Environment

City of Winnipeg

2010 Residential Street Renewals, Package #1: Park Blvd. North and Parkside Drive

Prepared by:

AECOM
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Project Number:

60143720 (4.2.1.1)

Date:

February 2010

Statement of Qualifications and Limitations

The attached Report (the "Report") has been prepared by AECOM Canada Ltd. ("Consultant") for the benefit of the client ("Client") in accordance with the agreement between Consultant and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report:

- are subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations")
- represent Consultant's professional judgement in light of the Limitations and industry standards for the preparation of similar reports
- may be based on information provided to Consultant which has not been independently verified
- have not been updated since the date of issuance of the Report and their accuracy is limited to the time period and circumstances in which they were collected, processed, made or issued
- must be read as a whole and sections thereof should not be read out of such context
- were prepared for the specific purposes described in the Report and the Agreement
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time

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- agrees that the Report represents its professional judgement as described above for the specific purpose described in the Report and the Agreement, but Consultant makes no other representations with respect to the Report or any part thereof
- in the case of subsurface, environmental or geotechnical conditions, is not responsible for variability in such conditions geographically or over time

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- as agreed by Consultant and Client
- as required by law
- for use by governmental reviewing agencies

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This Statement of Qualifications and Limitations is attached to and forms part of the Report.

AECOM
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February 8, 2010

Mr. Ron Bruce, P.Eng.
AECOM Canada Ltd.
99 Commerce Drive
Winnipeg, Manitoba
R3P 0Y7

Dear Sir:

Project No: **60143720 (4.2.1.1)**

Regarding: **2010 Residential Street Renewals, Package #1**
Park Blvd. North and Parkside Drive

AECOM Canada Ltd. (AECOM) is pleased to present our report on the above referenced project. If you have any questions, please contact Stephen Petsche directly.

Sincerely,
AECOM Canada Ltd.

Ron Typliski, P.Eng.
Vice-President, Manitoba District
Canada West Region

SP:dh

Distribution List

# of Hard Copies	PDF Required	Association / Company Name
4	0	Ron Bruce, AECOM

Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	S. Petsche	February 8/2010	Final

AECOM Signatures

Report Prepared By:

Stephen Petsche, C.E.T.
Coordinator, Lab & Technical Services

Report Reviewed By:

Gil Robinson, P.Eng., M.Sc.
Manager, Geotechnical Engineering

APEGM
Certificate of Authorization
AECOM Canada Ltd. (MB)
No. 4671 Date: 2010/02/08

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Appendix B Parkside Drive, Test Hole Location Plan, Test Hole Logs, Core Photographs, Lab Testing Summary

1. Summary

This report summarizes the results of the geotechnical investigation completed for the proposed 2010 Residential Street Renewals on Park Boulevard North between Cuthbertson Ave and Corydon Ave and Parkside Drive. At each test hole location a core of the surface pavement was obtained and a test hole was drilled to determine the pavement base and subgrade materials. The scope of work was provided in the Quotation Outline for the 2010 Street Renewals Package.

2. Field Investigation and Laboratory Program

The field and laboratory programs were conducted in accordance with the City's Public Works Department Guidelines for Geotechnical Investigations for Street Reconstruction dated October 28, 2008. The general location and number of test holes drilled on each street were provided in the Quotation Outline. The final test hole locations were established based on the location of underground utilities

A total of ten (10) test holes were drilled of which six (6) test holes were located on Park Boulevard North and four (4) test holes on Parkside Drive. Appendices A and B contain test hole location plans, test hole logs, pavement core photographs and a tabular summary of the laboratory testing results for Park Boulevard North and Parkside Drive, respectively. Test hole locations noted on the test hole location plans and logs are based on measured distances from the nearest curb and associated house number.

