# APPENDIX 'A' GEOTECHNICAL REPORT

## **ST. JAMES CIVIC CENTRE**

GEOTECHNICAL REPORT FOR ASPHALT PAVEMENT RESURFACING

2055 NESS AVENUE, WINNIPEG

**Prepared for:** 

City of Winnipeg Public Works Department Winnipeg, Manitoba

City Project No.: 40993 CEL Project No.: WE 05 047 00 WE

June 2005

COCHRANE ENGINEERING LTD.

600 – 5 DONALD STREET WINNIPEG, MB R3L 2T4

ENGINEERS, SCIENTISTS & PROJECT MANAGERS

COCHRANE

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Appendix A - Site Plan

- Appendix B Testhole Logs
- Appendix C Laboratory Test Results

#### 1.0 SUMMARY

A pavement investigation was conducted for the proposed Asphalt Pavement reconstruction of the south, east and north parking lots of the St. James Civic Centre to assess the general subsurface conditions. It was requested that pavement recommendations designed to heavy-duty and light-duty parking lot standards for the proposed Asphalt Pavement Reconstruction be provided. Fourteen testholes drilled to 3.05m depth revealed a general soil profile consisting of a layer of an average 50mm asphalt over an average of 250mm granular fill consisting of either limestone or granular (A-base) fill followed by 150mm to 1m of clay fill (average is about 300mm) over a 150 to 600mm of grey-black clay. This thin clay layer was followed by an olive-grey silt layer in some testholes that ranged from 150 to 600mm over the lower brown, stiff clay which extended to the depth explored at 3m below grade. The clay fill and the silt layers are sporadic which means, not uniform layer. Moist conditions were observed from the silt layers.

Based upon the subsurface conditions encountered, the pavement recommendations for light duty and heavy-duty traffic at the proposed Asphalt Overlay is discussed in Section 6 of this report.

#### 2.0 INTRODUCTION

#### 2.1 SCOPE OF WORK

As part of our Engineering Services Proposal, a subsurface investigation was conducted for the proposed Asphalt Pavement Reconstruction of the south, east and north parking lots of the St. James Civic Centre, 2055 Ness Avenue, Winnipeg. The purpose of this work was to establish the soil and groundwater conditions at the site and provide pavement recommendations as well as comments on potential problems. Authorization to proceed with the work was provided by Mr. Lou Chubenko of the City of Winnipeg.

#### 2.2 EXISTING PARKING LOTS

The existing parking lots at the south, east and north contain numerous alligator cracks, occasional upheaval and trace of raveling (only at south parking lot). The asphalted west parking lot is in good condition.

### 3.0 FIELD INVESTIGATION

The field investigation was undertaken on May 13, 2005. A truck-mounted drill rig with a continuous flight auger was used to drill a total of 14 testholes to a depth of 3m below grade. The testhole locations are shown on the site plan (Figure 1) in Appendix A.

The subsoils encountered were visually classified to the full extent in the testhole and representative soil samples were recovered at regular depth intervals. Pocket penetrometer tests were conducted on cohesive soil to determine the approximate unconfined compressive strength and Standard Penetration Testing(SPT) was conducted as well to determine the relative density. In addition, particle size analysis as well as Atterberg limit tests were conducted on representative samples for classification. Any groundwater seepage and sloughing encountered in the testholes were noted.

#### 4.0 FIELD / LABORATORY TESTING

In the field, random pocket penetrometer and SPT testing were conducted in the testhole to determine the strength and relative density of the soil. The average shear strength ( $C_u$  of the subgrade clay is about 50 kPa. In addition, the average SPT(N) blows of the clay fill/grey-black clay (10) followed by silt layer(3) is about 6.5 blows per 0.3m (foot) which translates to at least a CBR number of 1.9 based on a soil strength relationship. Typically, the CBR number obtained at the laboratory for Winnipeg Clay is between 2 and 4. Detailed descriptions of the soil profiles in each testhole are shown on the attached testhole logs, TH1 to TH14 in Appendix B.

Based on particle size analysis, the samples obtained from TH1 at 1m and TH5, 0.8 to 1.2m were classified as clayey silt material, ML and silty clay, CH. Test results are shown in Appendix C.

