APPENDIX ‘G’

GEOTECHNICAL REPORT

EXPLANATION OF FIELD & LABORATORY TEST DATA

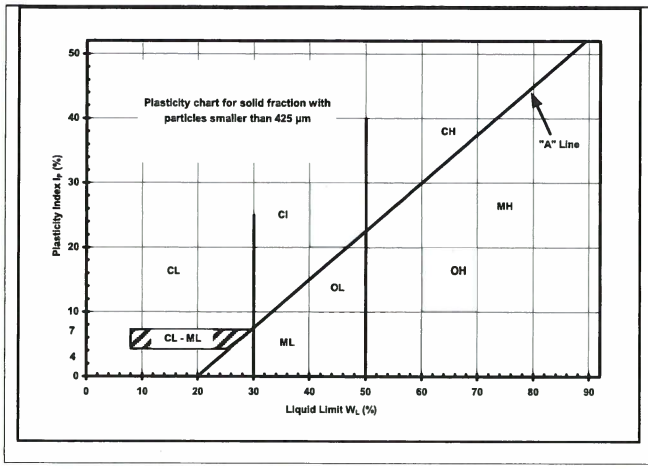
Description				UMA Log Symbols	USCS Classification	Laboratory Classification Criteria			
						Fines (%)	Grading	Plasticity	Notes
COARSE GRAINED SOILS	GRAVELS (More than 50% of coarse fraction of gravel size)	CLEAN GRAVELS (Little or no fines)	Well graded gravels, sandy gravels, with little or no fines		GW	0-5	$C_U > 4$ $1 < C_C < 3$		Dual symbols if 5-12% fines. Dual symbols if above "A" line and $4<W_P<7$ $C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
			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			Classification is Based upon Plasticity Chart	
		$W_L>50$	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				
		$30<W_L<50$	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 ORGAINIC SOILS			Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	

	Asphalt		Till		
	Concrete		Bedrock (Undifferentiated)		AECOM
	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.

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)

NOT USED TO CLASSIFY SUBGRADE. REFER TO CITY OF WINNIPEG SPECIFICATIONS FOR GEOTECHNICAL INVESTIGATIONS REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER, 2015)



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	10-20	some
Silt (non-plastic) or Clay (plastic)		< 0.075 mm		1-10	trace

* for example: gravelly, sandy clayey, silty

Definition of Oversize Material

COBBLES: 76mm to 300mm diameter
BOULDERS: >300mm diameter

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/m^3).
- 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

In addition:

(a) Included on the CD's will be a separate drawing in AutoCAD format with the following (8) basic layers (none of which are to include text) and a list describing additional layers used:

Layer Names:

1) Street Surface
2) Walk
3) Alley
4) Approach
5) Ramp Curb
6) Dimensions (to include all dimensions in the drawing)
7) Drainage Inlets
8) Elevations (min. all hi & low points)

F2. GEOTECHNICAL INVESTIGATION REQUIREMENTS FOR PUBLIC WORKS PROJECTS (SEPTEMBER 2015)

F2.1 Fieldwork

(a) Clear all underground services at each test-hole location.

(b) On most projects, test-holes are required every 50 metres with a minimum of three (3) test holes per Project Location. For street projects greater than 500 metres, test holes may be taken every 100 m. More or fewer test-holes may be required depending upon known 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 ±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.

F2.2 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 Pavement Rehabilitations and Mill and Fill Pavement Rehabilitation Method pavement cores may be required. Contact the City's Project Manager to confirm requirements.

(f) For any uncertain situations and/or locations, or clarification of these requirements, contact the Project Manager.

F3. TREE REMOVAL GUIDELINES

F3.1 These guidelines are applicable to situations where trees in fair to good condition on public boulevards, parks, or natural areas are requested to be removed. The following are some examples:

(a) Movie sets;

(b) Private and commercial approaches;

(c) Planned construction, street work, and water and waste projects.