The field investigation was conducted between January 11 and 19, 2010 and consisted of two stages. Stage one involved coring of the existing concrete and/or asphalt pavement surface which was followed by test hole drilling. The pavement surface materials were cored by AECOM on Park Boulevard North on January 11, 2010 and on Parkside Drive on January 13 and 15, 2010 using a portable coring drill equipped with a 150 mm diameter core barrel. The pavement cores were returned to AECOM's Materials Testing Laboratory to classify the material type, measure the thickness of the pavement and photograph each core.

All test holes were drilled on January 19, 2010 by Paddock Drilling Ltd using a truck mounted Brat 22 drill rig equipped with 125 mm diameter solid stem augers. The test holes were drilled to a depth of 2.5 m below road surface. Test Hole TH3 on Parkside Drive (Appendix B) was terminated at a depth of 1.5 m due to the presence of granular fill indicating that the test hole may be within the backfill of a former utility trench. The test hole conditions were reported to Ron Bruce of AECOM at the time of drilling and he indicated that an adjacent test hole was not required. General site supervision and visual test hole logging was performed by Stephen Petsche, C.E.T. of AECOM. Other pertinent information such as groundwater seepage and drilling conditions observed during drilling are included on the test hole logs. Representative soil samples (auger cuttings) were collected in accordance with the City's Guidelines for Street Reconstruction Geotechnical Investigations and were transported to AECOM's Materials Laboratory for further testing. The test holes were backfilled with auger cuttings and silica sand and the pavement surface was patched with cold mix asphalt.

The pavement structure materials and subgrade soils were classified in accordance with the City's Guidelines for Street Reconstruction Geotechnical Investigations. A copy of the Guideline is included with the test hole logs.

The laboratory testing program consisted of moisture content determination, Atterberg Limits and Hydrometer tests. The test results can be found on the test hole logs and summary tables.

Appendix A

Park Boulevard North,
Test Hole Location Plan,
Test Hole Logs,
Core Photographs,
Lab Testing Summary

B SIZE 11" x 17" (279.4mm x 431.8mm)

PLOT: 10/02/08 1:51:46 PM

ISS/REV: A

AECOM FILE NAME: 060143720_02-B-F001_RX.dwg Saved By: cloustonc

HOSMER BLVD

CUTHBERTSON AVE

CORYDON AVE

PARK BLVD N

LAMONT BLVD

TH1 TH2 TH3 TH4 TH5 TH6

43m 67m 34m 56m 50m 10m

6.096 wide

AECOM

0 10 20 m SCALE 1:1000

City of Winnipeg
2010 Residential Package #1
Test Hole Locations

Park Boulevard North

From Cuthbertson Avenue to Corydon Avenue

Figure - 1

Winnipeg

PUBLIC WORKS DEPARTMENT • SERVICE DES TRAVAUX PUBLICS

Engineering Division • Division de l'ingénierie

GEOTECHNICAL INVESTIGATION

STREET RECONSTRUCTION

Revised October 28th, 2008

Fieldwork

1. Clear all underground services at each testhole location.
2. Test holes required every **50** m with a minimum of **3** test holes per street.
3. Record location of testhole (offset from curb, distance from cross street and house number).
4. Drill 150 mm-diameter core in pavement.
5. Drill 125 mm-diameter testhole into fill materials and subgrade
6. If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.
7. Testhole to be drilled to depth of 2 m ± 150 mm below surface of the pavement.
8. Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).
9. Measure and record pavement section exposed in the testhole (thickness of concrete or asphalt and different types of pavement structure materials).
10. 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).
11. Log soil profile for the subgrade.
12. 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 testhole.
13. Make note of any water seepage into the testhole.
14. Backfill testhole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.
15. Return core sample from the pavement and soil samples to the laboratory.

Lab Work

1. Test all soil samples for moisture content.
2. Photograph core samples recovered from the pavement surface.
3. 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.
4. Prepare testhole 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

Prepared by: The National Testing Laboratories Limited and Eng-Tech Consulting

Embrace the Spirit • Vivez l'esprit

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AECOM Canada Ltd.

