

# **APPENDIX 'A'**

# **GEOTECHNICAL REPORT**

City of Winnipeg  
2009 Residential Street Renewal  
Baldry Bay, Fordham Bay  
and Seier Bay  
Subsurface Investigation

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Prepared by:

**AECOM Canada Ltd.**

1479 Buffalo Place, Winnipeg, MB, Canada R3T 1L7  
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Project Number:

0265 408 00 (4.4.2)

Date:

February, 2009

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This Disclaimer is attached to and forms part of the Report.

**AECOM**

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February 3, 2009

Project Number: 0265 408 00 (4.4.2)

Mr. Ron Bruce, P.Eng.  
AECOM Canada Ltd.  
2 – 1600 Ness Avenue  
Madison Square  
Winnipeg, Manitoba  
R3J 3W7

Dear Sir:

**Re: 2009 Residential Street Renewal – Baldry Bay, Fordham Bay and Seier Bay**

AECOM Canada Ltd. is pleased to present our report on the above referenced project. If you have any questions, please do not hesitate to contact Nelson Ferreira or Jared Baldwin of our office.

Sincerely,  
**AECOM Canada Ltd.**



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

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## Revision Log

Revision #	Revised By	Date	Issue / Revision Description
1	N. Ferreira	Feb. 3/09	Final

# Signature Page

Report Prepared By:



Jared Baldwin, M.Sc., EIT

Report Reviewed By:



Nelson Ferreira, M.Sc., P.Eng.



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# Table of Contents

## Statement of Qualifications and Limitations

## Letter of Transmittal

## Distribution List

	page
<b>1. Summary.....</b>	<b>1</b>
<b>2. Field Investigation and Laboratory Program .....</b>	<b>1</b>

## Appendices

Figures Test Hole Plan

Appendix A Test Hole Logs

Appendix B Photos of Core Samples

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## 1. Summary

This report summarizes the results of the subsurface investigation completed for the proposed 2009 Residential Street Renewals of Baldry Bay, Fordham Bay and Seier Bay in the Fort Richmond area of Winnipeg. The project consists of reconstruction of the existing streets. Information regarding the concrete, asphalt, road base for the existing road and the soil stratigraphy underneath the existing road is provided.

## 2. Field Investigation and Laboratory Program

A total of 9 test holes were drilled on Baldry Bay (TH-09-01, 02 and 03), Fordham Bay (Th-09-04, 05 and 06) and Seier Bay (TH-09-07, 08 and 09), at the locations shown on Figures 01, 02 and 03, respectively. The test holes were drilled in order to determine subsurface conditions at the three sites for reconstruction of the existing streets.

The field investigation was conducted on January 12, 2009. The test holes were drilled to a depth of 3.1 m below road surface by Paddock Drilling Ltd. using a Brat 22 truck mounted drill rig equipped with 125 mm diameter solid stem augers. The pavement structure (asphalt or concrete) was cored by Quality Cutting and Coring using a portable coring press equipped with a hollow 150 mm diameter diamond core drill bit. The soil subsurface conditions were observed during drilling and visually classified by Jared Baldwin, EIT of AECOM. Other pertinent information such as groundwater and drilling conditions were also recorded during the drilling investigation. Disturbed (auger cuttings) samples retrieved during the field investigation were transported to AECOM's material testing laboratory for further testing. Core samples were also retrieved and logged at AECOM's material testing. Photos of each core sample are included in Appendix B.

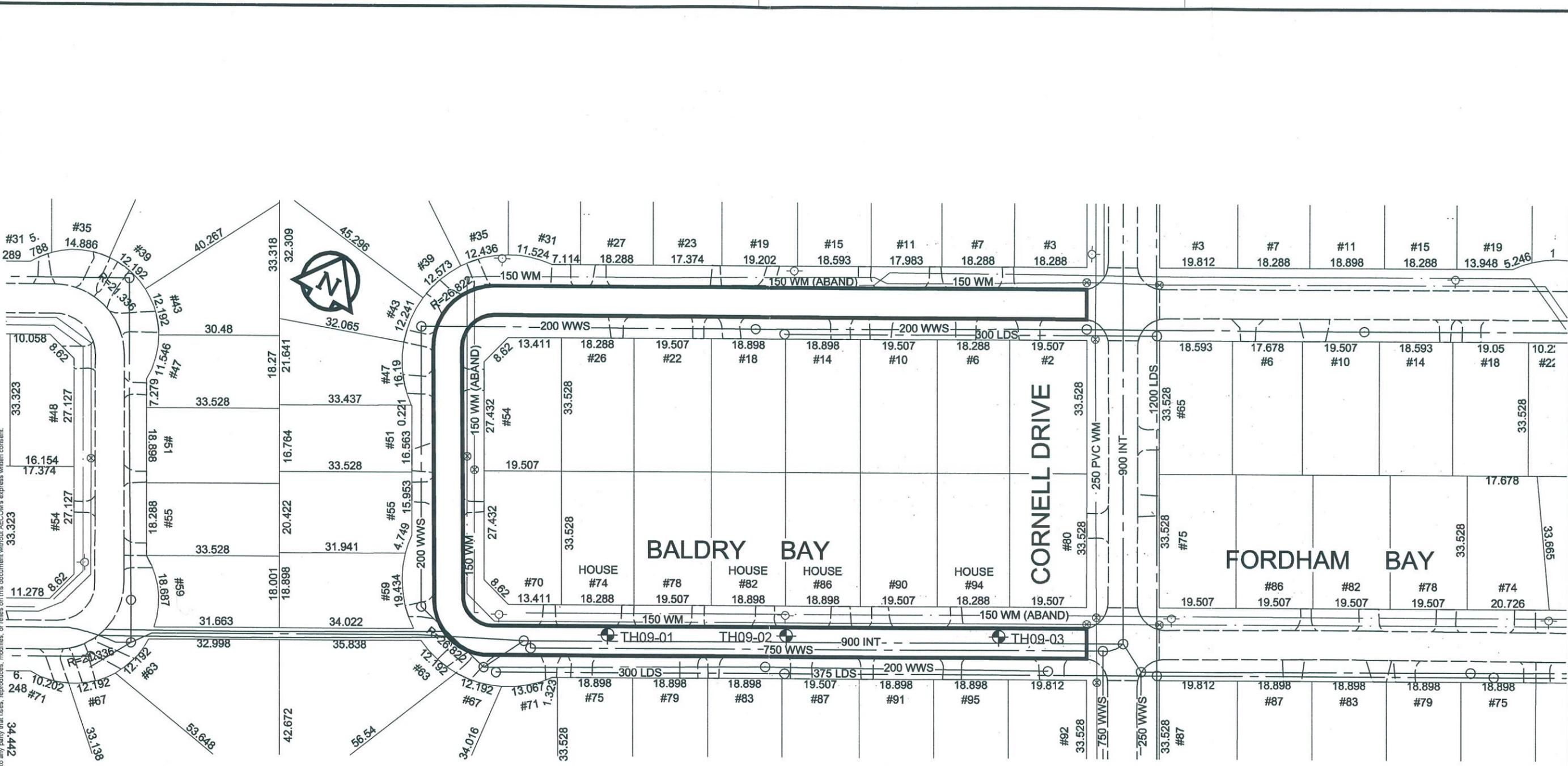
The laboratory testing program consisted of moisture content determination, Atterberg limits and hydrometer tests. The laboratory information has been included on the test hole logs and a summary table of the laboratory testing results has been included in Appendix A.

