some organics - dark grey to black, moist, firm to stiff - high plasticity		G57							
				G58	45	20					
				G60	55	20					
		CLAY - some silt, trace sand - light greyish brown, dry to moist, firm - high plasticity		G61	65	20					
		- dark brown below 1.6 m		G62	75	20					
				G63	85	20					
		END OF TEST HOLE AT 2.13 m IN CLAY									
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.									

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT 3/21/18



LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Elliott Drumright	COMPLETION DATE: 12/1/17
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

PROJECT: Local Streets Package - 18-R-02	CLIENT: City of Winnipeg	TESTHOLE NO: TH17-10
LOCATION: Woodhaven Boulevard, W lane, 18 m N of Emo Ave, 0.97 m E of W curb		PROJECT NO.: 60558249
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Mobile B40, 125 mm SSA	ELEVATION (m): N/A
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK	<input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m ³)	+ Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0		ASPHALT - 185 mm								
		SAND and GRAVEL FILL - 40 mm								
		CLAY - some silt - brown, moist, firm to stiff - high plasticity		G64	~45					
		SAND - silty, some clay - light brown, dry to moist		G65	~55				(G65): Gravel: 0%, Sand: 54%, Silt: 26%, Clay: 20%	
		CLAY - some silt - brown, moist, firm to stiff - high plasticity		G66	~45					
				G67	~45					
				G68	~45					
				G69	~45					
				G70	~45					
		END OF TEST HOLE AT 2.13 m IN CLAY								
		Notes: 1. No seepage or sloughing observed during drilling. 2. Test hole backfilled with drill cuttings and bentonite and sealed with asphalt patch upon completion.								

LOG OF TEST HOLE BOREHOLE LOGS TC REV1.GPJ UMA WINN.GDT 3/21/18



LOGGED BY: Tessa Christi	COMPLETION DEPTH: 2.13 m
REVIEWED BY: Elliott Drumright	COMPLETION DATE: 12/1/17
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

City of Winnipeg

Local Streets Package – 18-R-02 - Geotechnical Investigation

Table 01- Summary of Laboratory Soil Testing (Streets for Reconstruction)

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits			
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index	
TH17-01	Fidler Ave, Inside Lane, 46 m E of Mt Royal Rd, 1.04 m S of N curb 14U – 0626119 m E, 5526861 m N	Asphalt	20 mm	CLAY	0.23	44.8								
				CLAY	0.53	--								
				CLAY	0.84	36.8								
		Concrete	100 mm	CLAY	1.14	--								
				CLAY	1.45	18.3								
				CLAY	1.75	21.2								
				SILTY SAND	2.06	13.3								
TH17-02	Fidler Ave, Inside Lane, 150 m E of Mt Royal Rd, 0.90 m S of N curb 14U – 0626224 m E, 5526854 m N	Asphalt	30 mm	CLAY	0.28	--								
				CLAY	0.53	36.5	0	8	23	69	74	24	50	
				CLAY	0.84	--								
		Concrete	200 mm	CLAY	1.14	35.0								
				CLAY	1.45	--								
				CLAY	1.75	35.5								
				CLAY	2.06	--								
TH17-03	Fidler Ave, Outside Lane, 37 m N of S leg, 1.20 m W of E curb 14U – 0626303 m E, 5526889 m N	Asphalt	40 mm	CLAY	0.23	46.2								
				CLAY	0.53	--								
				CLAY	0.84	36.3								
		Concrete	195 mm	CLAY	1.14	--								
				CLAY	1.45	43.3								
				CLAY	1.75	--								
				CLAY	2.06	44.9								
TH17-04	Fidler Ave, Inside Lane, 180 m E of Mt Royal Rd, 1.30 m E of W curb 14U – 0626254 m E, 5526931 m N	Asphalt	20 mm	CLAY	0.27	--								
				CLAY	0.53	38.3								
		Asphalt	40 mm	CLAY	0.84	--								
				CLAY	1.14	38.7								
		Concrete	175 mm	CLAY	1.45	--								
				CLAY	1.75	45.8								
				CLAY	2.06	--								
TH17-05	Fidler Ave, Outside Lane, 63 m E of Mt Royal Rd, 1.40 m S of N curb 14U – 0626139 m E, 5526937 m N	Asphalt	23 mm	CLAY	0.24	20.5								
				CLAY	0.53									
				CLAY	0.84	31.8								
		Concrete	185 mm	CLAY	1.14									
				CLAY	1.45	15.2								
				SILT AND SAND	1.75									
				SILT AND SAND	2.06	15.5								