GENERAL STATEMENT

NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

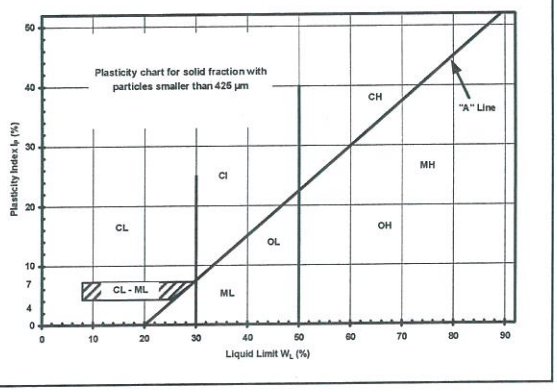
EXPLANATION OF FIELD & LABORATORY TEST DATA

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		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.

Not used. Refer to City of Winnipeg's Specs for Geotechnical Investigation Street Reconstruction Oct 28, 08



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

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH1**
LOCATION: Park Blvd N., Northbound Lane, In front of House #321, 2.0 m W of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #
0		ASPHALT (thickness = 90 mm)		
		CONCRETE (thickness = 115 mm)		
		CLAY - trace sand - brown - frozen, moist when thawed - high plasticity		G161
		SILT and CLAY - brown - frozen, moist when thawed - intermediate plasticity		
		CLAY - trace silt - brown - frozen to 0.7 m, moist when thawed - below 0.7 m, stiff - high plasticity		G162 G163
1				G164
				G165
		SILT - some clay - light brown - moist and firm - intermediate plasticity		G166
		CLAY - trace silt, trace sand - brown - soft, moist - high plasticity		G167
2				G168
		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement		
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 ×
□ Lab Vane □
△ Pocket Pen. △
● Field Vane ●
(kPa)
50 100 150 200

COMMENTS

DEPTH

1

2

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH2**
LOCATION: Park Blvd N., Southbound Lane, South property line of House #316, 2.0 m E of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (thickness = 55 mm)					
		CONCRETE (thickness = 165 mm)					
		GRANULAR FILL - brown, frozen, wet when thawed, well graded sand and gravel (< 20 mm)					
		CLAY - black - frozen, moist when thawed - high plasticity	■	G153			
		SILT - trace clay - light brown - frozen to 0.9 m, wet and loose to 1.1 m, moist to 1.2 m - low plasticity	■	G154			
1			■	G155			1
			■	G156			
		CLAY - silty, trace sand - silt lenses to 1.8 m - brown - moist and stiff - high plasticity	■	G157		Gradation: Sand = 1.6%, Silt = 23.3% and Clay = 75.2%	
		- dark brown below 1.8 m	■	G158			
2			■	G159			2
		CLAY and SILT - brown - moist and firm - intermediate plasticity	■	G160			
3		End of test hole at 2.5 m in silty clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement					

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 × □ Lab Vane □ △ Pocket Pen. △ ◆ Field Vane ◆ (kPa) 50 100 150 200

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH3**
LOCATION: Park Blvd N., Northbound Lane, North edge of Driveway of House #313, 2.0 m W of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #
0		ASPHALT (thickness = 70 mm)		
		CONCRETE (thickness = 180 mm)		
		CLAY - trace sand, trace silt, trace gravel - brown - frozen, moist when thawed - high plasticity		G169
		- below 0.5 m, trace silt, brown, frozen to 0.9 m, moist when thawed		G170
		- below 0.9 m, stiff		G171
1				G172
				G173
				G174
		- below 1.9 m, light brown		G175
2				
		CLAY and SILT - brown - moist and firm - intermediate plasticity		G176
		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement		
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 ×
□ Lab Vane □
△ Pocket Pen. △
◓ Field Vane ◓
(kPa)
50 100 150 200

