

# **APPENDIX 'A'**

# **GEOTECHNICAL REPORT**

CITY OF WINNIPEG

2019 LOCAL STREET RENEWALS -  
19-R-03 CONTRACT 1  
GEOTECHNICAL REPORT

APRIL 29, 2019

ORIGINAL





2019 LOCAL STREET  
RENEWALS - 19-R-03  
CONTRACT 1  
GEOTECHNICAL REPORT  
CITY OF WINNIPEG

ORIGINAL

WSP PROJECT NO.: 18M-01969-00  
DATE: APRIL 29, 2019

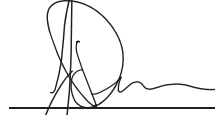
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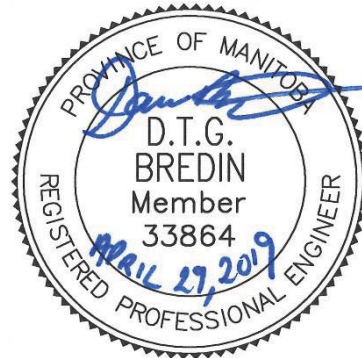
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# SIGNATURES

PREPARED BY



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Dana Bredin, P.Eng.  
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# 1 INTRODUCTION

A geotechnical investigation was conducted by WSP Canada Inc. for the proposed 2019 Local Street Renewals – Contract 1 (Project # 19-R-03) in Winnipeg, Manitoba. The purpose of this investigation was to assess the general subsurface conditions with respect to identifying the existing pavement structure and the underlying soil profile.

Three (3) streets were cored and two (2) streets were cored and drilled, which includes the following:

1. **Dowker Ave** from Pembina Hwy to Crowson Bay (east leg) – drilled and cored
2. **Mulvey Ave** from Lilac St to Arbutnot St – drilled and cored
3. **Maureen St** from Barron Dr to Assiniboine Ave – cored only
4. **Whitegate Cres** from Barron Dr to Maureen St – cored only
5. **Ness Ave** from Pebblewood Ln to Sturgeon Rd – cored only

# 2 SUB-SURFACE INVESTIGATION AND TESTING

The field investigation commenced on March 20, 2019 and was completed on April 11, 2019. A total of 11 testholes and 20 pavement cores were completed by Maple Leaf Drilling. The testholes were drilled to a depth of 3.05 m below the road surface using a B40 truck-mounted rig equipped with a 125 mm solid stem auger. The pavement was cored using a 150 mm diameter coring press. All testholes were backfilled with auger cuttings and bentonite after the completion of the drilling and patched with hot mix asphalt. All pavement cores were patched with hot mix asphalt. Testhole and pavement core locations are noted on the testhole logs, and within the testhole and pavement core summary tables.

The soils encountered were visually classified to the full extent of the test hole. Representative soil samples were recovered at regular intervals starting from 0.1 m below pavement structure and every 0.3 m thereafter to a maximum depth of approximately 2.4 m below grade (mbg). All of the soil samples were tested for their moisture contents and selected soil samples were submitted for grain size analysis and Atterberg limits (minimum one per street). The pavement cores were measured for their thickness and each core was photographed. Any groundwater seepage or sloughing that was encountered in any of the test holes during drilling was noted.

The photos of the pavement cores, detailed descriptions of the soil profiles for each test hole, the material test results and the testhole maps are included in Appendices, organized by street.

# 3 TESTHOLE SUMMARY TABLES

Table 3-1 – Dowker Avenue

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH-01	UTM 14N: 5522364.9 m N, 632961.2 m E Eastbound lane near 1392 Pembina Hwy, 31.7 m northeast of Pembina Hwy, 1.7 m northwest of south curb	Asphalt	70	Granular Fill (Crushed Limestone, 20 mm)	1170	Clay	3.05	8
TH-02	UTM 14N: 5522393.5 m N, 633002.5 m E Westbound lane near 1 Kenneth St, 80.7 m northeast of Pembina Hwy, 6.8 m northwest of south curb	Asphalt	70	Granular Fill (Crushed Limestone, 20 mm)	560	Clay	3.05	8
TH-03	UTM 14N: , 5522413.5 m N 633048.6 m E Eastbound lane near 2 Kenneth St, 131.7 m northeast of Pembina Hwy, 2.3 m northwest of south curb	Asphalt	85	Granular Fill (Crushed Limestone, 20 mm)	410	Clay	3.05	8
TH-04	UTM 14N: 5522442.1 m N, 633089.9 m E, Westbound lane in front of 959 Dowker Ave, 180.9 m northeast of Pembina Hwy, 7.2 m northwest of south curb	Asphalt	60	Granular Fill (Crushed Limestone, 20 mm)	560	Clay	1.52	5

TH-05	UTM 14N: 5522462.0 m N, 633136.0 m E Eastbound lane in front of 947 Dowker Ave, 232.0 m northeast of Pembina Hwy, 2.1 m northwest of south curb	Asphalt	130	Granular Fill (Crushed Limestone, 20 mm)	380	Clay	3.05	8
TH-06	UTM 14N: 5522490.6 m N, 633177.3 m E Westbound lane in front of 931 Dowker Ave, 280.0 m northeast of Pembina Hwy, 7.1 m northwest of south curb	Asphalt	100	Granular Fill (Crushed Limestone, 20 mm)	360	Clay, Silt, Clay	3.05	8
TH-07	UTM 14N: 5522510.5 m N, 633223.5 m E Eastbound lane in front of 919 Dowker Ave, 331.9 m northeast of Pembina Hwy, 2.0 m northwest of south curb	Asphalt	75	Granular Fill (Crushed Limestone, 20 mm)	250	Clay	3.05	8
TH-08	UTM 14N: 5522539.2 m N, 633264.7 m E Westbound lane in front of 909 Dowker Ave, 380.8 m northeast of Pembina Hwy, 7.3 m northwest of south curb	Asphalt	100	Granular Fill (Crushed Limestone, 20 mm)	360	Clay	3.05	8



**Table 3-2 – Mulvey Street**

TEST HOLE NO.	TESTHOLE LOCATION	PAVEMENT SURFACE		PAVEMENT STRUCTURE MATERIAL		SOIL DESCRIPTION	BOREHOLE DEPTH (m)	No. of Samples Taken
		Type	Thickness (mm)	Type	Thickness (mm)			
TH-09	UTM 14N: 5525512.6 m N, 632591.5 m E Eastbound lane in front of 775 Mulvey Ave, 26.5 m northeast of Lilac St, 1.6 m northwest of south curb	Asphalt & Concrete	50 & 200	Granular Fill (Crushed Limestone, 20 mm)	50	Fill, Clay, Silty Clay & Clay	3.05	8
TH-10	UTM 14N: 5525512.6 m N, 632591.5 m E Westbound lane in front of 761 Mulvey Ave, 81.4 m northeast of Lilac St, 5.2 m northwest of south curb	Asphalt & Concrete	50 & 150	Granular Fill (Crushed Limestone, 20 mm)	30	Silt, Silty Clay, Clay	3.05	8
TH-11	UTM 14N: 5525512.6 m N, 632591.5 m E Eastbound lane in front of 748 Mulvey Ave, 131.5 m northeast of Lilac St, 1.8 m northwest of south curb	Asphalt & Concrete	50 & 125	Granular Fill (Crushed Limestone, 20 mm)	20	Clay	3.05	8

**Table 3-3 – Maureen Street**

PAVEMENT CORE NO.	PAVEMENT CORE LOCATION	PAVEMENT SURFACE	
		Type	Thickness (mm)
PC-01	UTM 14N: 5525229.6 m N, 621888.3 m E Northbound lane near 3335 Assiniboine Ave, 16.0 m north of Assiniboine Ave, 1.8 m west of east curb	Concrete	150 (40 mm intact, 110 mm broken)
PC-02	UTM 14N: 5525279.7 m N, 621886.8 m E Southbound lane in front of 118 Maureen St, 65.6 m north of Assiniboine Ave, 5.3 m west of east curb	Concrete	150
PC-03	UTM 14N: 5525329.5 m N, 621892.5 m E Northbound lane in front of 130 Maureen St, 116.5 m north of Assiniboine Ave, 1.8 m west of east curb	Concrete	150
PC-04	UTM 14N: 5525374.6 m N, 621890.8 m E Southbound lane in front of 142 Maureen St, 160.6 m north of Assiniboine Ave, 6.7 m west of east curb	Concrete	150
PC-05	UTM 14N: 5525434.4 m N, 621897.0 m E Northbound lane in front of 158 Maureen St, 221.5 m north of Assiniboine Ave, 1.8 m west of east curb	Concrete	200
PC-06	UTM 14N: 5525479.5 m N, 621895.3 m E Southbound lane in front of 170 Maureen St, 265.6 m north of Assiniboine Ave, 5.5 m west of east curb	Concrete	150
PC-07	UTM 14N: 5525529.3 m N, 621901.0 m E Northbound lane near 197 Barron Dr, 316.5 m north of Assiniboine Ave, 1.9 m west of east curb	Concrete	150