#### 5.0 SUBSURFACE CONDITIONS

#### 5.1 SOIL PROFILE/GROUNDWATER

The general soil profile revealed an average layer 50mm asphalt over an average of 250mm granular fill consisting of either limestone or granular (A-base) fill followed by 150mm to 1m of clay fill (average is about 300mm) over a 150 to 600mm of grey-black clay. This thin clay layer was followed by an olive-grey silt layer in some testholes that ranged from 150 to 600mm over the lower brown, stiff clay which extended to the depth explored at 3m below grade. The clay fill and the silt layers are sporadic or not in uniform layers. Moist conditions were observed from the silt layers.

#### 6.0 DISCUSSION AND PAVEMENT RECOMMENDATIONS

Under a light duty traffic, an assumption was made that the pavement will be subjected to a much lesser load in terms of average daily traffic (ADT) of 500 car/van traffic at 12-hour usage with 2% light truck traffic, truck factor of 0.39 and a 15 year design. The light duty traffic translates to wheel loads of 3000 kg each for a maximum of 15,000 kg. Hence, the Equivalent Single Axle Load (ESAL) for light duty traffic is approximately 26,910.

Based on the SPT test and approximate  $C_u$ , the considered value of a Resilient Modulus with an approximate CBR of 1.9 is 10.4 MPa (1520 psi). A CBR of 1.9 was selected since the subgrade (grey-black clay or clay fill) was closely followed by a soft silt layer.

Corresponding calculations for the heavy duty ESAL considering 25 trucks per day, 80% heavy vehicle usage and a truck factor of about 2.39(5-axle tractor semi-trailer with a maximum gross load of 36,500 kg) results in a value of about 261,705 for flexible pavement.

The pavement design was checked with the same subgrade support value and ESALs using AASHTO method. The required structural number (SN) for light duty and heavy duty traffic is 3.19 and 4.58, respectively using a reliability of 85%, overall deviation of 0.5, initial serviceability of 4.2, terminal service of 2.0 and layer coefficients of 0.42 for HMA, 0.14 for granular base and 0.12 for granular subbase preferably limestone.

The recommended pavement construction at this site should be as follows:

### **Pavement Structure**

	Light Duty Traffic Thicknesses	Heavy Duty Traffic Thicknesses	% Compaction
Asphalt	50 mm	75 mm	97% Marshall
Base Course	150 mm	175 mm	100% STD Proctor
Subbase	300 mm	400 mm	100% STD Proctor

The granular base course and subbase materials should include organic-free, non-frozen, aggregate conforming to the City of Winnipeg gradation limits (CW 3110). The subbase material is preferably 150 mm crushed max. limestone aggregate. The subgrade (clay fill/clay) should be compacted to 95% STD Proctor Density.

Where soft silt/clay but dry spots are encountered at the subgrade level, construction traffic should be restricted. Soft spots should be covered with geotextile followed by geogrid and the recommended pavement structure. Any saturated subgrade conditions should be dried off quickly by excavation of sump pit or installation of permanent subdrains (600mm below the subgrade level) connected to positive outlet (catch basin) prior to placing the granular fill structure. Otherwise, the procedure of subcutting and replacing with 150mm down crush limestone over a non-woven geotextile with geogrid will be attempted. The depth of the subcut would entirely depend on the saturation of the subgrade. At these locations, the placing of granular fill should follow the geotextile specifications for soft grounds spot.

Sieve analysis and compaction testing of the granular base and subgrade materials should be conducted by qualified geotechnical personnel to ensure that the materials supplied and percent compactions are in accordance with design specifications. For the hot mix asphaltic concrete, gradation analysis of the aggregates (i.e. stone, fines and additive), compaction testing and sampling of at least one representative hot mix asphalt mixture (during construction) for laboratory Marshall testing should be undertaken. This would provide data to confirm that the asphaltic concrete pavement complies with the project specification. Hot mix asphaltic concrete should not be placed at ambient temperatures lower than  $+4^{\circ}$ C. During placement, the temperature of the paving mix should be in the range of  $+120^{\circ}$ C to  $+150^{\circ}$ C and compaction should not take place at paving mix temperatures lower than  $+85^{\circ}$ C.