COMMENTS

DEPTH

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH4**
LOCATION: Park Blvd N., Southbound Lane, In front of House #310, 2.0 m E of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ▨ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (thickness = 60 mm)					
		CONCRETE (thickness = 170 mm)					
		CLAY - trace silt - black - frozen, moist when thawed - intermediate to high plasticity		G145			
		SILTY CLAY - brown - frozen, moist when thawed - intermediate plasticity		G146			
		SILT - some clay - light brown - frozen to 0.9 m, moist and loose when thawed - low plasticity		G147			
1		SILTY SAND - light brown - moist - non-plastic		G148			1
		CLAY - trace silt, trace fine sand - brown - moist and stiff - high plasticity		G149			
				G150			
2				G151			2
				G152			
3		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement					

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 × □ Lab Vane □ △ Pocket Pen. △ ◓ Field Vane ◓ (kPa) 50 100 150 200

AECOM	LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
	REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
	PROJECT ENGINEER: Gil Robinson	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH5**
LOCATION: Park Blvd N., Northbound Lane, In front of House #305, 2.0 m W of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ▨ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	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 × □ Lab Vane □ △ Pocket Pen. △ ⊕ Field Vane ⊕ (kPa) 50 100 150 200	COMMENTS	DEPTH
0		ASPHALT (thickness = 55 mm)						
		CONCRETE (thickness = 145 mm)						
		GRANULAR FILL - brown, frozen, wet when thawed, well graded sand and gravel (< 20 mm)						
		CLAY - possible fill, trace sand - brown - frozen, moist when thawed - intermediate to high plasticity		G177				
		SILT - trace clay - brown - frozen, wet when thawed - low plasticity		G178				
		CLAYEY SILT - some sand - light brown - frozen to 0.9 m, moist and soft - intermediate plasticity		G179				
1				G180			Gradation: Sand = 12.6%, Silt = 52.2% and Clay = 35.2%	1
				G181				
				G182				
2				G183				2
		CLAY - dark brown - moist and firm - trace sulphates		G184				
3		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement						

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH6**
LOCATION: Park Blvd N., Southbound Lane, North edge of Driveway of House #300, 2.0 m E of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

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/m³) 16 17 18 19 20 21 Plastic MC Liquid 20 40 60 80 100

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

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (thickness = 55 mm)				
		CONCRETE (thickness = 175 mm)				
		CLAY - trace silt, trace sand, trace gravel - black - frozen, moist when thawed - high plasticity		G137		
		SILT - trace sand - light brown - frozen, moist when thawed - low plasticity		G138		
				G139		
1		SILT and CLAY - light brown - moist and firm - intermediate plasticty		G140		1
		CLAY - trace silt - dark brown - moist and stiff - high plasticity		G141		
				G142		
2				G143		2
				G144		
		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement				
3						

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS PARK.GPJ UMA WINN.GDT 2/8/10

Photograph 1. Park Blvd N. – TH1

Photograph 2. Park Blvd N. – TH2

Photograph 3. Park Blvd N. – TH3

Photograph 4. Park Blvd N. – TH4

Photograph 5. Park Blvd N. – TH5

Photograph 6. Park Blvd N. – TH6

City of Winnipeg
2010 Residential Streets Package #1
Geotechnical Investigation

Test Hole No.	Testhole Location	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic Limit	Liquid Limit	Plasticity Index
TH1	Park Blvd N., Northbound Lane, 2.0 m W of curb	321	Asphalt	90	None	n/a	Clay	0.3	26.2							
							Clay	0.6	19.8							
							Clay	0.9	31.7							
							Clay	1.2	39.5							
							Clay	1.5	45.0							
			Concrete	115			Silt	1.8	40.7							
							Clay	2.1	50.5							
							Clay	2.4	49.1							
TH2	Park Blvd N., Southbound Lane, 2.0 m E of curb	316	Asphalt	55	Granular Fill (< 20mm)	50	Clay	0.3	31.2							
							Silt	0.6	30.4							
							Silt	0.9	26.5							
							Silt	1.2	16.3							
							Clay	1.5	28.8	0.0	1.6	23.3	75.2	21.5	69.2	47.7
			Concrete	165			Clay	1.8	40.4							
							Clay	2.1	44.1							
							Clay and Silt	2.4	43.8							
TH3	Park Blvd N., Northbound Lane, 2.0 m W of curb	313	Asphalt	70	None	n/a	Clay	0.3	28.7							
							Clay	0.6	35.0							
							Clay	0.9	37.4							
							Clay	1.2	32.0							
							Clay	1.5	31.8							
			Concrete	180			Clay	1.8	39.0							
							Clay	2.1	45.5							
							Clay and Silt	2.4	38.2							