**Table 3-4 – Whitegate Crescent**

PAVEMENT CORE NO.	PAVEMENT CORE LOCATION	PAVEMENT SURFACE	
		Type	Thickness (mm)
PC-08	UTM 14N: 5525293.1 m N, 621918.4 m E Eastbound lane in front of 103 Whitegates Cres, 26.2 m east of Maureen St, 1.9 m north of south curb	Concrete	150
PC-09	UTM 14N: 5525281.6 m N, 621972.3 m E Westbound lane in front of 118 Whitegates Cres, 82.1 m east of Maureen St, 5.6 m north of south curb	Concrete	150
PC-10	UTM 14N: 5525266.0 m N, 622014.7 m E Eastbound lane in front of 131 Whitegates Cres, 126.2 m east of Maureen St, 2.2 m north of south curb	Concrete	150
PC-11	UTM 14N: 552530.0 m N, 622038.9 m E Southbound lane in front of 152 Whitegates Cres, 238.7 m south of Barron Dr, 1.8 m east of west curb	Concrete	150
PC-12	UTM 14N: 5525354.8 m N, 622044.9 m E Northbound lane in front of 163 Whitegates Cres, 183.7 m south of Barron Dr, 6.0 m east of west curb	Concrete	150
PC-13	UTM 14N: 5525399.9 m N, 622043.4 m E Southbound lane in front of 176 Whitegates Cres, 138.7 m south of Barron Dr, 1.9 m east of west curb	Concrete	150
PC-14	UTM 14N: 5525449.7 m N, 622049.2 m E Southbound lane near 7 West Ave, 88.8 m south of Barron Dr, 5.6 m east of west curb	Concrete	150
PC-15	UTM 14N: 5525499.8 m N, 622047.8 m E Southbound lane in front of 199 Whitegates Cres, 38.8 m south of Barron Dr, 2.1 m east of west curb	Asphalt & Concrete	100 & 150

**Table 3-5 – Ness Avenue**

PAVEMENT CORE NO.	PAVEMENT CORE LOCATION	PAVEMENT SURFACE	
		Type	Thickness (mm)
PC-16	UTM 14N: 5527592.6 m N, 623432.9 m E Eastbound lane near 15 Pebblewood Ln, 230.9 m west of Sturgeon Rd, 2.4 m north of south curb	Asphalt & Concrete	60 & 180
PC-17	UTM 14N: 5527598.1 m N, 623478.0 m E Westbound lane in front of 3046 Ness Ave, 186.1 m west of Sturgeon Rd, 8.5 m north of south curb	Asphalt & Concrete	60 & 150
PC-18	UTM 14N: 5527589.6 m N, 623527.9 m E Eastbound lane in front of 3034 Ness Ave, 135.9 m west of Sturgeon Rd, 1.7 m north of south curb	Asphalt & Concrete	75 & 180
PC-19	UTM 14N: 5527599.9 m N, 632588.0 m E Westbound lane near 809 Setter St, 76.2m west of Sturgeon Rd, 15.7 m north of south curb	Asphalt & Concrete	100 & 180
PC-20	UTM 14N: 5527588.5 m N, 623632.9 m E Eastbound lane near 809 Setter St, 30.9 m west of Sturgeon Rd, 4.7 m north of south curb	Asphalt & Concrete	90 & 180

## 4 CLOSURE

The findings and recommendations provided in this report were prepared by WSP Canada Inc. (the Consultant) in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations and are reflective only of the actual test hole(s) and/or excavation(s) examined. If conditions encountered during construction appear to be different than those shown by the test hole(s) and/or excavation(s) at this site, the Consultant should be notified immediately in order that the recommendations can be reviewed and modified as necessary to address actual site conditions.

This report is limited in scope to only those items that are specifically referenced in this report. There may be existing conditions that were not recorded in this report. Such conditions were not apparent to the Consultant due to the limitations imposed by the scope of work. The Consultant, therefore, accepts no liability for any costs incurred by the Client for subsequent discovery, manifestation or rectification of such conditions.

This report is intended solely for the Client named as a general indication of the visible or reported physical condition of the items addressed in the report at the time of the geotechnical investigation. The material in this report reflects the Consultant's best judgment in light of the information available to it at the time of preparation.

This report and the information and data contained herein are to be treated as confidential and may be used only by the Client and its officers and employees in relation to the specific project that it was prepared for. Any use a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report has been written to be read in its entirety, do not use any part of this report as a separate entity.

All files, notes, source data, test results and master files are retained by the Consultant and remain the property of the Consultant.

# APPENDIX

## A DOWKER AVE



DOWKER AVENUE

CROWSON BAY

PEMBINA HIGHWAY

TH-08

TH-07

TH-06

TH-05

TH-04

TH-03

TH-02

TH-01



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TITLE:

19-R-03 LOCAL STREETS  
DOWKER AVE FROM  
PEMBINA HWY TO CROWSON BAY

TESTHOLE LOCATIONS

SCALE:

N.T.S.

DATE:

2019/03/14

PROJECT NO:

18M-01969-00

REVISION:

0

DRAWING NO:

B101

XREF

STAMP



WSP  
 1600 Buffalo Place  
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TH-01

PAGE 1 OF 1

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 632961.2 m E, 5522364.9 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲			
									20	40	60	80
		99.93		ASPHALT - 70mm thick, intact.								
0.5				GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			16				
1.0					GB S2			9				
1.5					GB S3			8				
		98.78		CLAY - Brown, frozen, trace gravel, some silt. - Frost penetration at 1.68m below grade. - Moist, stiff below 1.68m.	GB S4			7				
2.0					GB S5			21				
2.5					GB S6			48				
					GB S7			47				
3.0					GB S8			65				
		96.95										

- Testhole ended at 3.05m below grade.
- No seepage encountered.
- Hole open to 2.29m below grade.
- Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19





WSP  
 1600 Buffalo Place  
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 Telephone: (204)-477-6650

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633002.5 m E, 5522393.5 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 ∇ AT TIME OF DRILLING 2.13 m / Elev 97.87 m  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲				
									20	40	60	80	
0.0	ASPHALT	99.93		- 70mm thick, intact.									
0.5	GRANULAR FILL	99.39		- Crushed limestone, 20mm down.	GB S1			10					
1.0	CLAY		∇	- Brown, frozen, some silt - Frost penetration at 1.52m below grade. - Moist, stiff below 1.52m.	GB S2			23					
1.5					GB S3			34					
2.0					GB S4			28					
2.5					GB S5			22					
3.0					GB S6			36					
					GB S7			54					
					GB S8			53					
3.05						96.95							

- Testhole ended at 3.05m below grade.
- Water measured at 2.13m below grade.
- Hole open to 2.59m below grade.
- Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



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 1600 Buffalo Place  
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CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633048.6 m E, 5522413.5 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 ∇ AT TIME OF DRILLING 2.44 m / Elev 97.56 m  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.92		ASPHALT - 85mm thick, intact.						
				GRANULAR FILL - Crushed limestone, 20mm down.						
0.5		99.54		CLAY - Brown to black, frozen, some silt. - Frost penetration at 1.52m below grade. - Moist, stiff below 1.52m.	Hand GB S1			13		
					Hand GB S2			29		
1.0					Hand GB S3			32		
					Hand GB S4			29		
1.5					Hand GB S5			36		
2.0					Hand GB S6			39		
					Hand GB S7			42		
2.5					Hand GB S8			42		
3.0			96.95							

- Testhole ended at 3.05m below grade.
- Water measured at 2.44m below grade.
- Hole open to 2.74m below grade.
- Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



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CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633089.9 m E, 5522442.1 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.94		ASPHALT - 60mm thick, intact.						
0.5				GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			13		
		99.39		CLAY - Brown, frozen, some silt. - Frost penetration at 1.52m below grade. - Moist, stiff below 1.52m.	GB S2			21		
1.0					GB S3			25		
					GB S4			42		
1.5					GB S5			44		
		98.48								

- Testhole ended at 1.52m below grade due to potential proximity to sewer service.  
 - No seepage or sloughing encountered.  
 - Testhole backfilled with bentonite and auger cuttings.



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TH-05

PAGE 1 OF 1

CLIENT City of Winnipeg

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals

PROJECT NUMBER 18M-01969-00

PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)

DATE STARTED 4/11/19 COMPLETED 4/11/19

GROUND ELEVATION 100 m HOLE SIZE 125mm

DRILLING CONTRACTOR Maple Leaf Drilling

GROUND WATER LEVELS:

DRILLING METHOD Solid Stem Auger - B40 Truck Rig

AT TIME OF DRILLING ---

LOGGED BY Jason Dunn CHECKED BY Dana Bredin

AT END OF DRILLING ---

NOTES 633136.0 m E, 5522462.0 m N

AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
0.0		99.87		ASPHALT - 130mm thick, intact.						
0.5		99.54		GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			12		
1.0		98.93		FILL - CLAY, sandy, silty, trace gravel, brown, frozen. - 36.3% clay, 31.2% sand, 27.4% silt, 5.1% gravel at 0.9 m	GB S2			28		
1.5				CLAY - Brown, some silt. - Frost penetration at 1.68m below grade. - Moist, stiff below 1.68m.	GB S3			41		
2.0					GB S4			34		
2.5					GB S5			32		
3.0					GB S6			38		
3.5					GB S8			36		

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



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CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633177.3 m E, 5522490.6 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									20	40 60 80
		99.90		ASPHALT - 100mm thick, intact.						
		99.54		GRANULAR FILL - Crushed limestone, 20mm down.						
0.5				CLAY - Brown, frozen, some silt, trace gravel. - Frost penetration at 1.52m below grade. - Moist, stiff below 1.52m.	Hand GB S1			11		
					Hand GB S2			32		
1.0					Hand GB S3			35		
					Hand GB S4			31		
					Hand GB S5			32		
					Hand GB S6			43		
2.0		98.02								
		97.87			SILT - Tan-brown, moist, soft, some clay, trace sand.	Hand GB S7			48	
				CLAY - Brown, moist, stiff.						
2.5					Hand GB S8			52		
3.0		96.95								

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



WSP  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
 Telephone: (204)-477-6650

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633223.5 m E, 5522510.5 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.95		ASPHALT - 75mm thick, intact.						
		99.70		GRANULAR FILL - Crushed limestone, 20mm down.						
0.5				CLAY - Brown to black, frozen, some silt. - Frost penetration at 1.52m below grade. - Moist, stiff below 1.52m.	GB S1			10		
					GB S2			30		
1.0					GB S3			37		
					GB S4			36		
1.5					GB S5			37		
2.0					GB S6			44		
					GB S7			51		
2.5					GB S8			51		
3.0										
		96.95								

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Testhole backfilled with bentonite and auger cuttings.