#### 7.0 ADDITIONAL CONSIDERATIONS

Adequate site drainage should be provided for the proposed Asphalt Reconstruction. For maintenance purposes, it may be necessary to reseal any cracks prior to winter season to minimize the entrance of water to the pavement structure.

#### 8.0 CLOSURE

The findings and recommendations provided in this report were prepared in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations. If conditions encountered during construction appear to be different than those shown by the testholes at this site, this office should be notified immediately in order that the recommendations can be reviewed.

This report has been prepared by Cochrane Engineering Ltd.(CEL) for the benefit of the client to whom it is addressed. The information and data contained herein represent CEL's best professional judgement in light of the knowledge and information available to CEL at the time of preparation. Except as required by law, this report and the information and data contained herein are to be treated as confidential and may be used and relied upon only by the client, its officers and employees. Cochrane Engineering Ltd. denies any liability whatsoever to other parties who may obtain access to this report for any injury, loss or damage suffered by such parties arising from their use of, or reliance upon, this report or any of its contents without the express written consent of Cochrane Engineering Ltd.(CEL) and

the client. Prepared by Silvestre Johano Jr., P.Eng. PROFESSION

Centificate of Authorization Cochrane Engineering Ltd. No. 227 Expiry: April 30, 2006

St. James Civic Centre Geotechnical Report

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## APPENDIX A

Site Plan



## APPENDIX B

**Testhole Logs** 



Project: St. James Civic Centre

#### Testhole No.: TH1

# COCHRANE

ENGINEERING

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE (BLOWS/0.3M) Description Symbol Depth • Wp |-----0-----| Wl • 20 60 100 140 180 220 **5**0 150 250 350 ft m 100 Ground Surface 0 **GRANULAR FILL** 20mm down limestone mixed with some clay 6 99.4 **CLAY FILL** 8 2 mixed grey and black clay, trace of fine gravel 3. CLAY 8 stiff, grey-black, trace of organic 4 SILT 5 olive-grey, moist to wet, trace of clay CLAY 6 stiff, brown, fissured; silty at 1.8 to 2m. 2 TESTHOLE WAS DRY AFTER 7 COMPLETION OF DRILLING. 8 9 97 - 3 10-End of Testhole 11. 12 13-4 14 15 16 5 17 18-19. 6 20-Cochrane Eng. Ltd. Drill Method: S/S Auger Elevation: 100.0 (Assumed) #600-5 Donald Street Checked by: SSU Drill Date: 05/13/05 Winnipeg, MB. R3L 2T4 Hole Size: 125mm Sheet: 1 of 1

co	CI	Project No: WE-05-04 Project: St. James Civ Client: City of Winnipe Location: 2055 Ness	vic Centre eg	e	Enclosure:	• No.: TH1
ENC	GIN	EERING	Avenue,		Engineer: SS	
		SUBSURFACE PROFILE		SAM	PLE	
Depth	Symbol	Description	Depth/Elev.,m	PP(kPa) ■ 50 150 250 350	SPT, N-VALUE (BLOWS/0.3M)	Water Content % ● Wp
		Ground Surface	100			
- 1 - 2 - 3 - 1 - 4 - 1 - 4 - 1 - 4 1 1 	XANAN	GRANULAR FILL 20mm down limestone mixed with some clay CLAY FILL mixed grey and black clay, trace of fine gravel CLAY stiff, grey-black, trace of organic SILT olive-grey, moist to wet, trace of clay	99.4		6 8 8	
7-	Z					





Project: St. James Civic Centre

Testhole No.: TH2

Client: City of Winnipeg

Enclosure:

Engineer: SSU

ENGINEERING

		SUBSURFACE PROFILE	1		SAMF	PLE							-
Depth	Symbol	Description	Depth/Elev.,m	<b>5</b> 0	PP(kPa)	SPT, N-VALUE (BLOWS/0.3M)						nt %	
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Drill N	Drill Method: S/S Auger Cochrane Eng. Ltd. Elevation: 100.0 (Ass #600-5 Donald Street										)		
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ENGINEERING