City of Winnipeg
2010 Residential Streets Package #1
Geotechnical Investigation

Test Hole No.	Testhole Location	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic Limit	Liquid Limit	Plasticity Index
TH4	Park Blvd N., Southbound Lane, 2.0 m E of curb	310	Asphalt	60	None	n/a	Clay	0.3	33.3							
							Silty Clay	0.6	25.6							
							Silt	0.9	27.1							
							Silty Sand	1.2	15.2							
			Concrete	170			Clay	1.5	27.6							
							Clay	1.8	32.8							
							Clay	2.1	40.5							
							Clay	2.4	47.8							
TH5	Park Blvd N., Northbound Lane, 2.0 m W of curb	305	Asphalt	55	Granular Fill (< 20mm)	50	Clay	0.3	24.8							
							Silt	0.6	38.4							
							Clayey Silt	0.9	22.1							
							Clayey Silt	1.2	23.6	0.0	12.6	52.2	35.2	13.7	43.4	29.7
			Concrete	145			Clayey Silt	1.5	22.3							
							Clayey Silt	1.8	24.0							
							Clayey Silt	2.1	24.4							
							Clay	2.4	43.1							
TH6	Park Blvd N., Southbound Lane, 2.0 m E of curb	300	Asphalt	55	None	n/a	Clay	0.3	26.3							
							Silt	0.6	20.3							
							Silt	0.9	22.9							
							Silt and Clay	1.2	23.6							
			Concrete	175			Clay	1.5	37.6							
							Clay	1.8	41.5							
							Clay	2.1	43.6							
							Clay	2.4	48.8							

Appendix B

Parkside Drive,
Test Hole Location Plan,
Test Hole Logs,
Core Photographs,
Lab Testing Summary

PLOT: 10/02/08 1:49:51 PM B SIZE 11" x 17" (279.4mm x 431.8mm)

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AECOM

City of Winnipeg
2010 Residential Package #1
Test Hole Locations

Parkside Drive
Winston Road to Winston Road
Figure - 2

Winnipeg

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GEOTECHNICAL INVESTIGATION

STREET RECONSTRUCTION

Revised October 28th, 2008

Fieldwork

1. Clear all underground services at each testhole location.
2. Test holes required every **50** m with a minimum of **3** test holes per street.
3. Record location of testhole (offset from curb, distance from cross street and house number).
4. Drill 150 mm-diameter core in pavement.
5. Drill 125 mm-diameter testhole into fill materials and subgrade
6. If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.
7. Testhole to be drilled to depth of 2 m ± 150 mm below surface of the pavement.
8. Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).
9. Measure and record pavement section exposed in the testhole (thickness of concrete or asphalt and different types of pavement structure materials).
10. 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).
11. Log soil profile for the subgrade.
12. 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 testhole.
13. Make note of any water seepage into the testhole.
14. Backfill testhole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.
15. Return core sample from the pavement and soil samples to the laboratory.

Lab Work

1. Test all soil samples for moisture content.
2. Photograph core samples recovered from the pavement surface.
3. 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.
4. Prepare testhole 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

Prepared by: The National Testing Laboratories Limited and Eng-Tech Consulting

Embrace the Spirit • Vivez l'esprit

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AECOM Canada Ltd.