Test hole locations noted on the test hole logs and shown on Figures 01, 02 and 03 are based on measured distances from the nearest curb and associated house number.

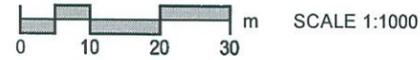
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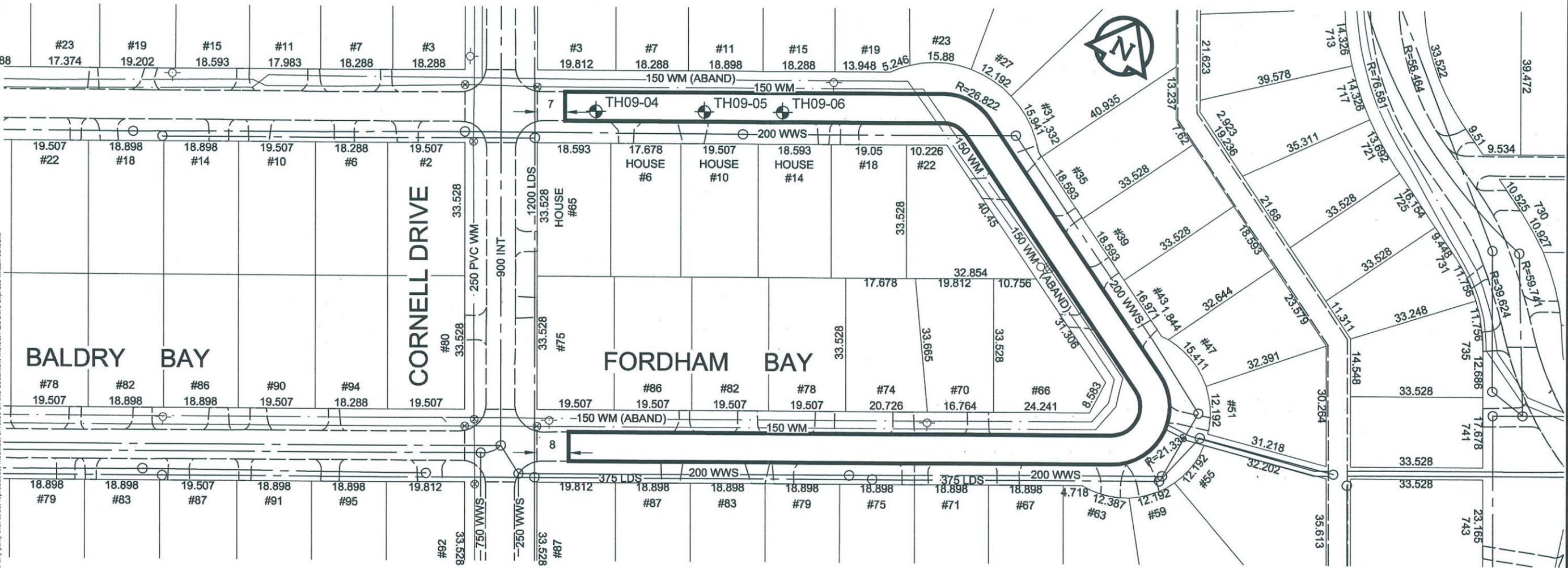
# Figures Test Hole Plan

ISS/REV: A  
 AECOM FILE NAME: 0265-408-00\_01-B-F001\_RX.dwg Saved By: cloustonec PLOT: 09/02/02 11:29:13 AM  
 B SIZE 11" x 17" (279.4mm x 431.8mm)  
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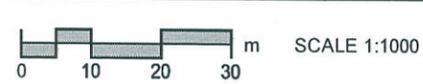


**PLAN**



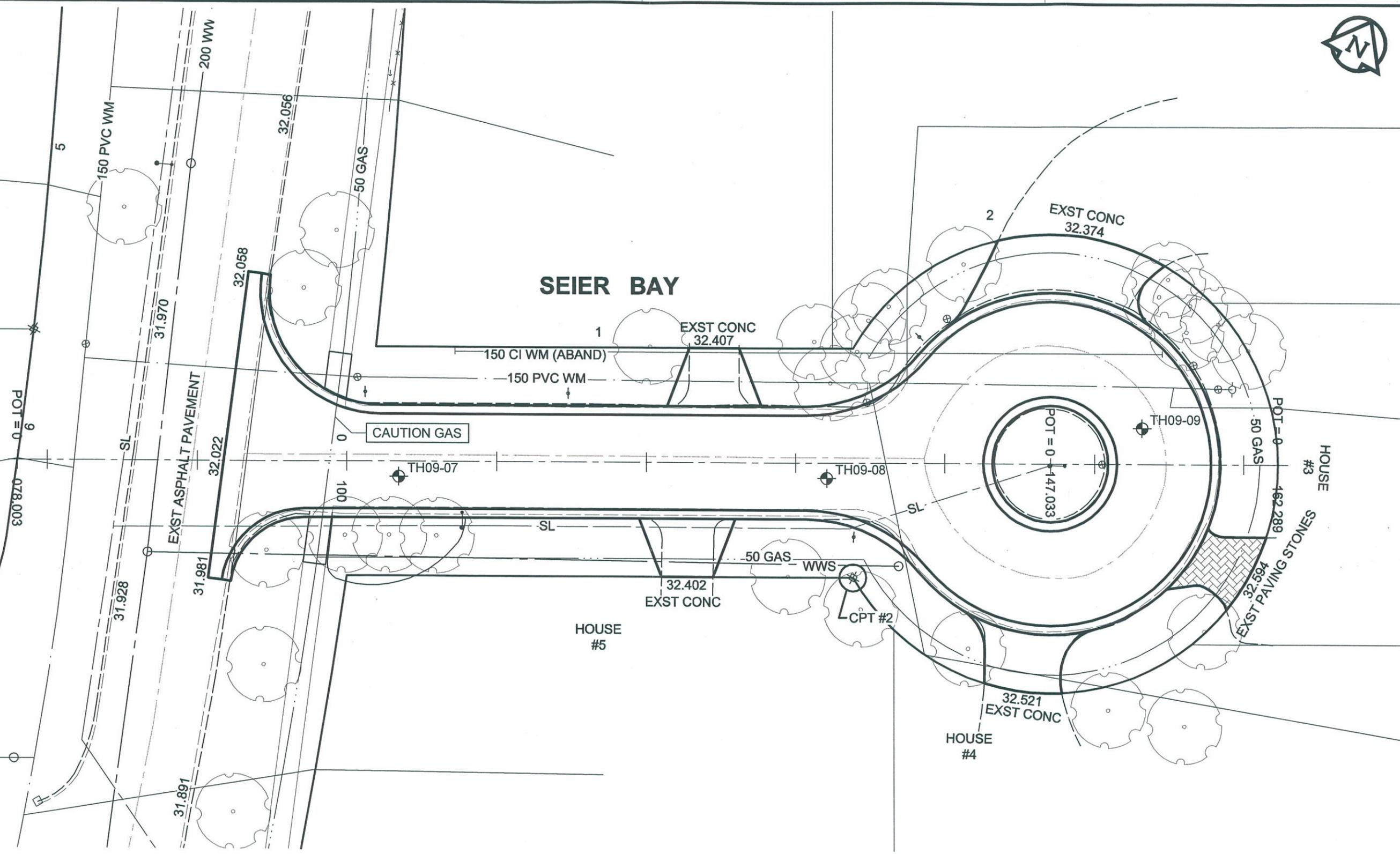
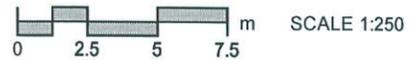