Project No: WE-05-047-00-WE

Project: St. James Civic Centre

Testhole No.: TH3

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SAMPLE SUBSURFACE PROFILE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE Description (BLOWS/0.3M) Symbol Depth ● Wp |-----0-----| WI ● 20 60 100140 180220 **5**0 150 250 350 ft m 0----0 Ground Surface 100 ASPHALT(50mm) 99.7 **GRANULAR FILL** 20mm down granular base course material CLAY 99.1 3. grey-black, stiff, trace of organic, fissured 4 SILT olive-grey, moist to wet, soft; frost from 1.2 to 98.5 5. 1.5m 6. 2 CLAY 7• frost down to 2.3m, brown; stiff below 2.3m, 150 fissured. TESTHOLE WAS DRY AFTER 8. COMPLETION OF DRILLING. 9 97 150 - 3 10-End of Testhole 11 12 13 • 4 14 15 16 • 5 17 18-19 • 6 20-Cochrane Eng. Ltd. Elevation: 100.0 (Assumed) Drill Method: S/S Auger #600-5 Donald Street Checked by: SSU Drill Date: 05/13/05 Winnipeg, MB. **R3L 2T4** Hole Size: 125mm Sheet: 1 of 1



Project: St. James Civic Centre

Testhole No.: TH4

Toject. Of James Olvie Cent

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

		SUBSURFACE PROFILE				S	AM	PLE		
Depth	Symbol	Description	Depth/Elev.,m		PP(			SPT, N-VALUE (BLOWS/0.3M)	Water Co	
	<i>。</i> ,	Ground Surface	100	50	150	250	350		20 60 100 14	0 180 220
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	Y		99.7							
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5	$\langle \rangle$	CLAY grey-black, trace of organic, stiff; frost from 1								-
6-	1/	to 2.3m, brown; stiff below 2.3m, fissured.								
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			Project: St. James Civ	vic Centre	Э						
60	Tel:	IRANE	Client: City of Winnipe	g				Enclosure:			
			Location: 2055 Ness	Avenue,	Winn	peg		Engineer: SS	SU		
	GIR	SUBSURFACE P					CAN				
		SUBSURFACE P	RUFILE				SAM				
c	lo	Descri	ption	Depth/Elev.,m		PP(k	Pa)	SPT, N-VALUE (BLOWS/0.3M)	Wa	ter Con	itent %
Depth	Symbol			Dept	<b>5</b> 0	150	250 350		● Wp 20 60	0 100 140	WI ● 180220
0 ft m		Ground Surface		100							
-		ASPHALT(100mm)		99.7							
1-1 _ 1-		GRANULAR FILL 20mm down granular ba	ase course material					10			
2- - 3-	1							6			
	-							0			
- 5	1	CLAY grey-black, trace of orga	anic, stiff; olive-grey at								
6	1	0.8m; frost from 1 to 2.1 stiff below 2.1m, fissure	d. TESTHOLE WAS			1					
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12-					-+-	+	++				
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Hole S	Size: 12	ōmm	R3L 2T	4				Sheet: 1 of 1			

Project: St. James Civic Centre

Client: City of Winnipeg

#### Testhole No.: TH6

## COCHRANE

ENGINEERING

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE Description (BLOWS/0.3M) Symbol Depth • Wp |-----0-----| WI • 20 60 100 140 180 220 **8** 50 150 250 350 Ground Surface 100 ASPHALT(50mm) 99.7 **GRANULAR FILL** 20mm down limestone base course material 4 2 99.2 CLAY FILL 3 3 grey-black and brown, mixed, trace of fine 98.9 gravel 4 SILT 5 olive-grey, moist to wet, soft, trace of clay CLAY 6 olive grey, frost down to 2.1m; brown at 1.5m; 2 stiff below 2.1m, fissured. TESTHOLE WAS 7 DRY AFTER COMPLETION OF DRILLING. 8 9 97 • 3 10-End of Testhole 11 12 13. Λ 14 15 16 5 17 18 19 6 20 Cochrane Eng. Ltd. Drill Method: S/S Auger Elevation: 100.0 (Assumed) #600-5 Donald Street Drill Date: 05/13/05 Checked by: SSU Winnipeg, MB. R3L 2T4 Hole Size: 125mm Sheet: 1 of 1