GENERAL STATEMENT

NORMAL VARIABILITY OF SUBSURFACE CONDITIONS

The scope of the investigation presented herein is limited to an investigation of the subsurface conditions as to suitability for the proposed project. This report has been prepared to aid in the evaluation of the site and to assist the engineer in the design of the facilities. Our description of the project represents our understanding of the significant aspects of the project relevant to the design and construction of earth work, foundations and similar. In the event of any changes in the basic design or location of the structures as outlined in this report or plan, we should be given the opportunity to review the changes and to modify or reaffirm in writing the conclusions and recommendations of this report.

The analysis and recommendations presented in this report are based on the data obtained from the borings and test pit excavations made at the locations indicated on the site plans and from other information discussed herein. This report is based on the assumption that the subsurface conditions everywhere are not significantly different from those disclosed by the borings and excavations. However, variations in soil conditions may exist between the excavations and, also, general groundwater levels and conditions may fluctuate from time to time. The nature and extent of the variations may not become evident until construction. If subsurface conditions differ from those encountered in the exploratory borings and excavations, are observed or encountered during construction, or appear to be present beneath or beyond excavations, we should be advised at once so that we can observe and review these conditions and reconsider our recommendations where necessary.

Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction procedures.

In order to observe compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated, we recommend that all construction operations dealing with earth work and the foundations be observed by an experienced soils engineer. We can be retained to provide these services for you during construction. In addition, we can be retained to review the plans and specifications that have been prepared to check for substantial conformance with the conclusions and recommendations contained in our report.

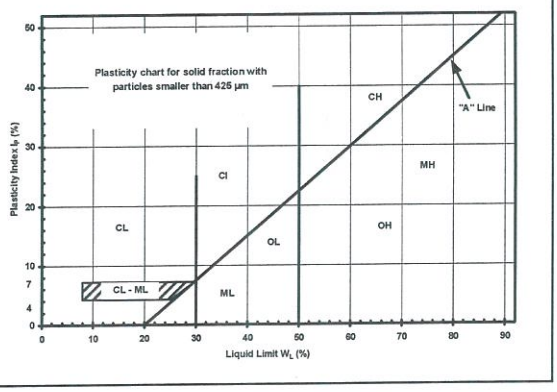
EXPLANATION OF FIELD & LABORATORY TEST DATA

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		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.

Not used. Refer to City of Winnipeg's Specs for Geotechnical Investigation Street Reconstruction Oct 28, 08



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

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH1**
LOCATION: Parkside Drive, Westbound Lane, 14.0 m East of Winston Rd, 2.0 m N of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

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 × □ Lab Vane □ △ Pocket Pen. △ ◓ Field Vane ◓ (kPa) 50 100 150 200

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	COMMENTS	DEPTH
0		ASPHALT (thickness = 45 mm)				
		CONCRETE (thickness = 145 mm)				
		CLAY - dark brown - frozen to 0.7 m, moist when thawed - high plasticity		G185		
				G186		
		- below 0.7 m, brown, trace silt, trace gravel, moist and stiff		G187		
1				G188		1
				G189		
				G190		
2		CLAY TILL - trace sand, trace gravel - moist and firm - high plasticity		G191		2
				G192		
		End of test hole at 2.5 m in clay till Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement				
3						

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS PARKSIDE.GPJ UMA WINN.GDT 2/8/10

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH2**
LOCATION: Parkside Drive, Northbound Lane, In front of House #121, 2.0 m W of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (thickness = 50 mm)					
		CONCRETE (thickness = 180 mm)					
		CLAY - dark brown - frozen to 0.7 m, moist when thawed - high plasticity		G193			
		-below 0.4 m, trace gravel, brown, moist		G194			
		SILTY CLAY - some sand, trace gravel - moist and firm - high plasticity		G195			
1				G196		Gradation: Sand = 15.6%, Silt = 38.0% and Clay = 46.4%	1
				G197			
				G198			
2				G199			2
		CLAY TILL - some silt, some gravel - light brown - moist and very soft - high plasticity		G200			
3		End of test hole at 2.5 m in clay till Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement					