**PLAN**



**KING'S DRIVE**

**PLAN**



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# Appendix A Test Hole Logs

**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.

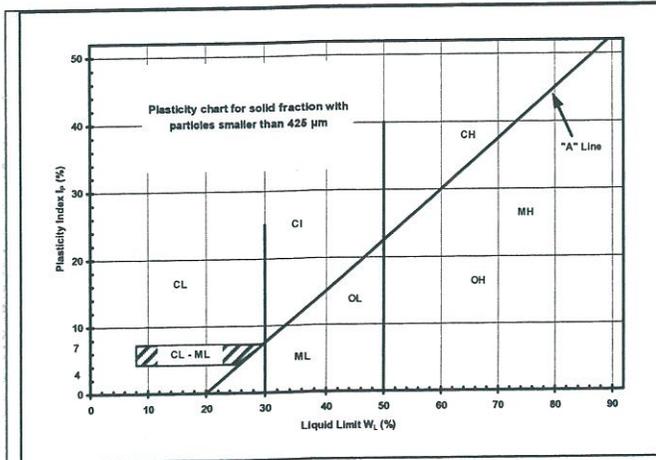
Since it is possible for conditions to vary from those assumed in the analysis and upon which our conclusions and recommendations are based, a contingency fund should be included in the construction budget to allow for the possibility of variations which may result in modification of the design and construction 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 $4 < W_p < 7$  $C_u = \frac{D_{60}}{D_{10}}$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$	
			Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		
		DIRTY GRAVELS (With some fines)	Silty gravels, silty sandy gravels		GM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey gravels, clayey sandy gravels		GC	> 12			Atterberg limits above "A" line or $W_p < 7$
	SANDS (More than 50% of coarse fraction of sand size)	CLEAN SANDS (Little or no fines)	Well graded sands, gravelly sands, with little or no fines		SW	0-5	$C_u > 6$ $1 < C_c < 3$		
			Poorly graded sands, gravelly sands, with little or no fines		SP	0-5	Not satisfying SW requirements		
		DIRTY SANDS (With some fines)	Silty sands, sand-silt mixtures		SM	> 12			Atterberg limits below "A" line or $W_p < 4$
			Clayey sands, sand-clay mixtures		SC	> 12			Atterberg limits above "A" line or $W_p < 7$
FINE GRAINED SOILS	SILTS (Below 'A' line negligible organic content)	$W_L < 50$	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML		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 ORGANIC SOILS		Peat and other highly organic soils		Pt	Von Post Classification Limit		Strong colour or odour, and often fibrous texture	
	Asphalt		Till				<div style="border-left: 1px solid black; padding-left: 10px;"> <h1 style="margin: 0;">AECOM</h1> </div>		
	Concrete		Bedrock (Undifferentiated)						
	Fill		Bedrock (Limestone)						

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



FRACTION	SEIVE SIZE (mm)		DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
	Passing	Retained	Percent	Identifier
Gravel	Coarse	76	19	35-50 and
	Fine	19	4.75	
Sand	Coarse	4.75	2.00	20-35 "y" or "ey" *
	Medium	2.00	0.425	
	Fine	0.425	0.075	
Silt (non-plastic) or Clay (plastic)	< 0.075 mm		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.
- $\gamma$  - bulk unit weight ( $\text{kN/m}^3$ ).
- 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 ( $S_u$ ) of a cohesive soil can be related to its consistency as follows:

$S_u$ (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

City of Winnipeg  
 2009 Street Renewal Program - Baldry Bay, Fordham Bay and Seier Bay  
 Subsurface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Location (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits				
		Type	Thickness (mm)	Type	Thickness (mm)		Start	End		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic Limit	Liquid Limit	Plasticity Index		
TH-09-01	2.1 m south of north curb, in front of #74 Baldry Bay			Concrete	150	Sand and Gravel Fill (Pit Run)	0.2	0.3	23.8									
						Clay	0.5	0.6	29.2									
						Clay	0.8	0.9	35.6									
						Clay	1.1	1.2	37.8									
						Clay	1.4	1.5	34.3									
						Clay	1.7	1.8	35.8									
						Clay	2.0	2.1	43.4									
						Clay	2.6	2.7	36.5									
TH-09-02	2.1 m south of north curb, in front of property boundary between #82 and #86 Baldry Bay			Concrete	115	Sand and Gravel Fill (Pit Run)	0.2	0.3	21.2									
						Clay	0.5	0.6	36.2									
						Clay	0.8	0.9	37.3	0.0	4.7	23.2	72.1	24.0	77.9	53.9		
						Clay	1.1	1.2	33.2									
						Clay	1.4	1.5	47.3									
						Clay	1.7	1.8	47.1									
						Clay	2.0	2.1	47.4									
						Clay	2.6	2.7	52.3									
TH-09-03	2.1 m south of north curb, in front of #94 Baldry Bay			Concrete	145	Sand and Gravel Fill (Pit Run)	0.2	0.3	47.6									
						Clay	0.5	0.6	43.0									
						Clay	0.8	0.9	38.2									
						Clay	1.1	1.2	36.2									
						Clay	1.4	1.5	46.7									
						Clay	1.7	1.8	50.6									
						Clay	2.0	2.1	44.2									
						Clay	2.6	2.7	48.4									
TH-09-04	2.4 m north of south curb, in front of property boundary between #6 Fordham Bay and #65 Corneli Drive			Concrete	140	Sand and Gravel Fill (Pit Run)	0.2	0.3	18.2									
						Clay	0.5	0.6	35.1									
						Clay	0.8	0.9	35.3									
						Silt	1.1	1.2	22.7	0.0	19.5	49.1	31.4	17.0	25.5	8.6		
						Silt	1.4	1.5	43.0									
						Clay	1.7	1.8	45.3									
						Clay	2.0	2.1	38.0									
						Clay	2.6	2.7	51.3									
TH-09-05	2.4 m north of south curb, in front of #10 Fordham Bay			Concrete	140	Sand and Gravel Fill (Pit Run)	0.2	0.3	32.3									
						Clay	0.5	0.6	30.9									
						Clay	0.8	0.9	30.6									
						Silt	1.1	1.2	23.2									
						Silt	1.4	1.5	25.3									
						Silt	1.7	1.8	29.7									
						Clay	2.0	2.1	44.7									
						Clay	2.6	2.7	49.2									
TH-09-06	2.4 m north of south curb, in front of #14 Fordham Bay			Concrete	140	Sand and Gravel Fill (Pit Run)	0.2	0.3	37.1									
						Clay	0.5	0.6	31.3									
						Clay	0.8	0.9	30.1	0.0	5.3	32.7	62.0	16.0	40.6	24.7		
						Silt	1.1	1.2	21.9									
						Silt	1.4	1.5	39.9									
						Clay	1.7	1.8	41.0									
						Clay	2.0	2.1	42.6									
						Clay	2.6	2.7	49.9									
TH-09-07	2.1 m north of south curb, in front of #5 Seier Bay			Asphalt	90	Sand and Gravel Fill (Pit Run)	0.2	0.3	11.1									
						Clay	0.5	0.6	34.4									
						Clay	0.8	0.9	32.3									
						Clay	1.1	1.2	32.9									
						Clay	1.4	1.5	30.6									
						Clay	1.7	1.8	32.7									
						Clay	2.0	2.1	38.6									
						Clay	2.6	2.7	43.2									