GENERAL\_BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



WSP  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
 Telephone: (204)-477-6650

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/11/19 COMPLETED 4/11/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 633264.7 m E, 5522539.2 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Dowker between Pembina/Crowson Bay (E Leg)  
 GROUND ELEVATION 100 m HOLE SIZE 125mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.90		ASPHALT - 100mm thick, intact.						
		99.54		GRANULAR FILL - Crushed limestone, 20mm down.						
0.5				CLAY - Brown to black, frozen, some silt. - Frost penetration at 1.68m below grade. - Moist, stiff below 1.68m.	Hand GB S1			6		
					Hand GB S2			35		
1.0					Hand GB S3			37		
					Hand GB S4			40		
1.5					Hand GB S5			41		
					Hand GB S6			46		
2.0					Hand GB S7			52		
					Hand GB S8			54		
2.5										
3.0		96.95								

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Testhole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - DOWKER.GPJ GINT STD CANADA.GDT 4/29/19



Figure 1 – TH-01 Dowker Ave



Figure 2 – TH-02 Dowker Ave





Figure 3 – TH-03 Dowker Ave



Figure 4 – TH-04 Dowker Ave



Figure 5 – TH-05 Dowker Ave



Figure 6 – TH-06 Dowker Ave



Figure 7 – TH-07 Dowker Ave



Figure 8 – TH-08 Dowker Ave

### MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 1	TH 1	TH 1	TH 1	TH 1
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	151.10	153.40	158.10	156.00	153.90
Wt Dry Sample + Tare	131.40	141.00	147.30	146.40	128.50
Wt Water	19.70	12.40	10.80	9.60	25.40
Wt Tare	4.60	4.40	4.30	4.20	4.30
Wt Dry Sample	126.80	136.60	143.00	142.20	124.20
<b>Moisture Content (%)</b>	<b>15.5</b>	<b>9.1</b>	<b>7.6</b>	<b>6.8</b>	<b>20.5</b>

Description	TH 1	TH 1	TH 1		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	134.10	123.60	130.60		
Wt Dry Sample + Tare	92.20	85.30	81.00		
Wt Water	41.90	38.30	49.60		
Wt Tare	4.20	4.20	4.30		
Wt Dry Sample	88.00	81.10	76.70		
<b>Moisture Content (%)</b>	<b>47.6</b>	<b>47.2</b>	<b>64.7</b>		

Description	TH 2	TH 2	TH 2	TH 2	TH 2
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	164.90	158.90	126.10	124.20	124.10
Wt Dry Sample + Tare	151.00	130.00	95.40	98.30	102.50
Wt Water	13.90	28.90	30.70	25.90	21.60
Wt Tare	4.20	4.20	4.20	4.10	4.10
Wt Dry Sample	146.80	125.80	91.20	94.20	98.40
<b>Moisture Content (%)</b>	<b>9.5</b>	<b>23.0</b>	<b>33.7</b>	<b>27.5</b>	<b>22.0</b>

Description	TH 2	TH 2	TH 2		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	126.70	123.50	128.70		
Wt Dry Sample + Tare	94.50	81.60	85.70		
Wt Water	32.20	41.90	43.00		
Wt Tare	4.20	4.20	4.30		
Wt Dry Sample	90.30	77.40	81.40		
<b>Moisture Content (%)</b>	<b>35.7</b>	<b>54.1</b>	<b>52.8</b>		

### MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 3	TH 3	TH 3	TH 3	TH 3
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	174.60	134.60	124.00	121.90	126.10
Wt Dry Sample + Tare	154.80	105.40	94.80	95.20	94.10
Wt Water	19.80	29.20	29.20	26.70	32.00
Wt Tare	4.60	4.40	4.60	4.30	4.20
Wt Dry Sample	150.20	101.00	90.20	90.90	89.90
<b>Moisture Content (%)</b>	<b>13.2</b>	<b>28.9</b>	<b>32.4</b>	<b>29.4</b>	<b>35.6</b>

Description	TH 3	TH 3	TH 3		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	126.80	125.10	127.10		
Wt Dry Sample + Tare	92.50	89.50	91.10		
Wt Water	34.30	35.60	36.00		
Wt Tare	4.20	4.40	4.70		
Wt Dry Sample	88.30	85.10	86.40		
<b>Moisture Content (%)</b>	<b>38.8</b>	<b>41.8</b>	<b>41.7</b>		

Description	TH 4	TH 4	TH 4	TH 4	TH 4
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	163.10	151.40	126.90	121.90	124.10
Wt Dry Sample + Tare	145.10	126.10	102.30	87.40	87.50
Wt Water	18.00	25.30	24.60	34.50	36.60
Wt Tare	4.50	4.20	4.30	4.30	4.30
Wt Dry Sample	140.60	121.90	98.00	83.10	83.20
<b>Moisture Content (%)</b>	<b>12.8</b>	<b>20.8</b>	<b>25.1</b>	<b>41.5</b>	<b>44.0</b>

Description	TH 5	TH 5	TH 5	TH 5	TH 5
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	164.80	128.30	441.90	121.20	123.00
Wt Dry Sample + Tare	147.40	101.00	317.70	91.50	94.50
Wt Water	17.40	27.30	124.20	29.70	28.50
Wt Tare	4.30	4.60	14.20	4.50	4.10
Wt Dry Sample	143.10	96.40	303.50	87.00	90.40
<b>Moisture Content (%)</b>	<b>12.2</b>	<b>28.3</b>	<b>40.9</b>	<b>34.1</b>	<b>31.5</b>

### MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 5	TH 5		
Sample	S6	S8		
Wt Wet Sample + Tare	123.20	127.80		
Wt Dry Sample + Tare	90.50	95.20		
Wt Water	32.70	32.60		
Wt Tare	4.20	4.30		
Wt Dry Sample	86.30	90.90		
<b>Moisture Content (%)</b>	<b>37.9</b>	<b>35.9</b>		

Description	TH 6	TH 6	TH 6	TH 6	TH 6
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	158.10	124.50	127.60	122.30	126.10
Wt Dry Sample + Tare	143.40	95.50	95.70	94.40	96.50
Wt Water	14.70	29.00	31.90	27.90	29.60
Wt Tare	4.40	4.30	4.30	4.50	3.90
Wt Dry Sample	139.00	91.20	91.40	89.90	92.60
<b>Moisture Content (%)</b>	<b>10.6</b>	<b>31.8</b>	<b>34.9</b>	<b>31.0</b>	<b>32.0</b>

Description	TH 6	TH 6	TH 6		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	121.20	128.80	120.10		
Wt Dry Sample + Tare	86.30	88.60	80.40		
Wt Water	34.90	40.20	39.70		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	82.10	84.40	76.20		
<b>Moisture Content (%)</b>	<b>42.5</b>	<b>47.6</b>	<b>52.1</b>		

Description	TH 7	TH 7	TH 7	TH 7	TH 7
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	179.40	127.30	125.60	122.00	127.60
Wt Dry Sample + Tare	163.30	98.80	93.10	91.00	94.60
Wt Water	16.10	28.50	32.50	31.00	33.00
Wt Tare	4.20	4.20	4.20	4.30	4.20
Wt Dry Sample	159.10	94.60	88.90	86.70	90.40
<b>Moisture Content (%)</b>	<b>10.1</b>	<b>30.1</b>	<b>36.6</b>	<b>35.8</b>	<b>36.5</b>

### MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 7	TH 7	TH 7		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	121.90	123.50	124.10		
Wt Dry Sample + Tare	85.90	83.20	83.90		
Wt Water	36.00	40.30	40.20		
Wt Tare	4.20	4.20	4.30		
Wt Dry Sample	81.70	79.00	79.60		
<b>Moisture Content (%)</b>	<b>44.1</b>	<b>51.0</b>	<b>50.5</b>		