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 × ☐ Lab Vane ☐ △ Pocket Pen. △ ◓ Field Vane ◓ (kPa) 50 100 150 200

LOGGED BY: Stephen Petsche		COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson		COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson		Page 1 of 1

AECOM

LOG OF TEST HOLE TEST HOLE LOGS PARKSIDE.GPJ UMA WINN.GDT 2/8/10

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH3**
LOCATION: Parkside Drive, Southbound Lane, In front of House #108, 2.0 m E of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▯ SHELBY TUBE ⊠ SPLIT SPOON ▤ BULK ⊘ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (thickness = 35 mm) CONCRETE (thickness = 120 mm)					
		GRANULAR FILL - brown, frozen, wet when thawed, well graded sand and gravel (< 20 mm)	■	G201			
			■	G202			
			■	G203			
1			■	G204			1
			■	G205			
		End of test hole at 1.5 m in granular material Notes: 1) Stopped at depth of 1.5 m due to possible trench. 2) No sloughing 3) No seepage 4) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement					
2							2
3							

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 × ☐ Lab Vane ☐ △ Pocket Pen. △ ◓ Field Vane ◓ (kPa) 50 100 150 200

AECOM

LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

LOG OF TEST HOLE TEST HOLE LOGS PARKSIDE.GPJ UMA WINN.GDT 2/8/10

PROJECT: 2010 Residential Streets Package #1	CLIENT: City of Winnipeg	TESTHOLE NO: **TH4**
LOCATION: Parkside Drive, Westbound Lane, In front of garage of House #102, 2.0 m N of Curb		PROJECT NO.: 60143720.1001
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):

SAMPLE TYPE ■ GRAB ▥ SHELBY TUBE ☒ SPLIT SPOON ▤ BULK ⧄ NO RECOVERY ◧ CORE

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	PENETRATION TESTS / UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
0		ASPHALT (thickness = 40 mm) CONCRETE (thickness = 200 mm)					
		SILTY CLAY - some sand - dark brown - frozen to 0.7 m, moist when thawed - high plasticity		G206			
				G207			
		- below 0.7 m, stiff		G208			
1				G209		Gradation: Sand = 17.1%, Silt = 39.4% and Clay = 43.4%	1
		CLAY - trace silt, trace sand - brown - moist and firm - intermediate plasticity		G210			
				G211			
2				G212			2
				G213			
		End of test hole at 2.5 m in clay Notes: 1) No sloughing 2) No seepage 3) Backfilled with auger cuttings to 0.2 m below top of pavement, sand to 0.15 m below top of pavement and asphalt cold patch to top of pavement					
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 × □ Lab Vane □ △ Pocket Pen. △ ◓ Field Vane ◓ (kPa) 50 100 150 200