City of Winnipeg  
 2009 Street Renewal Program - Baldry Bay, Fordham Bay and Seier Bay  
 Subsurface Investigation

Test Hole No.	Test Hole Location	Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Location (m)		Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
		Type	Thickness (mm)	Type	Thickness (mm)		Start	End		Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Plastic Limit	Liquid Limit	Plasticity Index
TH-09-08	2.1 m north of south curb, in front of property boundary between #5 and #4 Seier Bay			Asphalt	60	Sand and Gravel Fill (Pit Run)	0.2	0.3	8.5							
						Clay	0.5	0.6	35.5							
						Clay	0.8	0.9	34.4	0.0	7.2	47.1	45.7	19.0	57.1	38.1
						Silt	1.1	1.2	24.3	0.0	12.1	55.3	32.6	17.3	41.3	24.0
						Silt	1.4	1.5	40.7							
						Clay	1.7	1.8	43.5							
						Clay	2.0	2.1	43.5							
						Clay	2.6	2.7	35.2							
TH-09-09	6.7 m north-east of center median light stand, in front of #3 Seier Bay			Asphalt	80	Sand and Gravel Fill (Pit Run)	0.2	0.3	7.6							
						Clay	0.5	0.6	34.5	0.0	19.5	49.1	31.4	24.1	72.3	48.2
						Clay	0.8	0.9	27.8							
						Clay	1.1	1.2	27.1							
						Clay	1.4	1.5	42.3							
						Clay	1.7	1.8	44.2							
						Clay	2.0	2.1	45.6							
						Clay	2.6	2.7	47.5							

PROJECT: Residential Street Renewal      CLIENT: City of Winnipeg      TESTHOLE NO: TH-09-01  
 LOCATION: 2.1 m south of north curb, in front of #74 Baldry Bay      PROJECT NO.: 0265-408-00  
 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

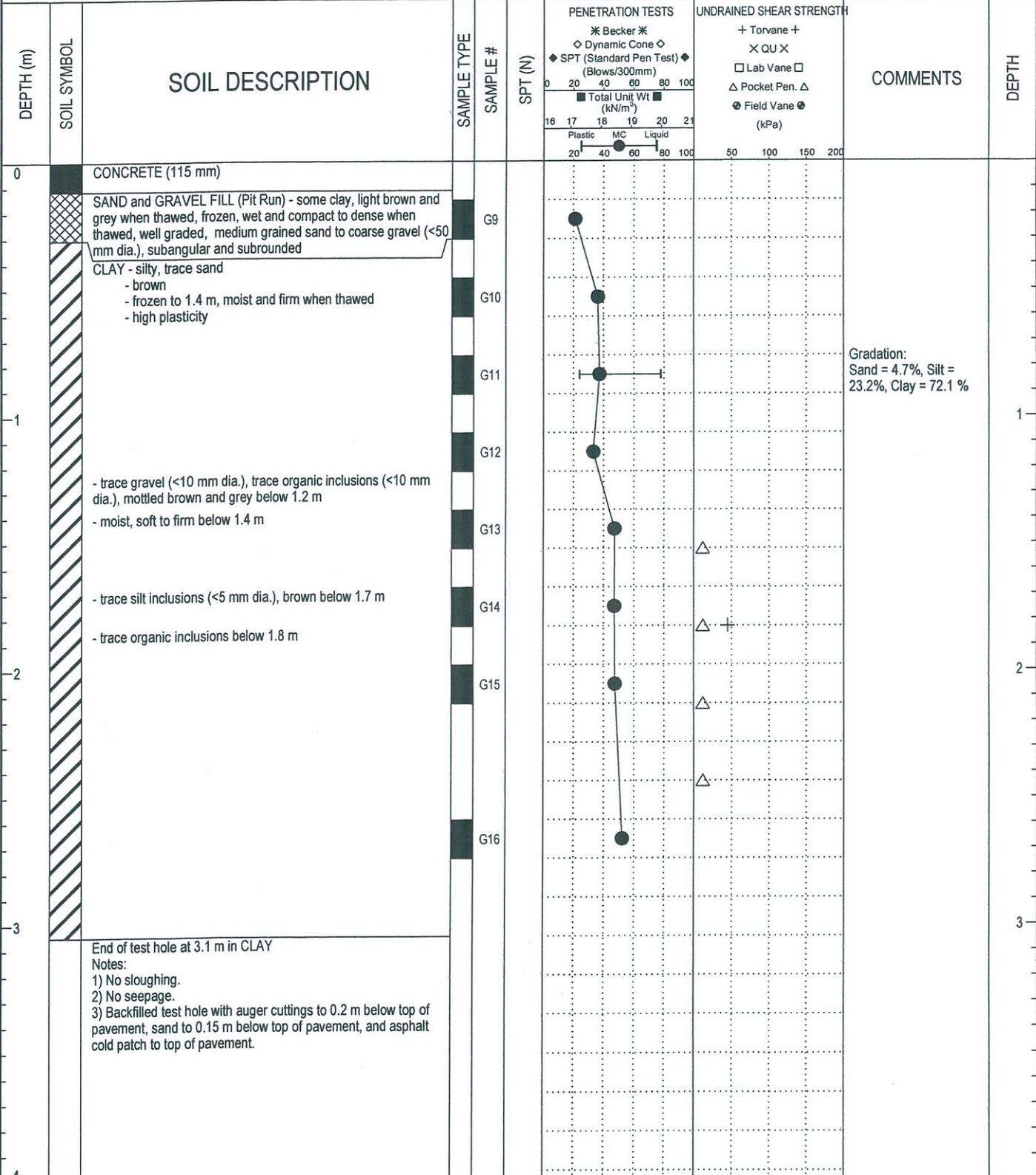
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH (kPa)	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + X QU X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●			
0		CONCRETE (150 mm)								
		SAND and GRAVEL FILL (Pit Run) - some clay, light brown and grey when thawed, frozen, wet and compact to dense when thawen, well graded, medium grained sand to coarse gravel (<50 mm dia.), subangular and subrounded		G1						
		CLAY - some silt, trace sand, trace gravel (<15 mm dia.) - brown - frozen to 1.2 m, moist and soft to firm when thawed - high plasticity		G2						
				G3						
				G4						
		- moist, soft, mottled brown and grey below 1.2 m		G5						
				G6						
		- trace organic inclusions (<4 mm dia.), soft to firm below 1.7 m		G7						
				G8						
3		End of test hole at 3.1 m in CLAY Notes: 1) No sloughing. 2) No seepage. 3) Backfilled test hole 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 FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin      COMPLETION DEPTH: 3.05 m  
 REVIEWED BY: Nelson Ferreira      COMPLETION DATE: 12/1/09  
 PROJECT ENGINEER: Nelson Ferreira      Page 1 of 1