Description	TH 8	TH 8	TH 8	TH 8	TH 8
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	154.10	121.70	122.10	125.60	124.00
Wt Dry Sample + Tare	145.30	91.40	90.60	90.80	89.30
Wt Water	8.80	30.30	31.50	34.80	34.70
Wt Tare	4.20	4.20	4.30	4.30	4.20
Wt Dry Sample	141.10	87.20	86.30	86.50	85.10
<b>Moisture Content (%)</b>	<b>6.2</b>	<b>34.7</b>	<b>36.5</b>	<b>40.2</b>	<b>40.8</b>

Description	TH 8	TH 8	TH 8		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	122.30	128.00	124.60		
Wt Dry Sample + Tare	85.30	85.60	82.20		
Wt Water	37.00	42.40	42.40		
Wt Tare	4.20	4.30	4.20		
Wt Dry Sample	81.10	81.30	78.00		
<b>Moisture Content (%)</b>	<b>45.6</b>	<b>52.2</b>	<b>54.4</b>		

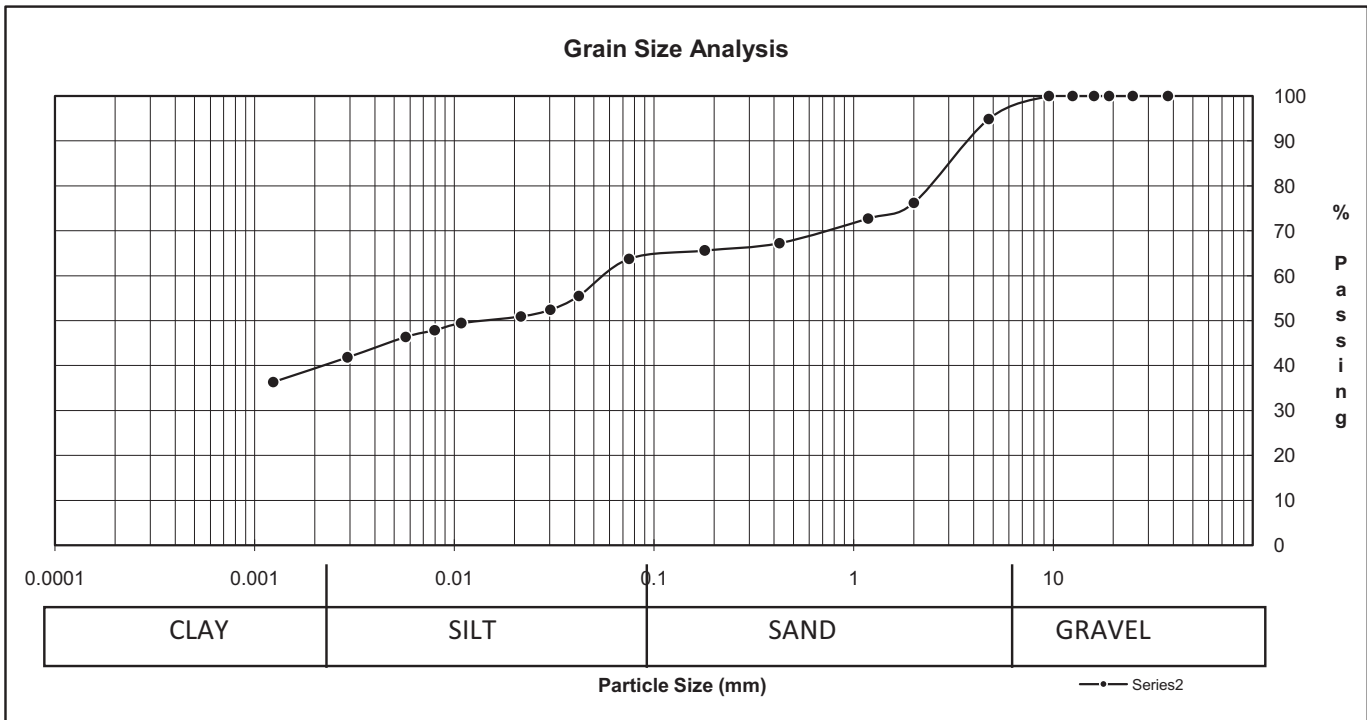
## PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT:	WSP 1600 Buffalo Place Winnipeg, MB R3T 6B8	PROJECT NO.	103-1906
ATTENTION:	Dana Bredin	Test No:	1
PROJECT:	18M-01969-00 Phase 802-1	Lab No:	HM 48-1P

Date Sampled:	Date Received:	Sieve Analysis		Hydrometer Analysis	
Sampled By:	Date Tested:	Sieve (mm)	% Passing	Diameter	% Finer
17-Apr-19	17-Apr-19	50.00	100.0		
Client	18-Apr-19	37.50	100.0		
		25.00	100.0		
		19.00	100.0		
		16.00	100.0		
		12.50	100.0	0.0420	55.5
		9.50	100.0	0.0302	52.4
		4.75	94.9	0.0215	50.9
		2.00	76.2	0.0109	49.4
		1.18	72.7	0.0080	47.9
		0.425	67.2	0.0057	46.3
		0.180	65.6	0.0029	41.8
		0.075	63.7	0.0012	36.3

**Material Identification**

B.H./T.H. No.                    **TH 5, S3**  
**Sample No.**                    **HM 48-1P**  
 Sample Source                  Various City Street  
 Specific Gravity of Material:    2.65



SOIL DESCRIPTION	% Composition		D10	0.05500
		5.1	Gravel	
	31.2	Sand	D60	
	27.4	Silt	Cu	
	36.3	Clay	Cc	

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: Navi



Reviewed by: Hermie Manalo



## ATTERBERG LIMITS

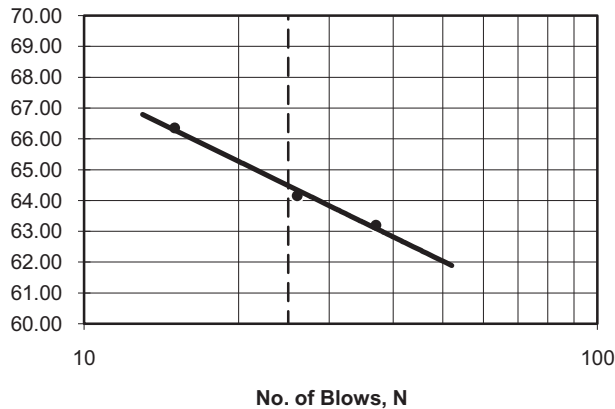
**CLIENT:** WSP Canada Group Limited  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
**ATTENTION:** Dana Bredin  
**PROJECT:** 18M-01969-00 Phase 802-1

**PROJECT NO.:** 103-1906  
**TEST NO.:** 1  
**LAB NO.:** HM 48-1

### Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:	14.82	14.7	13.11		
Dry Soil + Dish:	10.75	10.62	9.6		
Moisture:	4.07	4.08	3.51		
Dish:	4.31	4.26	4.31		
Dry Soil:	6.44	6.36	5.29		
% Moisture:	63.20	64.15	66.35		
No. of Blows:	37	26	15		
Liquid Limits:	66.27	64.46	62.37		

**Liquid Limit**



### Material Identification:

T.H. No. **TH 5 , S3**

Depth: **3'**

Liquid Limit, %: **64**  
 Plastic Limit, %: **32**  
 Plasticity Index: **32**  
 ( LL-PL )

### Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	6.81	5.68	6.18		
Dry Soil + Dish:	6.2	5.32	5.72		
Moisture:	0.61	0.36	0.46		
Dish:	4.26	4.23	4.25		
Dry Soil:	1.94	1.09	1.47		
% Moisture:	31.44	33.03	31.29		
Average:					<b>32</b>

**Test Method :** ASTM: D4318, D2216  
**HMCL Tech:** Navi  
**Date Tested:** 23-Apr-19



Reviewed by: Hermie Manalo

# APPENDIX

## **B** MULVEY AVE

ARBUTHNOT STREET



MULVEY AVENUE

TH-03

TH-02

TH-01

LILAC STREET



1600 BUFFALO PLACE  
WINNIPEG, MANITOBA  
CANADA R3T 6B8  
PHONE: 204-477-6650 FAX : 204-474-2864  
WWW.WSPGROUP.COM

TITLE:

19-R-03 LOCAL STREETS  
MULVEY AVE FROM  
LILAC ST TO FLEET ST

TESTHOLE LOCATIONS

SCALE:

N.T.S.