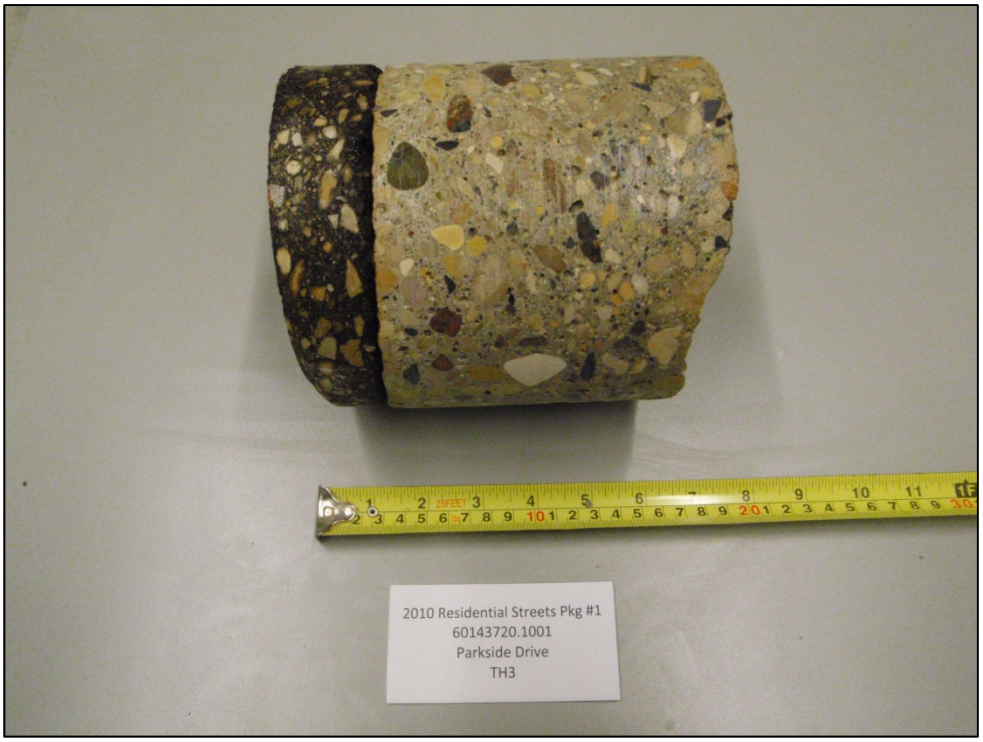
LOGGED BY: Stephen Petsche	COMPLETION DEPTH: 2.50 m
REVIEWED BY: Gil Robinson	COMPLETION DATE: 1/19/10
PROJECT ENGINEER: Gil Robinson	Page 1 of 1

AECOM

LOG OF TEST HOLE TEST HOLE LOGS PARKSIDE.GPJ UMA WINN.GDT 2/8/10

Photograph 1. Parkside Drive – TH1

Photograph 2. Parkside Drive – TH2



Photograph 3. Parkside Drive – TH3

Photograph 4. Parkside Drive – TH4

City of Winnipeg
2010 Residential Streets Package #1
Geotechnical Investigation

Test Hole No.	Testhole Location	House No.	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
			Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic Limit	Liquid Limit	Plasticity Index
TH1	Parkside Drive, Westbound Lane, 14.0 m East of Winston Road, 2.0 m S of edge of street	n/a	Asphalt	45	None	n/a	Clay	0.3	44.7							
							Clay	0.6	37.9							
							Clay	0.9	35.3							
							Clay	1.2	38.1							
							Clay	1.5	42.4							
			Concrete	145			Clay	1.8	43.1							
							Clay Till	2.1	50.7							
							Clay TIll	2.4	38.4							
TH2	Parkside Drive, Northbound Lane, 2.0 m W of edge of street	121	Asphalt	50	None	n/a	Clay	0.3	41.0							
							Clay	0.6	36.3							
							Silty Clay	0.9	27.4							
							Silty Clay	1.2	18.3	0.0	15.6	38.0	46.4	13.9	50.4	36.5
							Silty Clay	1.5	22.8							
			Concrete	180			Silty Clay	1.8	26.7							
							Silty Clay	2.1	27.9							
							Clay Till	2.4	15.0							
TH3	Parkside Drive, Southbound Lane, 2.0 m E of edge of street	108	Asphalt	35	Granular Fill (< 20mm)	1.5 m	Granular Fill	0.25	9.4							
							Granular Fill	0.55	9.4							
							Granular Fill	0.85	8.1							
			Concrete	120			Granular Fill	1.15	7.9							
							Granular Fill	1.45	6.8							
							Test Hole was taken over possible trench and was stopped at 1.5 m depth.									
TH4	Parkside Drive, Westbound Lane, 2.0 m S of edge of road	Garage of 102	Asphalt	40	None	n/a	Silty Clay	0.3	34.4							
							Silty Clay	0.6	28.7							
							Silty Clay	0.9	26.9							
							Silty Clay	1.2	25.0	0.0	17.1	39.4	43.4	16.6	51.6	35.0
			Concrete	200			Clay	1.5	23.2							
							Clay	1.8	20.8							
							Clay	2.1	17.3							
							Clay	2.4	26.5							