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-02
LOCATION: 2.1 m south of north curb, in front of property boundary between #82 and #86 Baldry Bay	PROJECT NO.: 0265-408-00	
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	



LOG OF TEST HOLE - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA MNIN.GDT 2/2/09

AECOM

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-03
LOCATION: 2.1 m south of north curb, in front of #94 Baldry Bay		PROJECT NO.: 0265-408-00
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH (kPa)	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m³)	+ Torvane + X QU X □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ●			
0		CONCRETE (145 mm)								
		SAND and GRAVEL FILL (Pit Run) - some clay, light brown and grey when thawed, frozen, compact to dense, well graded, medium grained sand to coarse gravel (<25 mm dia.), subangular and subrounded		G17						
		CLAY - silty, trace sand - brown - frozen to 1.4 m, moist and firm when thawed - high plasticity		G18						
		- trace silt inclusions (<5 mm dia.), trace organic inclusions (<10 mm dia.) below 0.9 m		G19						
		- moist below 1.4 m		G20						
		- soft to firm below 1.5 m		G21						
		- trace silt inclusions (<5 mm dia.), trace organic inclusions (<10 mm dia.) below 2.1 m		G22						
		- trace gravel (<10 mm dia.), mottled brown and grey below 2.7 m		G23						
		- trace silt inclusions (<5 mm dia.), trace organic inclusions (<10 mm dia.) below 2.1 m		G24						
3		End of test hole at 3.1 m in CLAY								
		Notes: 1) No sloughing. 2) No seepage. 3) Backfilled test hole 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 - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA MNIN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Nelson Ferreira	COMPLETION DATE: 12/1/09
PROJECT ENGINEER: Nelson Ferreira	Page 1 of 1

PROJECT: Residential Street Renewal      CLIENT: City of Winnipeg      TESTHOLE NO: TH-09-04  
 LOCATION: 2.4 m north of south curb, in front of property boundary between #6 Fordham Bay and #65 Cornell Drive      PROJECT NO.: 0265-408-00  
 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 #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH (kPa)	COMMENTS	DEPTH
						Becker * Dynamic Cone SPT (Standard Pen Test) (Blows/300mm) Total Unit Wt (kN/m <sup>3</sup> )	Torvane + QU X Lab Vane □ Pocket Pen. Δ Field Vane ⊙			
0		CONCRETE (140 mm)								
		SAND and GRAVEL FILL (Pit Run) - trace clay, light brown, frozen, wet and compact to dense when thawed, well graded, medium grained sand to coarse gravel (<25 mm dia.), subangular and subrounded		G25						
		CLAY - silty, trace sand - brown - frozen, moist and firm when thawed - high plasticity		G26						
				G27						
1		SILT - clayey, some sand - light brown - frozen to 1.2 m, soft when thawed - low plasticity  - moist below 1.2 m		G28					Gradation: Sand = 19.5%, Silt = 49.1%, Clay = 31.4%	1
				G29						
		CLAY - some silt, trace sand - brown - moist, firm to stiff - high plasticity  - trace silt inclusions (<10 mm dia.) below 1.8 m		G30						
				G31						
2				G32						2
3		End of test hole at 3.1 m in CLAY Notes: 1) No sloughing. 2) No seepage. 3) Backfilled test hole 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

LOG OF TEST HOLE FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin      COMPLETION DEPTH: 3.05 m  
 REVIEWED BY: Nelson Ferreira      COMPLETION DATE: 12/1/09  
 PROJECT ENGINEER: Nelson Ferreira      Page 1 of 1

PROJECT: Residential Street Renewal      CLIENT: City of Winnipeg      TESTHOLE NO: TH-09-05  
 LOCATION: 2.4 m north of south curb, in front of #10 Fordham Bay      PROJECT NO.: 0265-408-00  
 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