F3.2 (0 – 10cm) Trees can be replaced at approximately the same size. Customer is responsible for removal utilizing an approved contractor and is to forward the replacement cost (currently $740 / tree) to the Urban Forestry Branch.

F3.3 (10 – 30cm) Trees are not easily replaced and are valued according to Council of Tree and Landscape Appraisal Formula.

F3.4 (30cm +) The Urban Forestry Branch's position is to deny removal and further consultation with the City of Winnipeg Forester is required.

F3.5 Funding received by The Urban Forestry Branch will be invested back in the form of tree planting within the Ward to maintain the canopy of the urban forest.

F3.6 Additional Guidelines:

(a) There shall be no appraised value applicable for trees that are dead or are in decline.

(b) Trees that are part of emergency water and waste projects shall be priced for removal and replacement cost.

(c) For new easements Manitoba Hydro shall consult with the City of Winnipeg Urban Forestry Branch prior to any proposed tree removal. During the consultation, all attempts shall be made to minimize tree removal. Trees that are removed shall be compensated at a value of 1 new tree per 10 cm of dbh (diameter at breast height; ie. 40 cm dbh tree = 4 replacement trees @ $740 / tree = $2960). If Manitoba Hydro fails to consult with the Urban Forestry Branch in these matters, then the Council of Tree & Landscape Appraisers, Guide for Plant Appraisal (current edition), shall be used to determine the value of trees.

(d) Natural stand trees are valued 1:1 ratio for those greater than 5cm dbh. One additional replacement tree will be required for every additional 7.5 cm of dbh (ie. 12.5cm dbh = 2 replacement trees @ $740 / tree = $1480). The ISA Species rating will be taken into consideration once a total appraised value has been determined.

F4. SEWER CONDITION ASSESSMENT & CCTV GUIDELINES (2017)

F4.1 Perform condition assessment on all relevant sewers and manholes in the right-of-way within the limits of the street renewal. Condition assessment includes, but is not limited to, the following;

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-14**
LOCATION: Lanark St., 1.6 m E of W curb, 14 m N of John Brebeuf Pl.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × □ Lab Vane □ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200	COMMENTS	DEPTH
0		ASPHALT - 30 mm CONCRETE - 190 mm							
		CLAY - trace to some sand - dark grey, frozen to 1.1 m		G73					
				G74					
1				G75					1
		- firm, moist, high plasticity below 1.1 m		G76					
				G77					
		SILT - clayey, some sand - light brown, soft to firm, moist - intermediate plasticity		G78					
2		END OF TEST HOLE AT 2.00 m IN SILT Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.							2
3									

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-15**
LOCATION: Lanark St., 1.6 m E of W curb, 83 m N of John Brebeuf Pl.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		ASPHALT - 89 mm					
		CONCRETE - 167 mm					
		CLAY - trace to some sand - dark grey, frozen to 1.1 m		G79			
				G80			
1				G81			1
		- firm, moist, high plasticity below 1.1 m					
		CLAY - trace sand - brown, firm, moist - high plasticity		G82			
				G83			
				G84			
2		END OF TEST HOLE AT 2.00 m IN CLAY					2
		Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					
3							

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-16**
LOCATION: 500 Lanark St., 1.4 m E of W curb, 145 m N of John Brebeuf Pl.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT - 50 mm						
		CONCRETE - 200 mm						
		SAND and GRAVEL (Fill) - 50 mm - aggregate < 15 mm diam.						
		CLAY - trace to some sand, trace gravel - dark grey, frozen to 1.1 m - high plasticity		G85				
				G86			(G86): Gravel: 7.1%, Sand: 20.6%, Silt: 23.6%, Clay: 48.8%	
1				G87				1
		- firm, moist below 1.1 m						
		SILT - clayey, trace to some sand - light brown, firm, moist - intermediate plasticity		G88				
		CLAY - trace sand - brown, firm, moist - high plasticity		G89				
				G90				
2		END OF TEST HOLE AT 2.00 m IN CLAY						2
		Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.						
3								