Project: St. James Civic Centre

#### Testhole No.: TH7

COCHRANE

ENGINEERING

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT. N-VALUE (BLOWS/0.3M) Description Symbol Depth ● Wp |------| WI ● 20 60 100 140 180 220 **5**0 150 250 350 ft m 100 Ground Surface 0-ASPHALT(125mm) 99.7 **GRANULAR FILL** 20mm down limestone(75mm) base course 2 material followed by a mixture(150mm) of clay and granular material 3. 4 CLAY grey-black, stiff, trace of organic; olive grey at 5 0.6m, silty, soft; frost from 1.1m to 2.1m; brown at 1.2m; stiff below 2.1m, fissured. **TESTHOLE WAS DRY AFTER** 6 COMPLETION OF DRILLING. 2 7 125 8 9 97 75 3 10-End of Testhole 11 12 13-4 14 15 16-5 17 18. 19 · 6 20-Elevation: 100.0 (Assumed) Drill Method: S/S Auger Cochrane Eng. Ltd. #600-5 Donald Street Drill Date: 05/13/05 Winnipeg, MB. Checked by: SSU R3L 2T4 Hole Size: 125mm Sheet: 1 of 1



Project: St. James Civic Centre

#### Testhole No.: TH8

COCHRANE

ENGINEERING

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE Description (BLOWS/0.3M) Symbol Depth ● Wp |-----0-----| WI ● 20 60 100 140 180 220 ₩ 50 150 250 350 ft m 100 Ground Surface 0-ASPHALT(50mm) **GRANULAR FILL** 99.5 20mm down granular base course material 2 99.2 **CLAY FILL** 3olive grey, mixed, trace of fine gravel 4 CLAY grey-black, stiff, fissured 98.5 5 SILT soft, olive-grey, moist to wet; frost from 1.2 to 6 2.1m 2 7 150 CLAY brown; stiff below 2.1m, fissured. TESTHOLE 8 WAS DRY AFTER COMPLETION OF DRILLING. 9. 97 100 • 3 10-End of Testhole 11 12. 13-4 14 15. 16-5 17 18-19-· 6 20-Drill Method: S/S Auger Cochrane Eng. Ltd. Elevation: 100.0 (Assumed) #600-5 Donald Street Drill Date: 05/13/05 Winnipeg, MB. Checked by: SSU R3L 2T4 Hole Size: 125mm Sheet: 1 of 1



ENGINEERING

Project No: WE-05-047-00-WE

Project: St. James Civic Centre

Testhole No.: TH9

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE Description (BLOWS/0.3M) Symbol Depth 50 150 250 350 • Wp |-----| WI • 20 60 100 140 180 220 ft m Ground Surface 100 0-ASPHALT(50mm) 99.7 **GRANULAR FILL** 20mm down granular base course material CLAY FILL 99.1 3 olive grey and grey-black, mixed, trace of fine gravel and silt material 5 CLAY 50mm of grey-black clay, stiff; olive grey at 6 1m, silty, firm; frost from 1.2 to 2.1m; brown at 1.5m; stiff below 2.1m, fissured. TESTHOLE 2 WAS DRY AFTER COMPLETION OF 7 125 DRILLING. 8 9 97 - 3 100 10-End of Testhole 11· 12 13-- 4 14 15 16 5 17 18 19 · 6 20-Drill Method: S/S Auger Cochrane Eng. Ltd. Elevation: 100.0 (Assumed) #600-5 Donald Street Drill Date: 05/13/05 Checked by: SSU Winnipeg, MB. **R3L 2T4** Hole Size: 125mm Sheet: 1 of 1