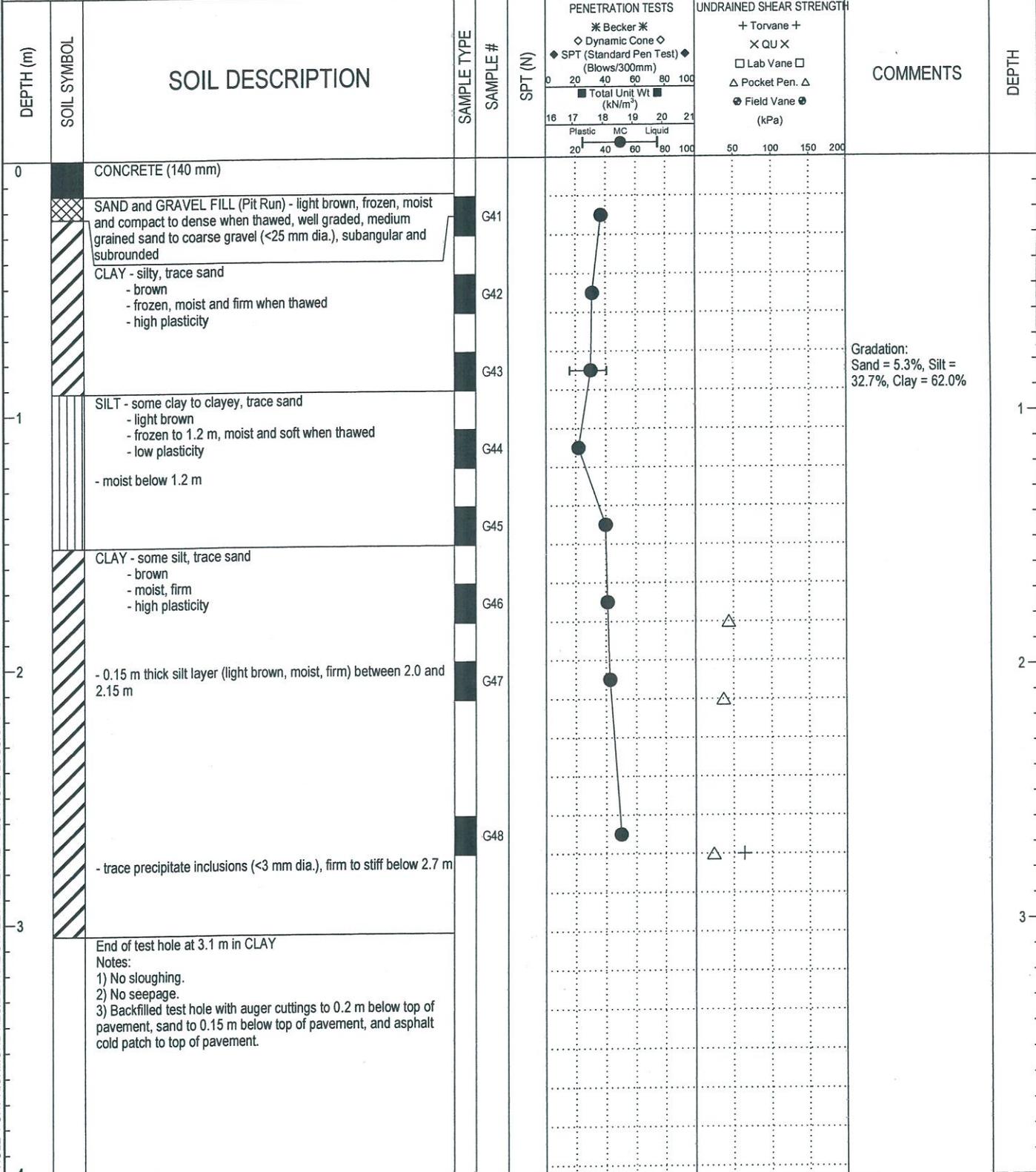
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH		COMMENTS	DEPTH
						Becker	Dynamic Cone	Torvane	QU		
0		CONCRETE (140 mm)									
		SAND and GRAVEL FILL (Pit Run) - light brown, frozen, moist and compact to dense when thawed, well graded, medium grained sand to coarse gravel (<25 mm dia.), subrounded and subangular		G33							
		CLAY - silty, some sand - brown - frozen, moist and firm when thawed - high plasticity		G34							
				G35							
1		SILT - some clay to clayey, some sand - light brown - frozen to 1.1 m, moist and soft when thawed - low plasticity - moist below 1.1 m		G36							
				G37							
				G38							
2		CLAY - some silt - brown - moist, firm to stiff - high plasticity - trace silt inclusions (<3 mm dia.) below 2.1 m		G39							
				G40							
3		- trace oxide inclusions (<5 mm dia.) below 2.7 m									
		End of test hole at 3.1 m in CLAY Notes: 1) No sloughing. 2) No seepage. 3) Backfilled test hole 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 FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin      COMPLETION DEPTH: 3.05 m  
 REVIEWED BY: Nelson Ferreira      COMPLETION DATE: 12/1/09  
 PROJECT ENGINEER: Nelson Ferreira      Page 1 of 1

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-06
LOCATION: 2.4 m north of south curb, in front of #14 Forham Bay		PROJECT NO.: 0265-408-00
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

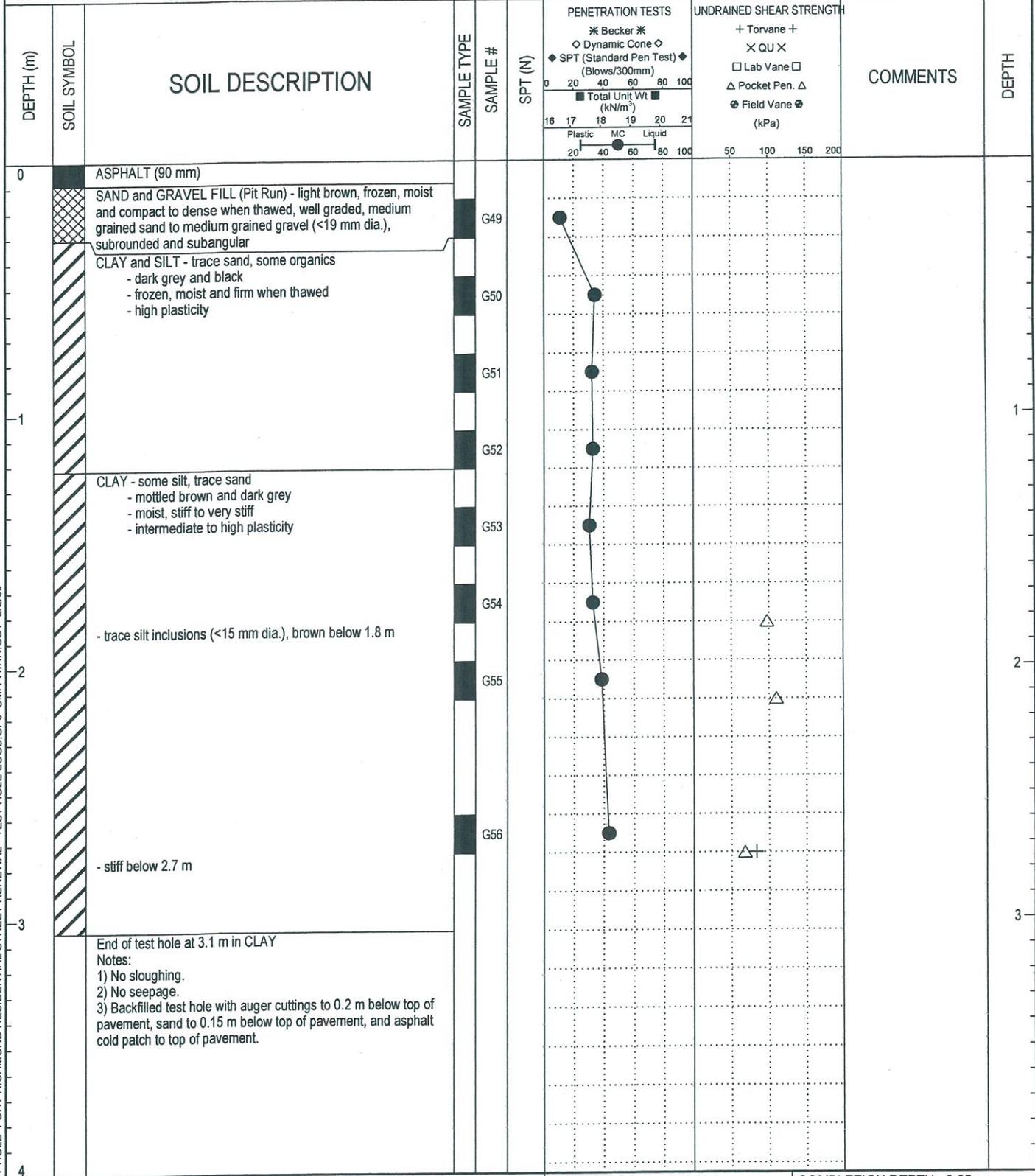


LOG OF TEST HOLE - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Nelson Ferreira	COMPLETION DATE: 12/1/09
PROJECT ENGINEER: Nelson Ferreira	Page 1 of 1