PENETRATION TESTS: ✳ Becker ✳ | ◇ Dynamic Cone ◇ | ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | □ Lab Vane □ | △ Pocket Pen. △ | ✤ Field Vane ✤ (kPa) 50 100 150 200

AECOM	LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-17**
LOCATION: 528 Lanark St., 1.8 m E of W curb, 130 m S of Corydon Ave.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		ASPHALT - 45 mm					
		CONCRETE - 222 mm					
		SAND and GRAVEL (Fill) - 33 mm - aggregate < 15 mm diam.					
		CLAY - trace sand - dark grey, frozen to 1.1 m		G91			
				G92			
1				G93			1
		- firm, moist, high plasticity below 1.1 m		G94			
		SILT - clayey, trace to some sand - light brown, firm, moist - intermediate plasticity		G95			
		CLAY - trace sand - brown, firm, moist - high plasticity		G96			
2		END OF TEST HOLE AT 2.00 m IN CLAY					2
		Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					
3							

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-18**
LOCATION: Lanark St., 0.3 m E of W curb, 75 m S of Corydon Ave.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100; ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ⬘ Field Vane ⬘ (kPa) 50 100 150 200	COMMENTS	DEPTH
0		ASPHALT - 59 mm							
		CONCRETE - 151 mm							
		SAND and GRAVEL (Fill) - 90 mm - aggregate < 15 mm diam.							
		CLAY - trace sand - dark grey, frozen - high plasticity		G97					
		- brown below 0.6 m		G98					
1				G99				(G99): Gravel: 0.0%, Sand: 4.2%, Silt: 17.1%, Clay: 78.7%	1
		SILT - clayey, trace to some sand - light brown, firm, moist - intermediate plasticity							
		CLAY - trace sand - brown, firm, moist - high plasticity		G100					
				G101					
				G102					
2		END OF TEST HOLE AT 2.00 m IN CLAY Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.							2
3									

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-19**
LOCATION: Lanark St., 2.0 m E of W curb, 33 m S of Corydon Ave.		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		ASPHALT - 33 mm CONCRETE - 127 mm					
		SAND and GRAVEL (Fill) - 70 mm - aggregate < 15 mm diam.					
		CLAY - trace to some sand - dark grey, frozen		G103			
				G104			
		SILT - clayey, trace to some sand - light brown, firm, moist - intermediate plasticity		G105		(Bulk) Soaked CBR: 1.6	
1							1
		CLAY - trace sand - brown, firm, moist - high plasticity		G106			
				G107			
				G108			
2		END OF TEST HOLE AT 2.00 m IN CLAY					2
3		Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Two additional holes drilled at this location to collect bulk sample between 0.3 m and 1.5 m. 4. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					

PENETRATION TESTS: ✳ Becker ✳ | ◇ Dynamic Cone ◇ | ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | ☐ Lab Vane ☐ | △ Pocket Pen. △ | ✤ Field Vane ✤ (kPa) 50 100 150 200

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/17/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-20**
LOCATION: 131/135 McDowell Dr., 1.5 m W of E curb, 28 m N of Westlund Way		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100; Total Unit Wt (kN/m³) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane (kPa) 50 100 150 200	COMMENTS	DEPTH
0		CONCRETE - 173 mm							
		SAND and GRAVEL (Fill) - 80 mm - aggregate < 15 mm diam.							
		SILT and SAND - dark grey, frozen - low plasticity		G109					
				G110				(G110): Gravel: 0.8%, Sand: 41.0%, Silt: 45.0%, Clay: 13.3%	
1				G111					1
		CLAY - trace sand - brown, frozen to 1.4 m		G112					
		- firm, moist, high plasticity below 1.4 m		G113					
				G114					
2		END OF TEST HOLE AT 2.00 m IN CLAY							2
		Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.							
3									