Project: St. James Civic Centre

Testhole No.: TH10

# COCHRANE

ENGINEERING

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

	SUBSURFACE PROFILE					
Depth Symbol	Description	Depth/Elev.,m		PP(kPa)	SPT, N-VALUE (BLOWS/0.3M)	Water Content % ● Wp
	Ground Surface	100				
$ \begin{array}{c} 0 & 1 \\ 1 \\ 2 \\ - \\ 3 \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ - \\ -$	Ground Surface ASPHALT(75mm) GRANULAR FILL 20mm down limestone base course material CLAY FILL olive grey and grey-black, mixed, trace of fine gravel and silt material CLAY grey-black, trace of organic, stiff SILT olive grey, soft, wet CLAY frost down to 2.1m, olive grey, silty; brown at 1.8m; stiff below 2.1m, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING. End of Testhole	99.2 98.2 97	100			
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Drill Method: Drill Date: 05 Hole Size: 12	#600-5 Dona /13/05 Winnipeg R3L 2	ld Stree MB.	t		Elevation: 100 Checked by: S Sheet: 1 of 1	



Project: St. James Civic Centre

Location: 2055 Ness Avenue, Winnipeg

Testhole No.: TH11

Client: City of Winnipeg

Enclosure:

Engineer: SSU

ENGINEERING



# COCHRANE

ENGINEERING

Project No: WE-05-047-00-WE

Project: St. James Civic Centre

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Testhole No.: TH12

Enclosure:

Engineer: SSU

		SUBSURFACE PROFILE				S	SAMF	PLE							
Depth	Symbol	Description	Depth/Elev.,m	<b>1</b> 50		kPa) 250	-	SPT, N-VALUE (BLOWS/0.3M)				Cor			
0 0 0 0		Ground Surface	100		dan İ		بت		+	<u> </u>	<u> </u>	<u>í í c</u>	ليت	لتت	٣
0+0	X	ASPHALT(37.5mm)			T	T			T	TT	TT	TT	17	П	П
		GRANULAR FILL 20mm down limestone base course material;	99.5												an an and a second second second second
2-		slight seepage at layer's base	99.2								+	+	++		
3		CLAY FILL olive grey and grey-black, mixed, trace of fine gravel and silt material													
		CLAY grey-black, trace of organic, stiff	98.3												
6- 2 7- -		<i>SILT</i> olive grey, soft, wet; frost at 1m; tan-brown at 1m		1	00										
8-1 9-1 10-1-3		CLAY frost down to 2.1m, olive grey; brown at 1.8m; stiff below 2.1m, fissured. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	97	75											
10		End of Testhole													
12- - 134 -															
15-1 15-1															
16- 										All Martin and All All And	And a second sec	and the second s		An in the second	
18-															
19 <b></b> -6 20													SANATANA SA		And a construction of the second
Drill Me	ethod: {	S/S Auger Cochrane E						Elevation: 100	).0 (/	Ass	um	ied)	,		
Drill Da	ate: 05/	/13/05 #600-5 Dona R3L 2	, MВ.	ət				Checked by: S	SU						
Hole Si	ize: 12	5mm KSL 2	14					Sheet: 1 of 1							

Project: St. James Civic Centre

Testhole No.: TH13

# COCHRANE

ENGINEERING

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

		SUBSURFACE PROFILE				SAMF	PLE	
Depth	Symbol	Description	Depth/Elev.,m		PP(kF	Pa) 250 350	SPT, N-VALUE (BLOWS/0.3M)	Water Content % ● Wp  0  WI ● 20 60 100 140 180 220
0		Ground Surface	100					
		ASPHALT(100mm)						
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	X ALTANA ANA ANA ANA ANA ANA ANA ANA ANA ANA	GRANULAR FILL 20mm down limestone base course material CLAY grey-black, trace of organic, stiff, fissured; olive grey at 0.8m, silty down to 1m; brown at 1.5m; silty at 1.8 to 2m. TESTHOLE WAS DRY AFTER COMPLETION OF DRILLING.	99.5		150			
10-3			97	75				
$ \begin{array}{c} 11 \\ 12 \\ 13 \\ -4 \\ 14 \\ 15 \\ -5 \\ 17 \\ 18 \\ -18 \\ -4 \\ -5 \\ 17 \\ -5 \\ 17 \\ -18 \\ -7 \\ -7 \\ -7 \\ -7 \\ -7 \\ -7 \\ -7 \\ -7$		End of Testhole						
19 <b></b> 6 20					an Anna Anna Anna Anna Anna Anna Anna A			
Drill Metho	od: S	/S Auger Cochrane Er	na Itd				Elevation: 100.	0 (Assumed)
Drill Date:	: 05/1	#600-5 Donal 3/05 Winnipeg, R3L 2T	d Street MB.	t			Checked by: SS	
	. 120							