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-07
LOCATION: 2.1 m north of south curb, in front of #5 Seier Bay		PROJECT NO.: 0265-408-00
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

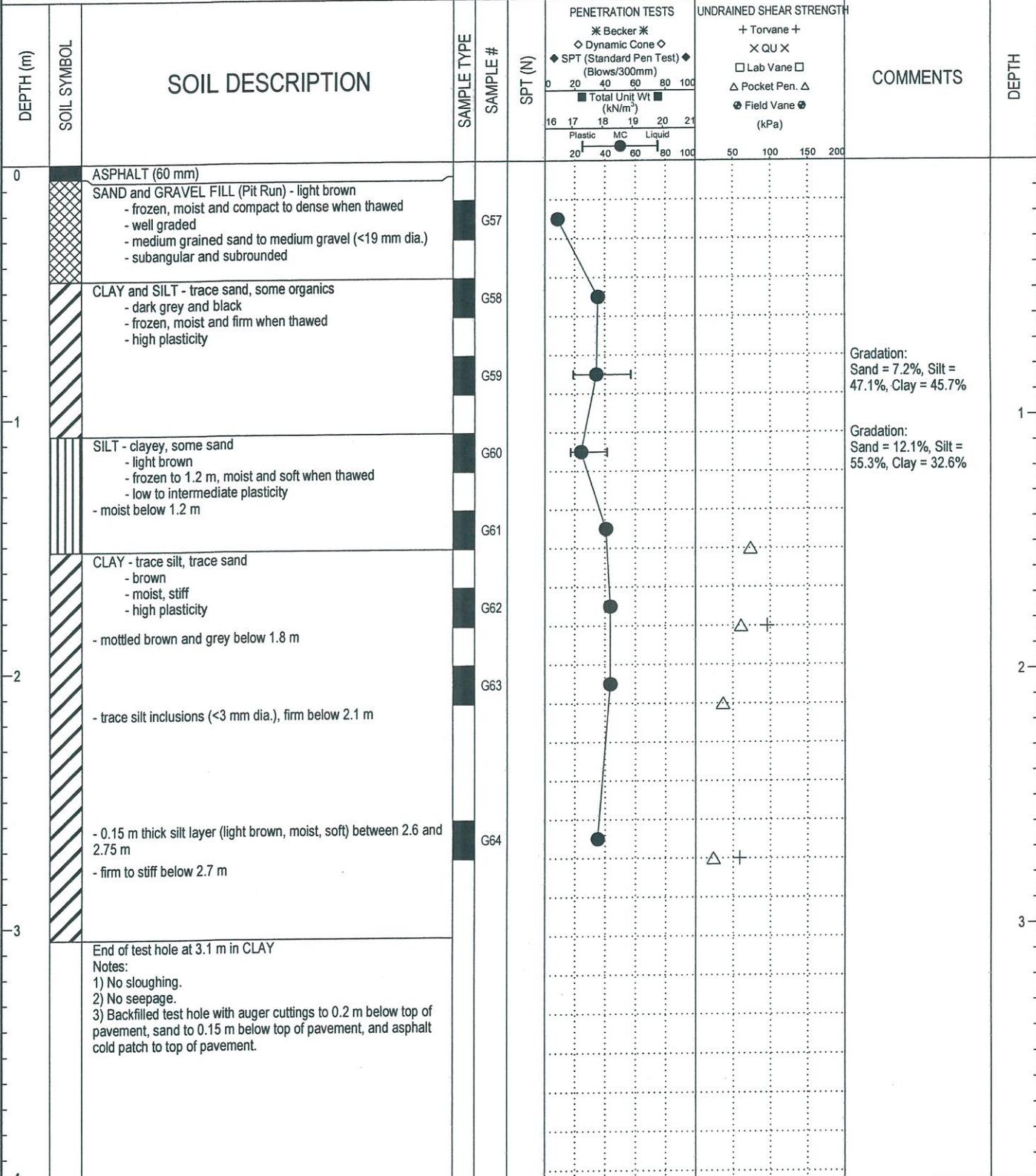


LOG OF TEST HOLE - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ - UMA WINNI.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Nelson Ferreira	COMPLETION DATE: 12/1/09
PROJECT ENGINEER: Nelson Ferreira	Page 1 of 1

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-08
LOCATION: 2.1 m north of south curb, in front of property boundary between #5 and #4 Seier Bay	PROJECT NO.: 0265-408-00	
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	



LOG OF TEST HOLE - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT 2/2/09

AECOM

LOGGED BY: Jared Baldwin	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Nelson Ferreira	COMPLETION DATE: 12/1/09
PROJECT ENGINEER: Nelson Ferreira	Page 1 of 1

PROJECT: Residential Street Renewal	CLIENT: City of Winnipeg	TESTHOLE NO: TH-09-09
LOCATION: 6.7 m north-east of center median light stand, in front of #3 Seier Bay	PROJECT NO.: 0265-408-00	
CONTRACTOR: Paddock Drilling Ltd.	METHOD: 125 mm SSA with 150 mm Coring	ELEVATION (m):
SAMPLE TYPE	<input checked="" type="checkbox"/> GRAB <input type="checkbox"/> SHELBY TUBE <input checked="" type="checkbox"/> SPLIT SPOON <input type="checkbox"/> BULK <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	

DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE #	SPT (N)	PENETRATION TESTS		UNDRAINED SHEAR STRENGTH	COMMENTS	DEPTH
						* Becker * ◇ Dynamic Cone ◇ ◆ SPT (Standard Pen Test) ◆ (Blows/300mm) ■ Total Unit Wt (kN/m <sup>3</sup> )	+ Torvane + × QU × □ Lab Vane □ △ Pocket Pen. △ ● Field Vane ● (kPa)			
0		ASPHALT (80 mm)								
		SAND and GRAVEL FILL (Pit Run) - light brown - frozen, moist and compact to dense when thawed - well graded - medium grained sand to medium gravel (<19 mm dia.) - subangular and subrounded		G65						
		CLAY - silty, trace sand, some organics - dark grey and brown - frozen to 1.4 m, moist and firm to stiff when thawed - high plasticity		G66						
				G67						
				G68						
		- 0.15 m thick silt layer (light brown, moist, soft) between 1.2 and 1.35 m - moist, stiff below 1.4 m		G69						
		CLAY - trace silt, trace sand - brown - moist, stiff - high plasticity - trace silt inclusions (3 mm dia.) below 1.8 m		G70						
				G71						
		- 0.15 m thick silt layer (light brown, moist, soft) between 2.6 and 2.75 m - firm to stiff below 2.7 m		G72						
3		End of test hole at 3.1 m in CLAY Notes: 1) No sloughing. 2) No seepage. 3) Backfilled test hole 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.								