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-21**
LOCATION: 107/111 McDowell Dr., 2.0 m W of E curb, Blossom Bay Intersection		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		CONCRETE - 147 mm					
		SAND and GRAVEL (Fill) - 132 mm - aggregate < 20 mm diam.					
		CLAY - trace to some sand - dark grey, frozen		G115			
				G116			
1				G117			1
		CLAY - trace to some sand - brown, firm, moist - high plasticity		G118			
				G119			
				G120			
2		END OF TEST HOLE AT 2.00 m IN CLAY Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					2
3							

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-22**
LOCATION: 95/99 McDowell Dr., 1.6 m W of E curb, 45 m N of South Leg of Blossom Bay		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		CONCRETE - 145 mm						
		SAND and GRAVEL (Fill) - 96 mm - aggregate < 15 mm diam.						
		CLAY - trace sand - brown, frozen to 1.2 m - high plasticity		G121				
				G122				
1				G123			(G123): Gravel: 0.0%, Sand: 5.2%, Silt: 24.9%, Clay: 69.9%	1
		- firm, moist below 1.2 m		G124				
				G125				
				G126				
2		END OF TEST HOLE AT 2.00 m IN CLAY Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.						2
3								

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

AECOM

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-23**
LOCATION: 78 McDowell Dr., 1.7 m E of W curb, 65 m S of North Leg of Blossom Bay		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		CONCRETE - 152 mm					
		SAND and GRAVEL (Fill) - 102 mm - aggregate < 20 mm diam.					
		SAND and SILT - light brown, frozen - low plasticity		G127			
				G128		(G128): Gravel: 0.0%, Sand: 44.8%, Silt: 43.0%, Clay: 12.2% (Bulk) Soaked CBR: 3.2	
1				G129			1
		CLAY - trace to some sand - brown, firm, moist - high plasticity		G130			
				G131			
				G132			
2		END OF TEST HOLE AT 2.00 m IN CLAY Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Two additional holes drilled at this location to collect bulk sample between 0.3 m and 1.5 m. 4. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					2
3							

PENETRATION TESTS: ✳ Becker ✳ | ◇ Dynamic Cone ◇ | ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 | ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 | Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + | × QU/2 × | ☐ Lab Vane ☐ | △ Pocket Pen. △ | ✣ Field Vane ✣ (kPa) 50 100 150 200

AECOM	LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
	REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
	PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-24**
LOCATION: 63 McDowell Dr., 1.9 m W of E curb, Blossom Bay Intersection		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

PENETRATION TESTS: ✳ Becker ✳ ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) 0 20 40 60 80 100 ■ Total Unit Wt ■ (kN/m^3) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

UNDRAINED SHEAR STRENGTH: + Torvane + × QU/2 × ☐ Lab Vane ☐ △ Pocket Pen. △ ✣ Field Vane ✣ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	COMMENTS	DEPTH
0		CONCRETE - 162 mm					
		SAND and GRAVEL (Fill) - 54 mm - aggregate < 15 mm diam.					
		CLAY - trace to some sand - dark brown, frozen		G133			
				G134			
		CLAY - trace to some sand - brown, frozen to 1.2 m					
1				G135			1
		- firm, moist, high plasticity below 1.2 m		G136			
				G137			
				G138			
2		END OF TEST HOLE AT 2.00 m IN CLAY Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.					2
3							

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

PROJECT: Local Streets Package - 19-R-04	CLIENT: City of Winnipeg	TESTHOLE NO: **TH19-25**
LOCATION: 51 McDowell Dr., 2.0 m E of W curb, 55 m N of North Leg of Blossom Bay		PROJECT NO.: 60596312
CONTRACTOR: Maple Leaf Drilling Ltd.	METHOD: Canterra C-250 Truck Rig, 125 mm SSA	ELEVATION (m): N/A