* Note – Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

Test Hole No.	Test Hole Location	Pavement Structure		Subgrade Description *	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
TH17-06	Woodhaven Blvd, W Lane, 116 m S of Portage Ave, 2.30 m E of W curb 14U – 0624100 m E, 5526357 m N	Concrete	130 mm	CLAY	0.23	37.2							
				CLAY	0.53	35.1							
				CLAY	0.84	33.3	5	20	25	50	66	19	47
				CLAY	1.14	39.6							
				CLAY	1.45	55.1							
				CLAY	1.75	48.6							
TH17-07	Woodhaven Blvd, E Lane, 161 m S of Portage Ave, 2.60 m W of E curb 14U – 0624082 m E, 5526311 m N	Asphalt	70 mm	CLAY	0.23	29.8							
				CLAY	0.53	42.5							
				CLAY	0.84	34.4							
				CLAY	1.14	34.8							
				CLAY	1.45	--							
				CLAY	1.75	33.7							
TH17-08	Woodhaven Blvd, W Lane, 12 m S of Woodhaven Cresc, 2.00 m E of W curb 14U – 0624044 m E, 5526287 m N	Asphalt	100 mm	CLAY	0.23	--							
				CLAY	0.53	37.6	0	8	10	82	75	25	50
				CLAY	0.84	--							
				CLAY	1.14	41.9							
				CLAY	1.45	--							
				CLAY	1.75	42.1							
TH17-09	Woodhaven Blvd, E Lane, 57 m N of Emo Ave, 1.40 m W of E curb 14U – 0624030 m E, 5526193 m N	Asphalt	130 mm	CLAY	0.53	--							
				CLAY	0.84	42.4							
				CLAY	1.14	40.6							
				CLAY	1.45	33.9							
				CLAY	1.75	43.8							
				CLAY	2.06	--							
TH17-10	Woodhaven Blvd, W Lane, 18 m N of Emo Ave 0.97 m E of W curb 14U – 0624026 m E, 5526155 m N	Asphalt	185 mm	CLAY	0.23	28.1							
				SILTY SAND	0.53	18.8	0	54	26	20			
				CLAY	0.84	--							
				CLAY	1.14	32.7							
				CLAY	1.45	--							
				CLAY	1.75	36.3							
				CLAY	2.06	--							

* Note – Subgrade Description based on City of Winnipeg Specifications for Geotechnical Investigation Requirements for Public Works Projects (September 2015)

City of Winnipeg - Local Streets Package – 18-R-02

Geotechnical Investigation

Table 02- Summary of Pavement Core Thicknesses (Streets for Rehabilitation)

Test Hole No.	Test Hole Location	Pavement Structure	
		Type	Thickness (mm)
PC18-11	Bruce Ave; 52.0 m E of Conway St; 1.6 m N of curb	Asphalt	25
		Concrete	152
PC18-12	Bruce Ave; 17.5 m E of Duffield St; 1.8 m S of curb	Asphalt	51
		Concrete	152
PC18-13	Bruce Ave; 23.0 m W of Woodlawn St; 1.5 m N of curb	Asphalt	18
		Concrete	165
PC18-14	Lodge Ave; 28.0 m W of Thompson Dr; 2.2 m S of curb	Asphalt	50
		Concrete	135
PC18-15	Lodge Ave; 25.0 m W of Harcourt St; 2.0 m N of curb	Asphalt	50
		Concrete	135

Test Hole No.	Test Hole Location	Pavement Structure	
		Type	Thickness (mm)
PC18-16	Lodge Ave; 17.0 m E of Aldine St; 1.8 m N of curb	Asphalt	52
		Concrete	135
PC18-17	Ness Ave; 54.0 m E of Cavalier Dr; 1.8 m N of curb	Asphalt	65
		Concrete	180
PC18-18	Ness Ave; 137.0 m E of Cavalier Dr; 2.5 m S of curb	Asphalt	65
		Concrete	180
PC18-19	Ness Ave; 27.0 m W of Muriel St; 1.9 m N of curb	Asphalt	65
		Concrete	175
PC18-20	Whitegates Cresc; 53.0 m S of Sansome Ave; 1.50 m W of curb	Asphalt	0
		Concrete	150

Test Hole No.	Test Hole Location	Pavement Structure	
		Type	Thickness (mm)
PC18-21	Whitegates Cresc; 34.0 m N of Browning Blvd; 1.5 m E of curb	Asphalt	0
		Concrete	150
PC18-22	Whitegates Cresc; 155 m S of Browning Blvd; 1.5 m S of curb	Asphalt	0
		Concrete	160
PC18-23	Whitegates Cresc; 47.0 m N of Browning Blvd; 1.7 m E of curb	Asphalt	0
		Concrete	145



Photograph 1: Test Hole TH17-01 – Fidler Ave



Photograph 2: Test Hole TH17-03 – Fidler Ave



Photograph 3: Test Hole TH17-04 – Fidler Ave



Photograph 4: Test Hole TH17-05 – Fidler Ave



Photograph 5: Test Hole TH17-06 – Woodhaven Blvd



Photograph 6: Test Hole TH17-07 – Woodhaven Blvd



Photograph 7: Test Hole TH17-08 – Woodhaven Blvd



Photograph 8: Test Hole TH17-09 – Woodhaven Blvd



Photograph 9: Test Hole TH17-10 – Woodhaven Blvd



Photograph 10: Pavement Core PC18-11 – Bruce Ave



Photograph 11: Pavement Core PC18-12 – Bruce Ave



Photograph 12: Pavement Core PC18-13 – Bruce Ave



Photograph 13: Pavement Core PC18-14 – Lodge Ave



Photograph 14: Pavement Core PC18-15 – Lodge Ave



Photograph 15: Pavement Core PC18-16 – Lodge Ave



Photograph 16: Pavement Core PC18-17 – Ness Ave



Photograph 17: Pavement Core PC18-18 – Ness Ave



Photograph 18: Pavement Core PC18-19 – Ness Ave



Photograph 19: Pavement Core PC18-20 – Whitegates Cres



Photograph 20: Pavement Core PC18-21 – Whitegates Cresc



Photograph 21: Pavement Core PC18-22 – Whitegates Cresc



Photograph 22: Pavement Core PC18-23 – Whitegates Cresc