Gradation:  
Sand = 19.5%, Silt = 49.1%, Clay = 31.4%

LOG OF TEST HOLE - FORT RICHMOND RESIDENTIAL STREET RENEWAL - TEST HOLE LOGS.GPJ UMA WINN.GDT. 2/2/09

AECOM

LOGGED BY: Jared Baldwin	COMPLETION DEPTH: 3.05 m
REVIEWED BY: Nelson Ferreira	COMPLETION DATE: 12/1/09
PROJECT ENGINEER: Nelson Ferreira	Page 1 of 1

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# Appendix B

## Photos of Core Samples



Photo 1: Concrete core sample from TH-09-01



Photo 2: Concrete core sample from TH-09-02

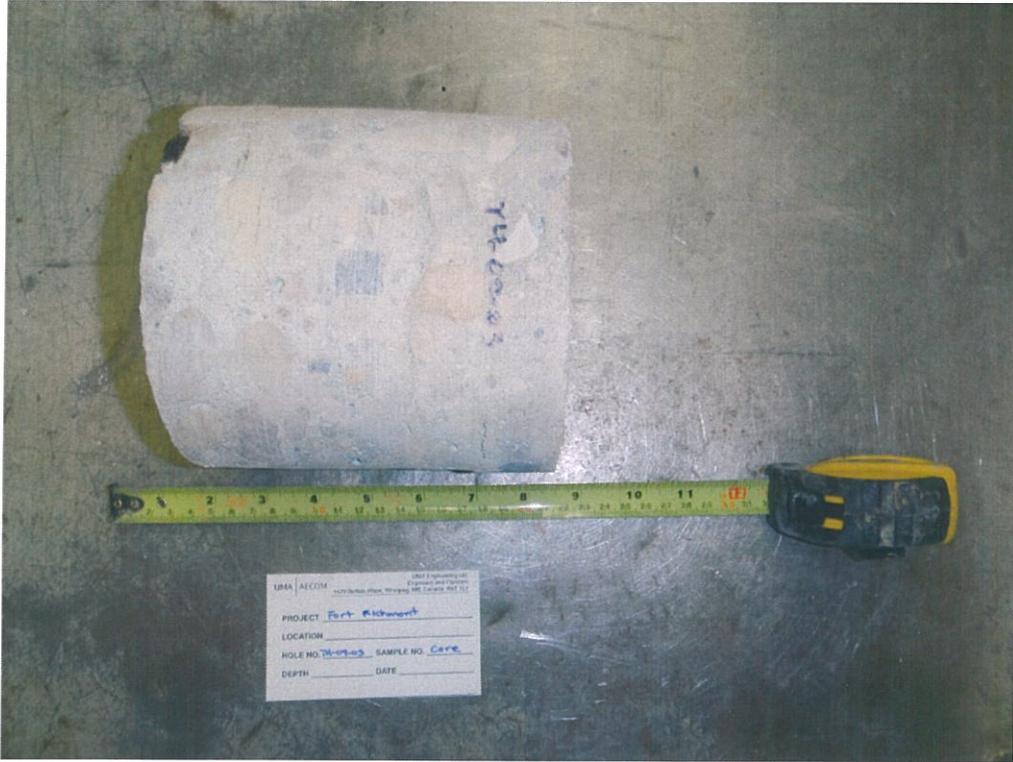


Photo 3: Concrete core sample from TH-09-03

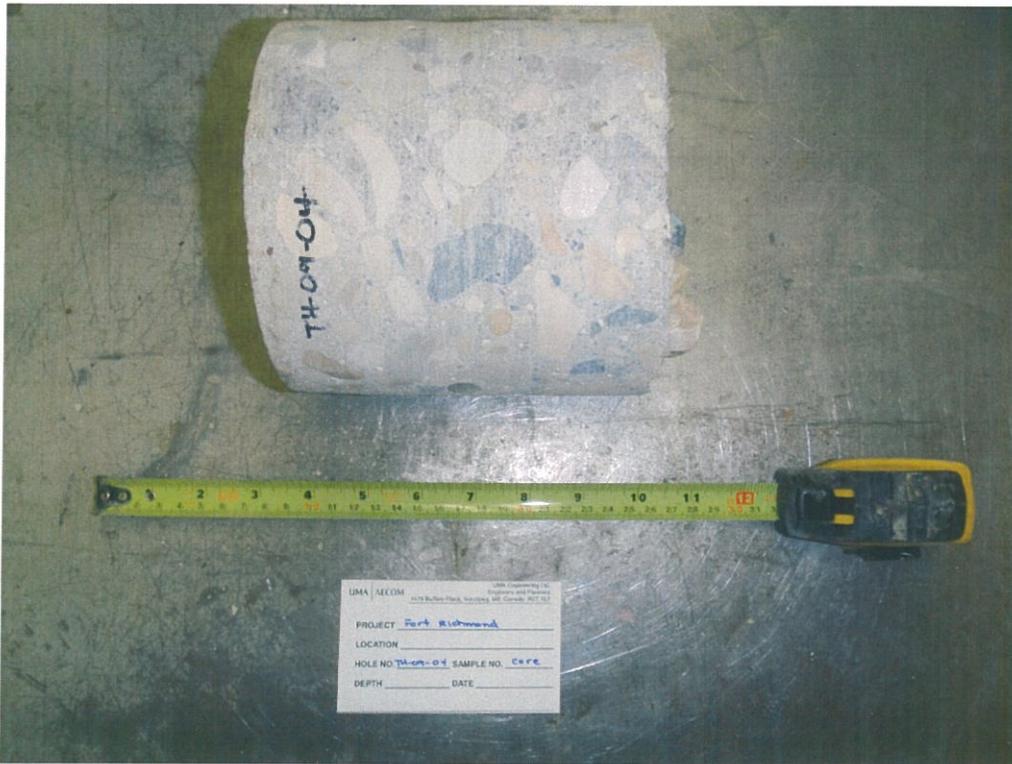


Photo 4: Concrete core sample from TH-09-04



Photo 5: Concrete core sample from TH-09-05



Photo 6: Concrete core sample from TH-09-06



Photo 7: Asphalt core sample from TH-09-07



Photo 8: Asphalt core sample from TH-09-07



Photo 9: Asphalt core sample from TH-09-08



Photo 10: Asphalt core sample from TH-09-08



Photo 11: Asphalt core sample from TH-09-09