ENGINEERING

Project No: WE-05-047-00-WE

**Testhole No.: TH14** 

Project: St. James Civic Centre

Client: City of Winnipeg

Location: 2055 Ness Avenue, Winnipeg

Enclosure:

Engineer: SSU

SUBSURFACE PROFILE SAMPLE Depth/Elev.,m PP(kPa) Water Content % SPT, N-VALUE (BLOWS/0.3M) Description Symbol Depth 150 250 350 50 ft m Ground Surface 100 0 GRANULAR FILL 99.7 20mm down limestone base course material 2 3 CLAY grey-black, trace of organic, stiff, fissured; 5 olive grey at 0.8m, silty down to 1m; frost from 1.2 to 2.1m; brown at 1.8m; stiff below 2.1m. TESTHOLE WAS DRY AFTER 6 COMPLETION OF DRILLING. 2 7 150 8 g 97 100 • 3 10 End of Testhole 11 12 13. 14 15 16 5 17 18 19 6 20. Drill Method: S/S Auger Cochrane Eng. Ltd. Elevation: 100.0 (Assumed) #600-5 Donald Street Checked by: SSU Drill Date: 05/13/05 Winnipeg, MB. R3L 2T4 Sheet: 1 of 1 Hole Size: 125mm

## APPENDIX C

Laboratory Test Results

MAY 31 '05 14:07 FR NATIONA	_ TESTING LABS204 488	3 6947 TO 4742864
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199 Henlow Bay Winnipeg, MB R3Y 1G4 Phone (204) 488-6999 Fax (204) 488-6997 Email info@nationaltestlabs.com www.nationaltestlabs.com

P.01/02

Cochrane Engineering Ltd. 600-5 Donald Street Winnipeg, Manitoba R3L 2T4 May 30, 2005

Attention:Silvestre Urbano

Project: St. James Civic Centre (COC-506)

Soll samples were submitted to our laboratory on May 24, 2005. The following tests were conducted on selected soil samples as requested by the client:

- water content (ASTM D2216)
- particle size analysis (ASTM D422)

The test results are provided in the attached tables.

Please call if you have any questions regarding this report.

Prepared by:

Engineering Services

Robert Brown, Environmental and Geotechnical

Reviewed by: Mathali

Rob Hochkievich, C. Tech., Project Manager, Environmental and Geotechnical Engineering Services

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P.02/02



### TABLE 1 ST. JAMES CIVIC CENTRE WATER CONTENT TEST DATA

Sample Identification	Water Content, %
TH1, 2.5'	31.4
TH1, 3'	19.0
<b>T</b> H1, 5'	31.8
TH1, 10'	55.3
TH2, 2.5'	23.1
TH3, 2.5'	37.1
TH5,1'-2.5'	14.7
TH5, 2.5'-4'	28.7
TH5, 10'	41.5

#### Note:

1. Tests conducted in accordance with ASTM D2216.

### TABLE 2 ST. JAMES CIVIC CENTRE PARTICLE SIZE ANALYSIS TEST DATA

Sample Identification	Gravel, %		Sand, %	Silt, %	Clay, %	Colloids, %	
	75 to 4.75 mm	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm	<0.075 to 0.005 mm	< 0.005 mm	< 0.001 mm
TH1, 3'	11.2	2.6	3.7	12.4	43.5	26.6	20.0
TH5, 2.5'-4'	0.0	0.5	1.3	3.1	18.2	76.9	68.1

#### <u>Notes</u>

1. Test conducted in accordance with ASTM D422.

2. A high speed stirring device was used for 1 minute to disperse the test sample.

3. The percentage of colloids is also included in the clay size fraction.