DATE:

2019/03/14

PROJECT NO:

18M-01969-00

REVISION:

0

DRAWING NO:

B102

XREF

STAMP



WSP  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
 Telephone: (204)-477-6650

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/8/19 COMPLETED 4/8/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 632591.5 m E, 5525512.6 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Mulvey between Lilac/Arbutnot  
 GROUND ELEVATION 100 m HOLE SIZE 125 mm  
 GROUND WATER LEVELS:  
 AT TIME OF DRILLING ---  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
0.0		99.95		ASPHALT - 50mm thick, broken.						
0.0		99.75		CONCRETE - 200mm thick, intact.						
0.0		99.70		GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			33		
0.0		99.55		FILL - Clayey, black, frozen.						
0.5				CLAY - Grey, frozen, trace sand, some silt. - Frost penetration to 1.52m below grade.  - 69.7% clay, 26.0% silt, 4.3% sand.	GB S2			35		
1.0					GB S3			33		
1.5					GB S4			33		
1.5		98.48		SILT - Tan-brown, moist, soft, some clay.	GB S5			35		
1.5		98.32		CLAY - Brown, moist, stiff, trace gravel.						
2.0					GB S6			43		
2.5					GB S7			46		
3.0					GB S8			50		
3.0		96.95								

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Test hole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - MULVEY.GPJ GINT STD CANADA.GDT 4/29/19



WSP  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
 Telephone: (204)-477-6650

**CLIENT** City of Winnipeg  
**PROJECT NUMBER** 18M-01969-00  
**DATE STARTED** 4/8/19 **COMPLETED** 4/8/19  
**DRILLING CONTRACTOR** Maple Leaf Drilling  
**DRILLING METHOD** Solid Stem Auger - B40 Truck Rig  
**LOGGED BY** Jason Dunn **CHECKED BY** Dana Bredin  
**NOTES** 632635.1 m E, 5525540.6 m N

**PROJECT NAME** 19-R-03 - Contract 1 - Street Renewals  
**PROJECT LOCATION** Mulvey between Lilac/Arbutnot  
**GROUND ELEVATION** 100 m **HOLE SIZE** 125 mm  
**GROUND WATER LEVELS:**  
**AT TIME OF DRILLING** ---  
**AT END OF DRILLING** ---  
**AFTER DRILLING** ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.95		ASPHALT - 50mm thick, intact.						
		99.80		CONCRETE - 150mm thick, intact.						
		99.77		GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			36		
0.5				SILT - Tan-brown, frozen, some clay. - Trace organics above 0.5m.	GB S2			21		
1.0					GB S3			17		
		98.78		SILTY CLAY - Brown, frozen, some silt. - Frost penetration to 1.52m below grade. - Moist, firm below 1.52m. - Silty below 1.98m.	GB S4			18		
1.5					GB S5			33		
2.0					GB S6			41		
		97.71		CLAY - Brown, moist, stiff, some silt.	GB S7			45		
2.5					GB S8			47		
3.0		96.95								

- Testhole ended at 3.05m below grade.  
 - No seepage or sloughing encountered.  
 - Test hole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - MULVEY.GPJ GINT STD CANADA.GDT 4/29/19



WSP  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
 Telephone: (204)-477-6650

CLIENT City of Winnipeg  
 PROJECT NUMBER 18M-01969-00  
 DATE STARTED 4/8/19 COMPLETED 4/8/19  
 DRILLING CONTRACTOR Maple Leaf Drilling  
 DRILLING METHOD Solid Stem Auger - B40 Truck Rig  
 LOGGED BY Jason Dunn CHECKED BY Dana Bredin  
 NOTES 632683.5 m E, 5525563.1 m N

PROJECT NAME 19-R-03 - Contract 1 - Street Renewals  
 PROJECT LOCATION Mulvey between Lilac/Arbutnot  
 GROUND ELEVATION 100 m HOLE SIZE 125 mm  
 GROUND WATER LEVELS:  
 ∇ AT TIME OF DRILLING 1.83 m / Elev 98.17 m  
 AT END OF DRILLING ---  
 AFTER DRILLING ---

DEPTH (m)	GRAPHIC LOG	ELEV. (m)	WATER LEVEL	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	POCKET PEN. (kPa)	MOISTURE CONTENT (%)	▲ SPT N VALUE ▲	
									PL	MC
		99.95		ASPHALT - 50mm thick, intact.						
		99.83		CONCRETE - 125mm thick, intact.						
		99.78		GRANULAR FILL - Crushed limestone, 20mm down.	GB S1			40		
0.5				CLAY - Brown, frozen, some silt, trace sand and gravel. - Frost penetration to 1.37m below grade. - Moist, stiff below 1.37m. - Silty at 2.59m.	GB S2			40		
1.0					GB S3			33		
1.5					GB S4			34		
2.0					GB S5			42		
2.5					GB S6			45		
3.0					GB S7			46		
					GB S8			40		

- Testhole ended at 3.05m below grade.
- Water measured at 1.83m below grade.
- Hole open to 2.29m below grade.
- Test hole backfilled with bentonite and auger cuttings.

GENERAL BH PLOTS - WSP - 19-R-03-C1 - MULVEY.GPJ GINT STD CANADA GDT 4/29/19

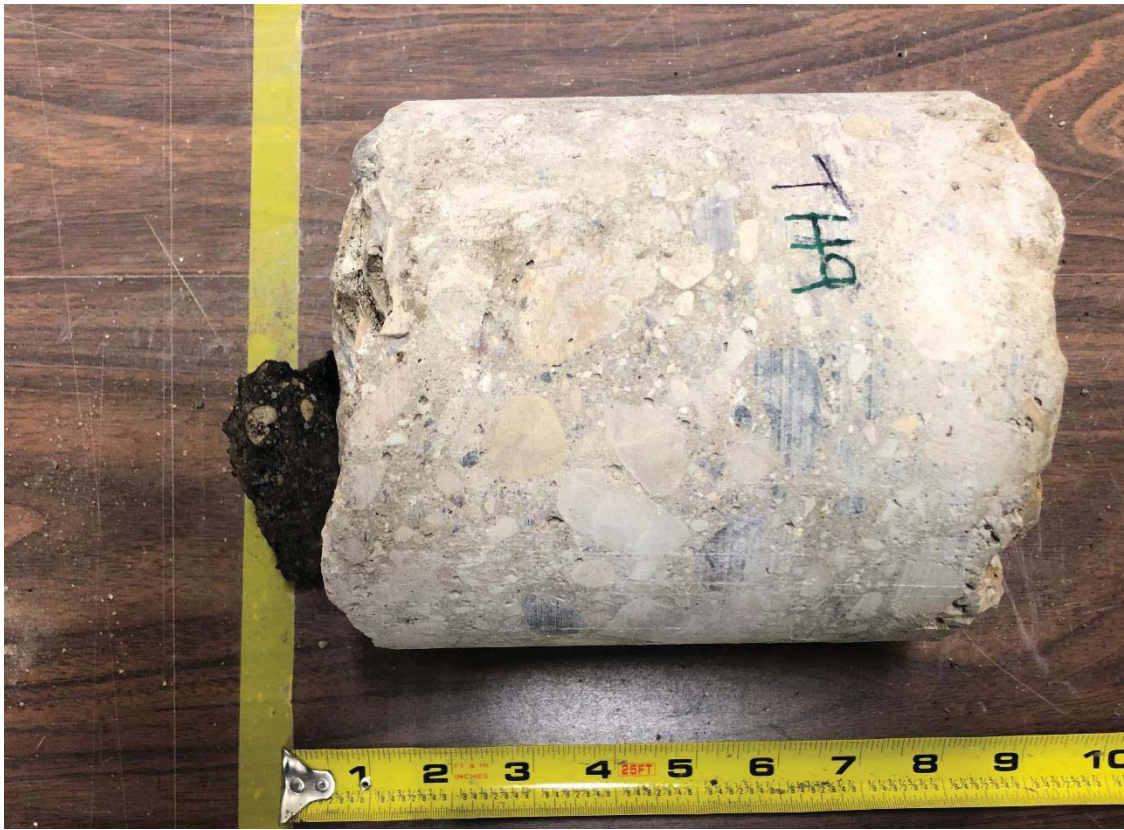


Figure 1 – TH-09 Mulvey Ave



Figure 2 – TH-10 Mulvey Ave



Figure 3 – TH-11 Mulvey Ave (asphalt not shown)



**MOISTURE CONTENT OF SOIL (ASTM D2216)**

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 9	TH 9	TH 9	TH 9	TH 9
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	149.20	241.50	343.70	126.80	122.90
Wt Dry Sample + Tare	113.60	183.30	262.40	96.30	92.50
Wt Water	35.60	58.20	81.30	30.50	30.40
Wt Tare	4.20	14.50	13.80	4.10	4.30
Wt Dry Sample	109.40	168.80	248.60	92.20	88.20
<b>Moisture Content (%)</b>	<b>32.5</b>	<b>34.5</b>	<b>32.7</b>	<b>33.1</b>	<b>34.5</b>

### MOISTURE CONTENT OF SOIL (ASTM D2216)

CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH 9	TH 9	TH 9		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	122.50	122.20	128.70		
Wt Dry Sample + Tare	86.70	85.10	87.00		
Wt Water	35.80	37.10	41.70		
Wt Tare	4.20	4.10	4.20		
Wt Dry Sample	82.50	81.00	82.80		
<b>Moisture Content (%)</b>	<b>43.4</b>	<b>45.8</b>	<b>50.4</b>		

Description	TH-10	TH-10	TH-10	TH-10	TH-10
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	130.80	122.90	124.00	122.80	126.00
Wt Dry Sample + Tare	97.60	102.20	106.30	104.50	95.80
Wt Water	33.20	20.70	17.70	18.30	30.20
Wt Tare	4.20	4.20	4.60	4.30	4.20
Wt Dry Sample	93.40	98.00	101.70	100.20	91.60
<b>Moisture Content (%)</b>	<b>35.5</b>	<b>21.1</b>	<b>17.4</b>	<b>18.3</b>	<b>33.0</b>