SAMPLE TYPE: GRAB | SHELBY TUBE | SPLIT SPOON | BULK | NO RECOVERY | CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS: Becker; Dynamic Cone; SPT (Standard Pen Test) (Blows/300mm) 0 20 40 60 80 100; Total Unit Wt (kN/m³) 16 17 18 19 20 21; Plastic MC Liquid 20 40 60 80 100	UNDRAINED SHEAR STRENGTH: Torvane; QU/2; Lab Vane; Pocket Pen.; Field Vane (kPa) 50 100 150 200	COMMENTS	DEPTH
0		CONCRETE - 154 mm							
		SAND and GRAVEL (Fill) - 113 mm - aggregate < 15 mm diam.							
		CLAY - some sand - dark brown, frozen to 1.4 m - high plasticity		G139					
				G140				(G140): Gravel: 0.1%, Sand: 18.9%, Silt: 28.6%, Clay: 52.4%	
1				G141					1
				G142					
		- firm, moist below 1.4 m		G143					
		SILT - clayey, some sand - light brown, soft to firm, moist - intermediate plasticity		G144					
2		END OF TEST HOLE AT 2.00 m IN SILT Notes: 1. No seepage observed during drilling. 2. No sloughing observed during drilling. 3. Test hole backfilled with drill cuttings and bentonite and patched with asphalt upon completion.							2
3									

AECOM

LOGGED BY: Ryan Harras	COMPLETION DEPTH: 2.00 m
REVIEWED BY: Faris Alobaidy	COMPLETION DATE: 1/21/19
PROJECT ENGINEER: Kevin Rae	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS - LOCAL STREETS.GPJ UMA WINN.GDT 3/12/19

City of Winnipeg

Local Streets Pkg 19-R-04 – Contract 2 - Lanark Street/ McDowell Drive/ Mountbatten Avenue/ Maurepas Crescent

Geotechnical Investigation

Table 01- Summary of Laboratory Soil Test Results

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
TH19-14	Lanark Street - 1.6 m E of W curb, 14 m N of John Brebeuf Pl.	Asphalt	30	CLAY	0.3	37.4							
				CLAY	0.6	37.7							
		Concrete	190	CLAY	0.9	33.4							
				CLAY	1.2	35.7							
		Sand and Gravel (Fill)	0	CLAY	1.5	37.9							
				SILT	1.8	35.3							
TH19-15	Lanark Street - 1.6 m E of W curb, 83 m N of John Brebeuf Pl.	Asphalt	89	CLAY	0.3	56.0							
				CLAY	0.6	47.5							
		Concrete	167	CLAY	0.9	32.4							
				CLAY	1.2	38.9							
		Sand and Gravel (Fill)	0	CLAY	1.5	41.9							
				CLAY	1.8	43.5							
TH19-16	500 Lanark Street - 1.4 m E of W curb, 145 m N of John Brebeuf Pl.	Asphalt	50	CLAY	0.3	37.0							
				CLAY	0.6	32.5	7.1	20.6	23.6	48.8	60.2	21.3	38.9
		Concrete	200	CLAY	0.9	37.1							
				CLAYEY SILT	1.2	40.3							
		Sand and Gravel (Fill)	50	CLAY	1.5	38.2							
				CLAY	1.8	40.8							
TH19-17	528 Lanark Street - 1.8 m E of W curb, 130 m S of Corydon Ave.	Asphalt	45	CLAY	0.3	51.6							
				CLAY	0.6	40.3							
		Concrete	222	CLAY	0.9	40.9							
				CLAY	1.2	35.4							
		Sand and Gravel (Fill)	33	CLAYEY SILT	1.5	42.2							
				CLAY	1.8	46.0							
TH19-18	Lanark Street - 0.3 m E of W curb, 75 m S of Corydon Ave.	Asphalt	59	CLAY	0.3	36.7							
				CLAY	0.6	37.1							
		Concrete	151	CLAY	0.9	37.5	0.0	4.2	17.1	78.7	85.1	24.9	60.2
				CLAY	1.2	41.9							
		Sand and Gravel (Fill)	90	CLAY	1.5	39.1							
				CLAY	1.8	39.6							

* 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
TH19-19	Lanark Street - 2.0 m E of W curb, 33 m S of Corydon Ave.	Asphalt	33	CLAY	0.3	37.0							
				CLAY	0.6	36.0							
		Concrete	127	CLAYEY SILT	0.9	36.2							
				CLAY	1.2	37.6							
		Sand and Gravel (Fill)	70	CLAY	1.5	41.1							
				CLAY	1.8	42.8							
TH19-20	131/135 McDowell Drive - 1.5 m W of E curb, 28 m N of Westlund Way	Asphalt	0	SILT AND SAND	0.3	25.6							
				SILT AND SAND	0.6	18.7	0.8	41.0	45.0	13.3	24.2	14.3	9.9
		Concrete	173	SILT AND SAND	0.9	35.9							
				CLAY	1.2	41.7							
		Sand and Gravel (Fill)	80	CLAY	1.5	33.4							
				CLAY	1.8	45.7							
TH19-21	107/111 McDowell Drive - 2.0 m W of E curb, Blossom Bay Intersection	Asphalt	0	CLAY	0.3	35.7							
				CLAY	0.6	34.9							
		Concrete	147	CLAY	0.9	35.0							
				CLAY	1.2	34.7							
		Sand and Gravel (Fill)	132	CLAY	1.5	40.8							
				CLAY	1.8	41.5							
TH19-22	95/99 McDowell Drive - 1.6 m W of E curb, 45 m N of South Leg of Blossom Bay	Asphalt	0	CLAY	0.3	28.2							
				CLAY	0.6	28.2							
		Concrete	145	CLAY	0.9	30.8	0.0	5.2	24.9	69.9	68.5	21.4	47.1
				CLAY	1.2	35.2							
		Sand and Gravel (Fill)	96	CLAY	1.5	41.4							
				CLAY	1.8	42.4							
TH19-23	78 McDowell Drive - 1.7 m E of W curb, 65 m S of North Leg of Blossom Bay	Asphalt	0	SAND AND SILT	0.3	21.5							
				SAND AND SILT	0.6	18.9	0.0	44.8	43.0	12.2	22.7	13.1	9.6
		Concrete	152	SAND AND SILT	0.9	15.5							
				CLAY	1.2	35.2							
		Sand and Gravel (Fill)	102	CLAY	1.5	38.4							
				CLAY	1.8	40.7							

* 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
TH19-24	63 McDowell Drive - 1.9 m W of E curb, Blossom Bay Intersection	Asphalt	0	CLAY	0.3	38.9							
				CLAY	0.6	41.1							
		Concrete	162	CLAY	0.9	42.9							
				CLAY	1.2	45.3							
		Sand and Gravel (Fill)	54	CLAY	1.5	40.9							
				CLAY	1.8	42.0							
TH19-25	51 McDowell Drive - 2.0 m E of W curb, 55 m N of North Leg of Blossom Bay	Asphalt	0	CLAY	0.3	22.4							
				CLAY	0.6	20.9	0.1	18.9	28.6	52.4	55.6	17.0	38.6
		Concrete	154	CLAY	0.9	21.8							
				CLAY	1.2	24.7							
		Sand and Gravel (Fill)	113	CLAY	1.5	36.5							
				CLAYEY SILT	1.8	37.6							
CH19-33	111 Mountbatten Avenue - 2.4 m S of N curb, 7 m W of Bower Blvd.	Asphalt	65										
		Concrete	145										
CH19-34	116 Mountbatten Avenue - 1.3 m N of S curb, 60 m W of Bower Blvd.	Asphalt	125										
		Concrete	135										
CH19-35	Mountbatten Avenue - 1.0 m S of N curb, 20 m E of Shaftesbury Blvd.	Asphalt	95										
		Concrete	155										