Description	TH-10	TH-10	TH-10		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	120.40	125.30	123.90		
Wt Dry Sample + Tare	87.20	87.60	85.40		
Wt Water	33.20	37.70	38.50		
Wt Tare	5.90	4.30	4.20		
Wt Dry Sample	81.30	83.30	81.20		
<b>Moisture Content (%)</b>	<b>40.8</b>	<b>45.3</b>	<b>47.4</b>		

Description	TH-11	TH-11	TH-11	TH-11	TH-11
Sample	S1	S2	S3	S4	S5
Wt Wet Sample + Tare	128.60	126.60	123.50	123.30	121.10
Wt Dry Sample + Tare	92.90	91.50	93.80	93.30	86.60
Wt Water	35.70	35.10	29.70	30.00	34.50
Wt Tare	4.20	4.30	4.10	4.20	4.10
Wt Dry Sample	88.70	87.20	89.70	89.10	82.50
<b>Moisture Content (%)</b>	<b>40.2</b>	<b>40.3</b>	<b>33.1</b>	<b>33.7</b>	<b>41.8</b>

**MOISTURE CONTENT OF SOIL (ASTM D2216)**

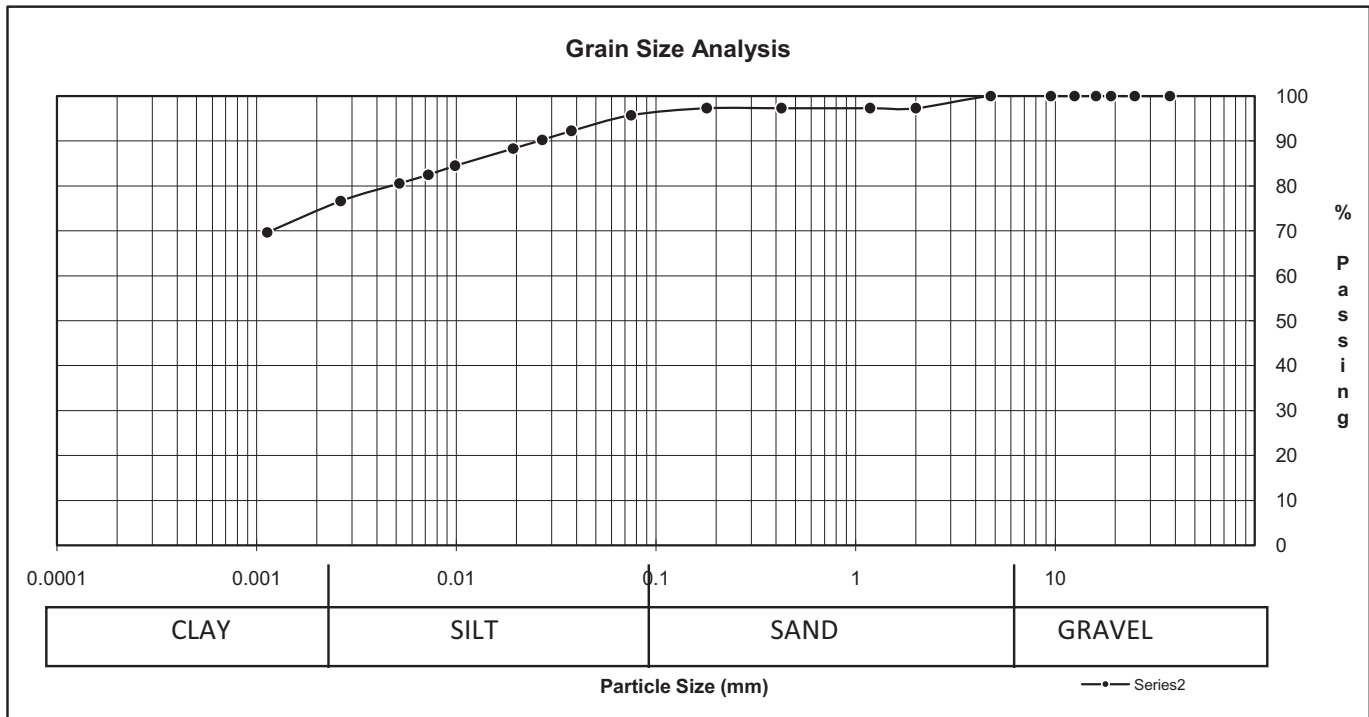
CLIENT: WSP Canada Group Limited	TEST NO: 19- 001	PROJECT NO: 103-1906
PROJECT: 18M-01969-00 - Phase 802-1	DATE SAMPLED: 8-Apr-2019	SAMPLED BY: Client
PROJECT CONTACT: Dana Bredin	DATE TESTED: 18-Apr-2019	TESTED BY: Viet Linh
TEST LOCATION: Phase 802-1		

Description	TH-11	TH-11	TH-11		
Sample	S6	S7	S8		
Wt Wet Sample + Tare	121.70	123.90	127.40		
Wt Dry Sample + Tare	85.30	86.00	92.20		
Wt Water	36.40	37.90	35.20		
Wt Tare	4.20	4.20	4.20		
Wt Dry Sample	81.10	81.80	88.00		
<b>Moisture Content (%)</b>	<b>44.9</b>	<b>46.3</b>	<b>40.0</b>		

## PARTICLE SIZE ANALYSIS OF SOILS TEST REPORT

CLIENT:	WSP 1600 Buffalo Place Winnipeg, MB R3T 6B8	PROJECT NO.	103-1906
ATTENTION:	Dana Bredin	Test No:	2
PROJECT:	18M-01969-00 Phase 802-1	Lab No:	HM 48-2P

Date Sampled:	17-Apr-19	Date Received:	17-Apr-19	Sieve Analysis	Hydrometer Analysis
Sampled By:	Client	Date Tested:	18-Apr-19	Sieve (mm) % Passing	Diameter % Finer
<b>Material Identification</b> B.H./T.H. No. <b>TH 9, S2</b> <b>Sample No.</b> <b>HM 48-2P</b> Sample Source                    Various City Street Specific Gravity of Material:    2.65				50.00	100.0
				37.50	100.0
				25.00	100.0
				19.00	100.0
				16.00	100.0
				12.50	100.0
				9.50	100.0
				4.75	100.0
				2.00	97.3
				1.18	97.3
0.425	97.3				
0.180	97.3				
0.075	95.7				
		0.0378	92.2		
		0.0270	90.3		
		0.0193	88.3		
		0.0098	84.4		
		0.0073	82.5		
		0.0052	80.5		
		0.0026	76.6		
		0.0011	69.7		



SOIL DESCRIPTION	% Composition		D10
		4.3	Gravel
	26.0	Sand	D60
	69.7	Silt	Cu
		Clay	Cc

Remarks: Test Method: ASTM D422, D2216, D4318

Technician: Navi



Reviewed by: Hermie Manalo

## ATTERBERG LIMITS

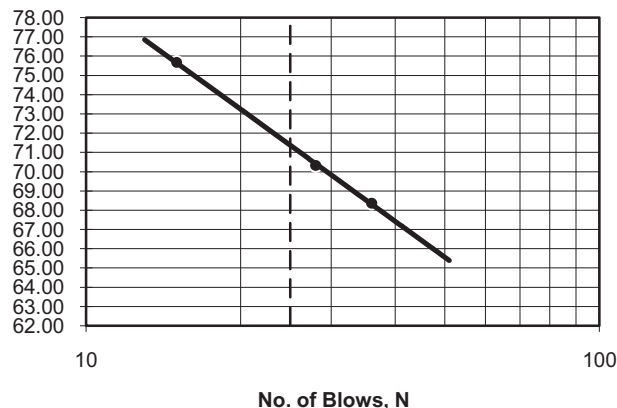
**CLIENT:** WSP Canada Group Limited  
 1600 Buffalo Place  
 Winnipeg, MB R3T 6B8  
**ATTENTION:** Dana Bredin  
**PROJECT:** 18M-01969-00 Phase 802-1

**PROJECT NO.:** 103-1906  
**TEST NO.:** 2  
**LAB NO.:** HM 48-2

### Liquid Limit Determination

Dish No.:	1	2	3		Liquid Limit 25 Blows
Wet Soil + Dish:	13	11.28	13.47		
Dry Soil + Dish:	9.5	8.46	9.52		
Moisture:	3.5	2.82	3.95		
Dish:	4.38	4.45	4.3		
Dry Soil:	5.12	4.01	5.22		
% Moisture:	68.36	70.32	75.67		
No. of Blows:	36	28	15		
Liquid Limits:	71.44	71.30	71.13		<b>71</b>

### Liquid Limit



### Material Identification:

T.H. No. **TH 9, S2**

Depth: **2'**

Liquid Limit, %: **71**  
 Plastic Limit, %: **31**  
 Plasticity Index: **40**  
 (LL-PL)

### Plastic Limit Determination

Dish No.:	1	2	3		
Wet Soil + Dish:	7.2	6.03	5.54		
Dry Soil + Dish:	6.49	5.61	5.22		
Moisture:	0.71	0.42	0.32		
Dish:	4.19	4.19	4.22		
Dry Soil:	2.3	1.42	1		
% Moisture:	30.87	29.58	32.00		
Average:					<b>31</b>

**Test Method :** ASTM: D4318, D2216  
**HMCL Tech:** Navi  
**Date Tested:** 23-Apr-19



Reviewed by: Hermie Manalo

# APPENDIX

**C** MAUREEN ST



BARRON DRIVE

PC-07

PC-06

PC-05

PC-04

PC-03

WHITEGATE CRESCENT

PC-02

ASSINIBOINE AVENUE

PC-01

MAUREEN STREET



1600 BUFFALO PLACE  
WINNIPEG, MANITOBA  
CANADA R3T 6B8  
PHONE: 204-477-6650 FAX : 204-474-2864  
WWW.WSPGROUP.COM

TITLE:

19-R-03 LOCAL STREETS  
MAUREEN ST FROM  
BARRON DR TO ASSINIBOINE AVE

CORING LOCATIONS

SCALE:

N.T.S.