* 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
CH19-45	Maurepas Crescent - 1.2 m from outer curb, 26 m E of North Intersection with Edgeland Blvd.	Asphalt	0										
		Concrete	161										
CH19-46	Maurepas Crescent - 1.0 m from inner curb, 80 m E of North Intersection with Edgeland Blvd.	Asphalt	0										
		Concrete	215										
CH19-47	Maurepas Crescent - 1.4 m from outer curb, 75 m E of South Intersection with Edgeland Blvd.	Asphalt	0										
		Concrete	240										
CH19-48	Maurepas Crescent - 1.1 m from inner curb, 28 m E of South Intersection with Edgeland Blvd.	Asphalt	0										
		Concrete	224										

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

Photograph 1: Test Hole TH19-14 - Lanark Street - Asphalt not recovered

Photograph 2: Test Hole TH19-15 - Lanark Street

Photograph 3: Test Hole TH19-16 - Lanark Street - Concrete not recovered

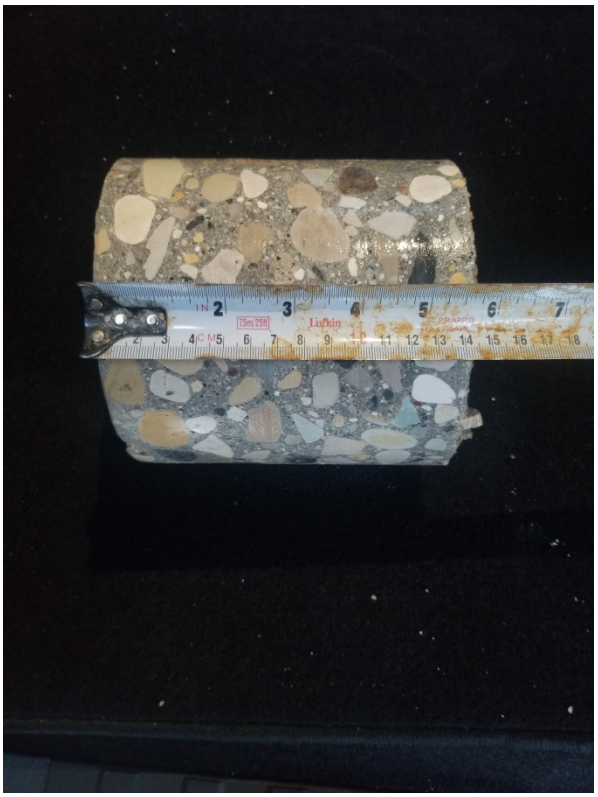
Photograph 4: Test Hole TH19-17 - Lanark Street

Photograph 5: Test Hole TH19-18 - Lanark Street

Photograph 6: Test Hole TH19-19 - Lanark Street

Photograph 7: Test Hole TH19-20 - McDowell Drive

Photograph 8: Test Hole TH19-21 - McDowell Drive



Photograph 9: Test Hole TH19-22 - McDowell Drive

Photograph 10: Test Hole TH19-23 - McDowell Drive

Photograph 11: Test Hole TH19-24 - McDowell Drive

Photograph 12: Test Hole TH19-25 - McDowell Drive

Photograph 13: Test Hole CH19-33 - Mountbatten Avenue

Photograph 14: Test Hole CH19-34 - Mountbatten Avenue - Concrete not recovered

Photograph 15: Test Hole CH19-35 - Mountbatten Avenue

Photograph 16: Test Hole CH19-45 - Maurepas Crescent

Photograph 17: Test Hole CH19-46 - Maurepas Crescent

Photograph 18: Test Hole CH19-47 - Maurepas Crescent

Photograph 19: Test Hole CH19-48 - Maurepas Crescent