DATE:

2019/03/14

PROJECT NO:

18M-01969-00

REVISION:

0

DRAWING NO:

B103

XREF

STAMP



**Figure 1 – PC-01 Maureen St (broken concrete shown, actual core size 150 mm)**



**Figure 2 – PC-02 Maureen St**





**Figure 3 – PC-03 Maureen St**



**Figure 4 – PC-04 Maureen St**



Figure 5 – PC-05 Maureen St



Figure 6 – PC-06 Maureen St



Figure 7 – PC-07 Maureen St

# APPENDIX

## D WHITEGATE CRES



BARRON DRIVE

MAUREEN STREET

WHITEGATE CRESCENT

PC-15

PC-14

PC-13

PC-12

PC-08

PC-09

PC-11

PC-10



1600 BUFFALO PLACE  
WINNIPEG, MANITOBA  
CANADA R3T 6B8  
PHONE: 204-477-6650 FAX : 204-474-2864  
WWW.WSPGROUP.COM

TITLE:

19-R-03 LOCAL STREETS  
WHITEGATE CRES FROM  
BARRON DR TO MAUREEN ST

CORING LOCATIONS

SCALE:

N.T.S.

DATE:

2019/03/14

PROJECT NO:

18M-01969-00

REVISION:

0

DRAWING NO:

B104

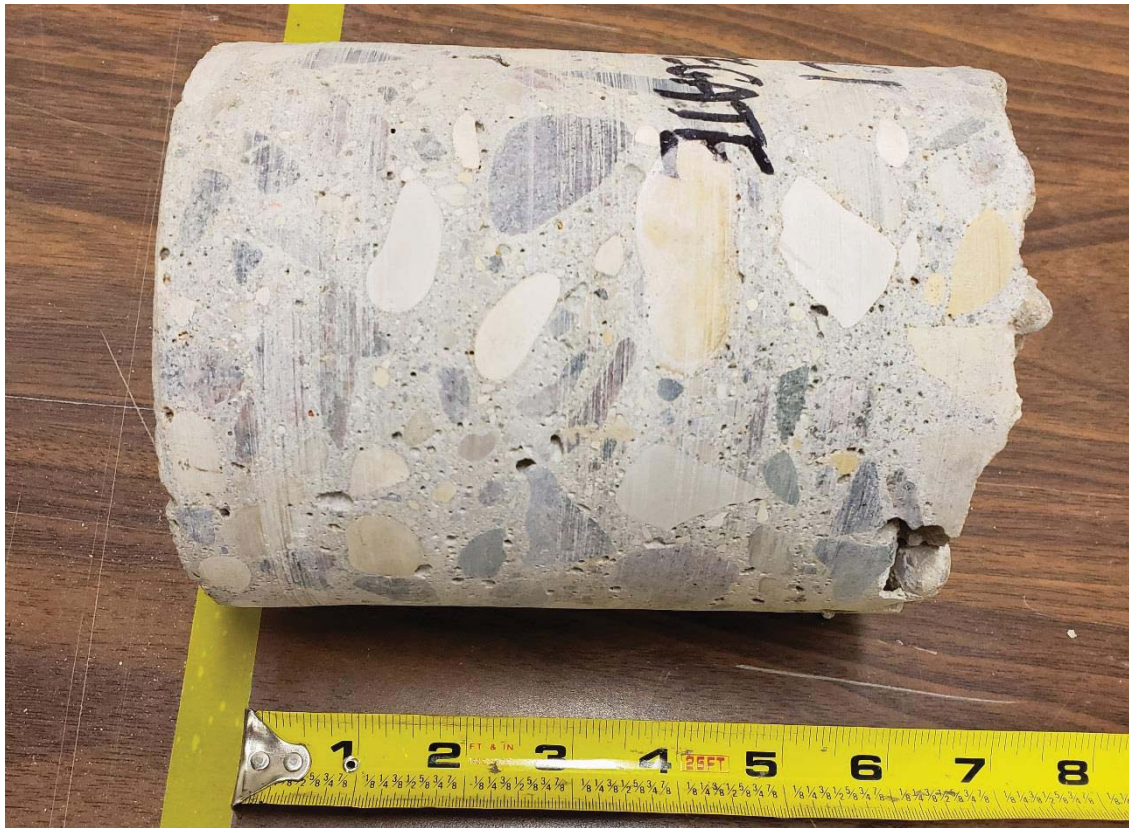


Figure 1 – PC-08 Whitegate Cres

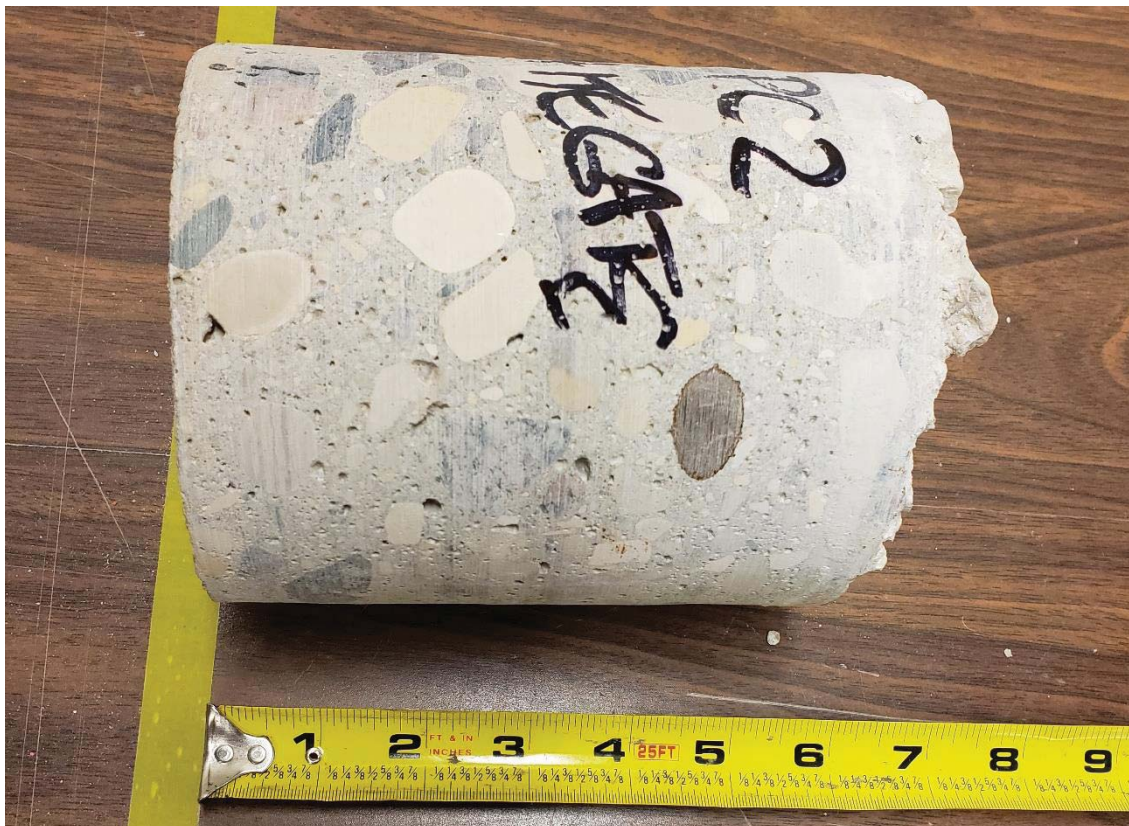


Figure 2 – PC-09 Whitegate Cres

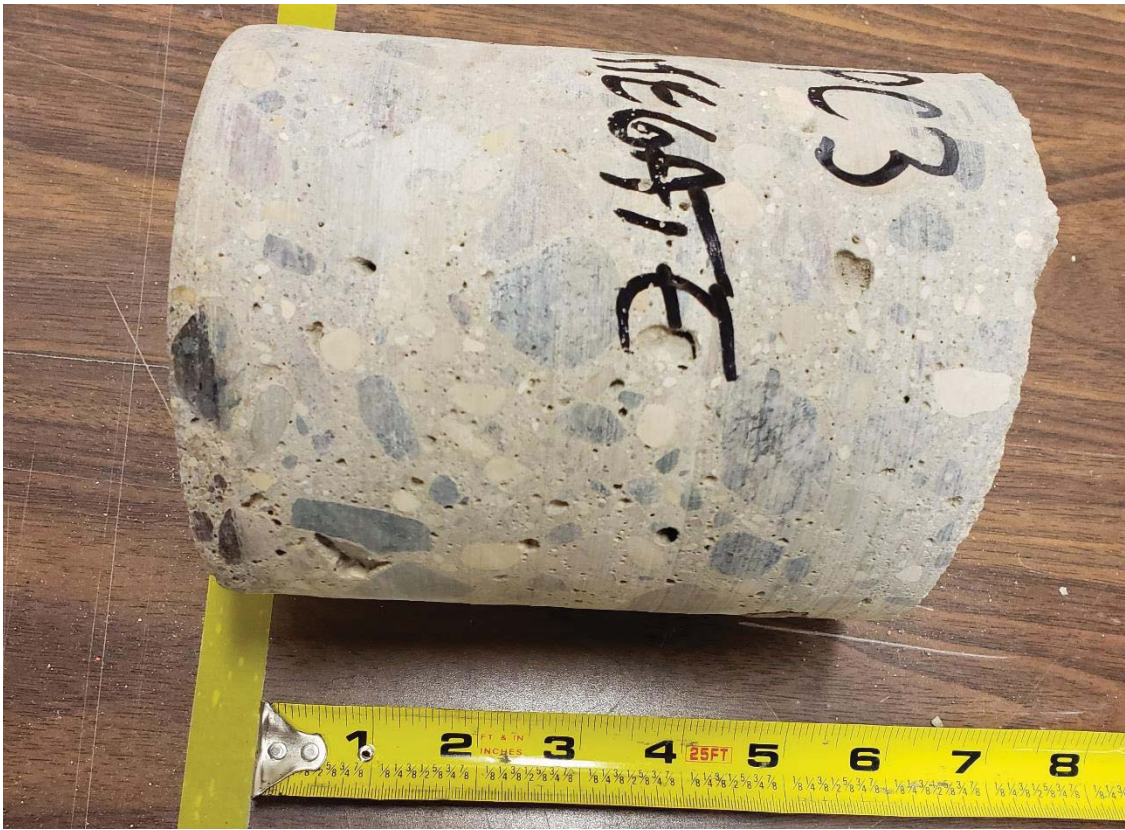


Figure 3 – PC-10 Whitegate Cres



Figure 4 – PC-11 Whitegate Cres



Figure 5 – PC-12 Whitegate Cres

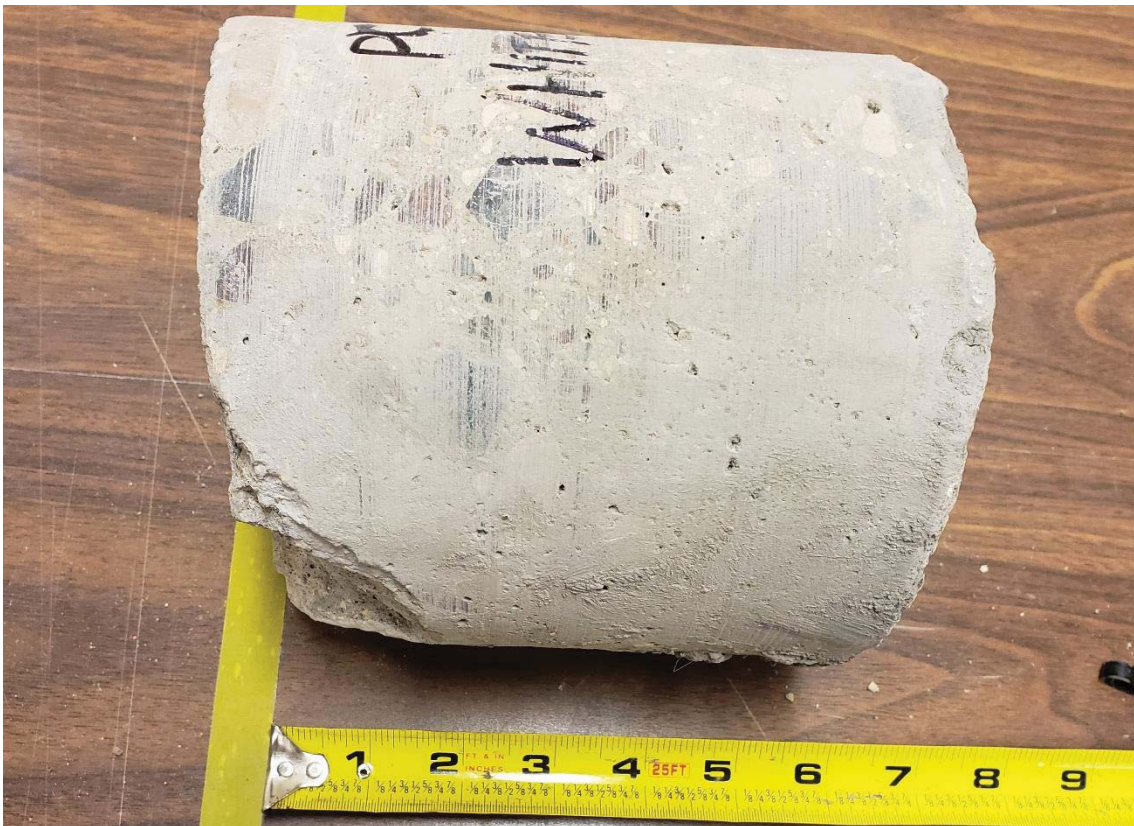


Figure 6 – PC-13 Whitegate Cres



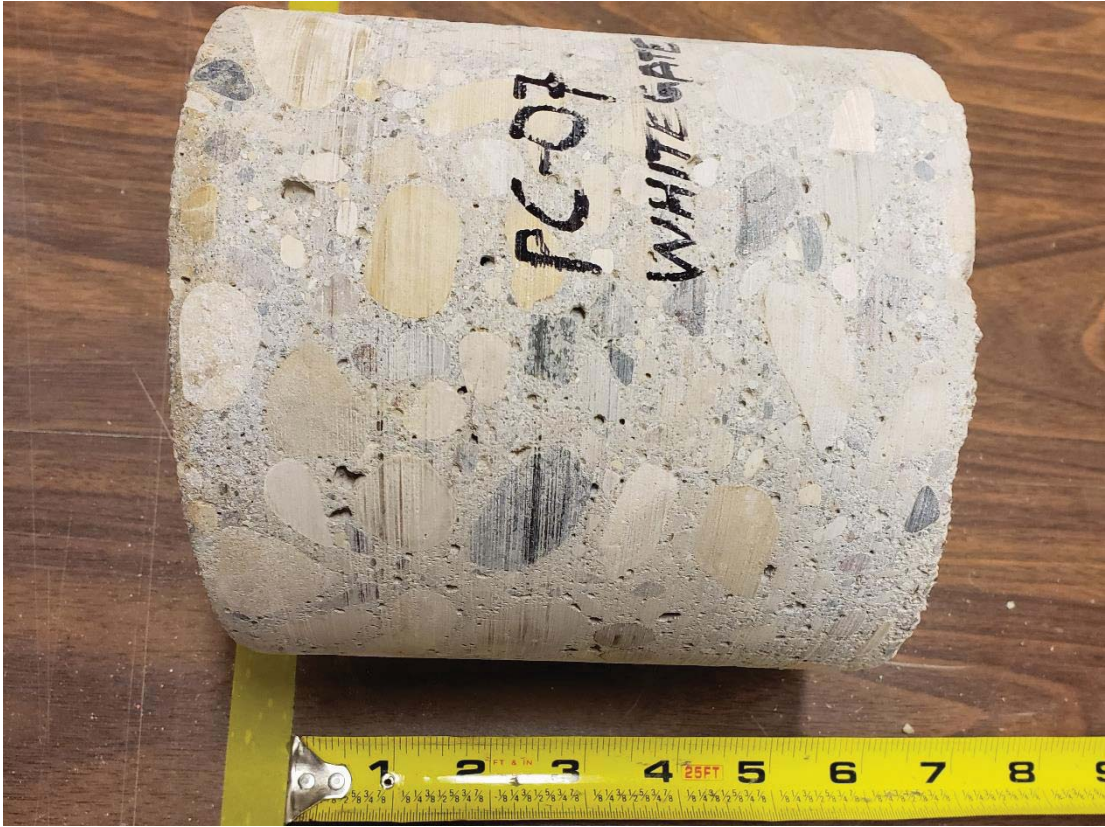


Figure 7 – PC-14 Whitegate Cres



Figure 8 – PC-15 Whitegate Cres

# APPENDIX

**E** NESS AVE



STURGEON ROAD

PC-20

PC-19

NESS AVENUE

PC-18

PC-17

PC-16

PEBBLEWOOD LANE



1600 BUFFALO PLACE  
WINNIPEG, MANITOBA  
CANADA R3T 6B8  
PHONE: 204-477-6650 FAX : 204-474-2864  
WWW.WSPGROUP.COM

TITLE:

19-R-03 LOCAL STREETS  
NESS AVE FROM  
PEBBLEWOOD LN TO STURGEON RD

CORING LOCATIONS

SCALE:

N.T.S.

DATE:

2019/03/14

PROJECT NO:

18M-01969-00

REVISION:

0

DRAWING NO:

B105

XREF

STAMP



Figure 1 – PC-16 Ness Ave



Figure 2 – PC-17 Ness Ave



Figure 3 – PC-18 Ness Ave



Figure 4 – PC-19 Ness Ave



Figure 5 – PC-20 Ness Ave