

APPENDIX 'A'

GEOTECHNICAL REPORT

APPENDIX 'A' – GEOTECHNICAL REPORT

GEOTECHNICAL REPORT FOR:

- I. BURROWS AVENUE FROM MCPHILLIPS STREET TO SGT TOMMY PRINCE STREET
- II. MAGNUS AVENUE FROM PARR STREET TO MCKENZIE STREET
- III. IRVING PLACE FROM GRANDVIEW STREET TO HENDERSON HIGHWAY
- IV. BRAZIER STREET FROM JAMISON AVENUE TO DONALDA AVENUE

The geotechnical report is provided to aid in the Contractor's evaluation of the existing pavement structure and/or soil conditions. The information presented is considered accurate at the locations shown on the Drawings and at the time of drilling. However, variations in pavement structure and/or soil conditions may exist between test holes and fluctuations in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences.



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February 20, 2013

File No.: 12-037-02

Engineering Division
Public Works Department
City of Winnipeg
106 – 1155 Pacific Avenue
Winnipeg, Manitoba
R3E 3P1

ATTENTION: Mr. Derek Teperto, C.E.T.

RE: 2013 City of Winnipeg Residential Street Renewal Program

Dear Mr. Teperto,

1.0 Introduction

ENG-TECH Consulting Limited (ENG-TECH) was retained by City of Winnipeg to conduct a geotechnical investigation on selected streets in the City of Winnipeg. The purpose of the geotechnical investigation was to identify the pavement structure and the underlying soil stratigraphy. In addition, a laboratory testing program consisting of moisture contents, atterberg limits and particle size analyses were conducted to confirm the classification of the underlain soils.

2.0 Scope of Work

The scope of work for the project was as follows:

- Core a total of 24 holes through the existing pavement structure on Magnus Avenue (between Mckenzie Street & Parr Street), Burrows Avenue (McPhillips Street to Sgt. Tommy Prince Street), Irving Place (Grandview Street to Henderson Highway), and Brazier Street (Jamison Avenue to Donalda Street) using a 150 mm diameter core barrel. Retain the cores for thickness measurements and photographs in our laboratory.
- Drill a test hole at each cored location to a depth of 2 m +/- 150 mm below the surface of the pavement. Classify the underlying soils and collect samples from the auger flights at regular intervals. Retain the samples for laboratory analysis and confirmatory classification.
- Complete a report outlining the work conducted including test hole summary tables with laboratory test results, and photographs of the cores.

3.0 Field Program

ENG-TECH conducted the coring and test hole drilling program on January 14th and 15th, 2013. All test holes were re-located from the original designations due to the presence of underground services, and are shown in Figures 1 to 4. The test holes were drilled using 125 mm diameter solid stem continuous flight augers using an Acker MP8 truck mounted drill rig owned and operated by Paddock Drilling Ltd. Twenty four (24) test holes were advanced from 2.1 to 2.3 m below surface of pavement. Soil samples were collected at regular depth intervals and at stratigraphic changes off the auger flights. All test holes were backfilled with the sand and capped with cold mix asphalt upon the completion of drilling. The core thicknesses and stratigraphy at the location of each test hole are outlined on Tables 1 to 4.

4.0 Laboratory Program

The soil samples collected and the pavement structure cores were retained for analysis in our laboratory. The moisture content of each sample was determined and select samples were tested for particle size analysis and atterberg limits. The pavement structure core thicknesses were confirmed and the cores photographed. The moisture content, particle size and atterberg limit results are summarized on Tables 1 to 4. The photographs of the cores and site plans are attached.

6.0 Closure

ENG-TECH trusts this is all the information required. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited

Reviewed by



Clark Hryhoruk, M.Sc., P. Eng.
Principal, Geotechnical Engineer



Danny Holfeld, Principal
Manager of Operations

CDH/wg

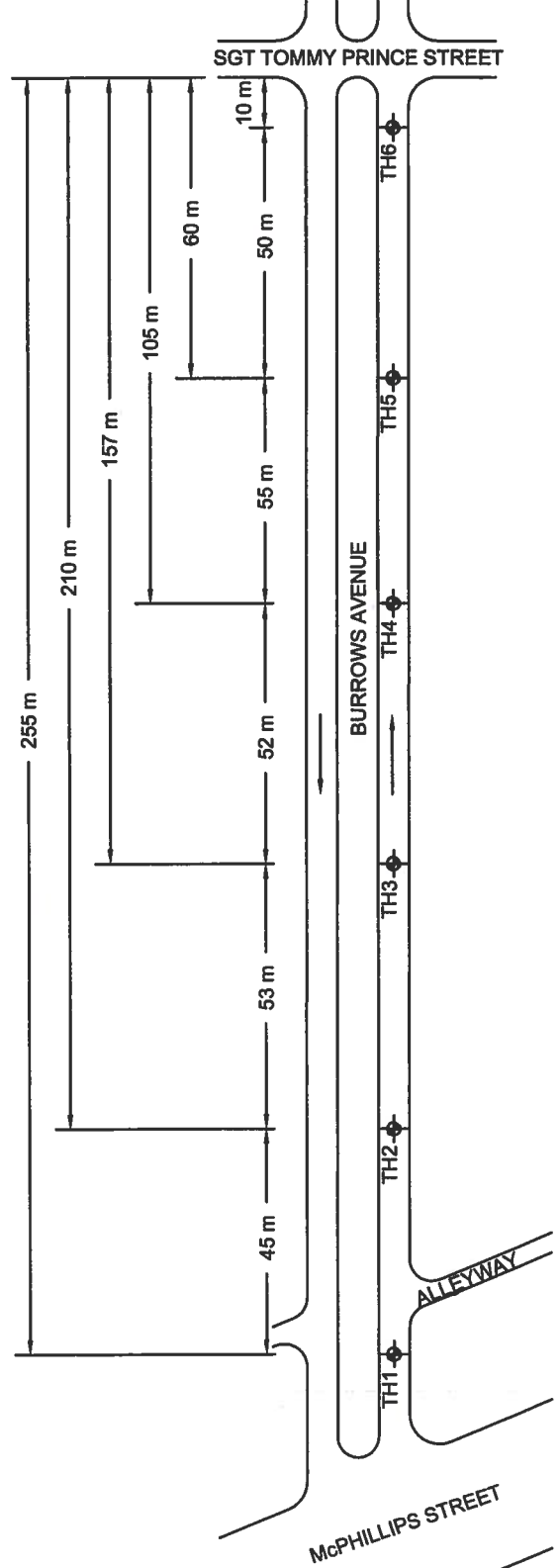
Attachments:

- Figure 1 of 4 – Test Hole Location Plan – Burrows Avenue
- Figure 2 of 4 – Test Hole Location Plan – Magnus Avenue
- Figure 3 of 4 – Test Hole Location Plan – Irving Place
- Figure 4 of 4 – Test Hole Location Plan – Brazier Street
- Table 1 – Summary of Pavement Structure – Burrows Avenue (3 pages)
- Table 2 – Summary of Pavement Structure – Magnus Avenue (2 pages)
- Table 3 – Summary of Pavement Structure – Irving Place (2 pages)
- Table 4 – Summary of Pavement Structure – Brazier Street (5 pages)
- Photograph of Cores – Burrows Avenue (2 sheets)
- Photograph of Cores – Magnus Avenue (2 sheet)
- Photograph of Cores – Irving Place (2 sheet)
- Photograph of Cores – Brazier Street (4 sheet)

TEST HOLE No.	OFFSET OF TEST HOLES
TH1	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH2	EAST BOUND LANE 1.5 m NORTH OF CENTRE LINE
TH3	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH4	EAST BOUND LANE 1.5 m NORTH OF CENTRE LINE
TH5	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH6	EAST BOUND LANE 1.5 m NORTH OF CENTRE LINE



GPS COORDINATES OF TEST HOLES		
TEST HOLE No.	UTM	14U
TH1	5531858	0631488
TH2	5531846	0631508
TH3	5531826	0631555
TH4	5531802	0631603
TH5	5531777	0631655
TH6	5531763	0631691



LEGEND



TEST HOLE

NO. DATE ISSUE / REVISION

0 Jan 16/13 review / approval



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CLIENT:
CITY OF WINNIPEG

PROJECT:
CITY OF WINNIPEG
STREET RENEWAL PROGRAM

DWG DESCRIPTION:
TEST HOLE LOCATION PLAN -
BURROWS AVENUE

SCALE:
NTS

DRAWN BY:
ALH

DATE:
JANUARY 2013

FILE No.:

12-037-02

ENG-TECH DWG/FIG. No.:

1

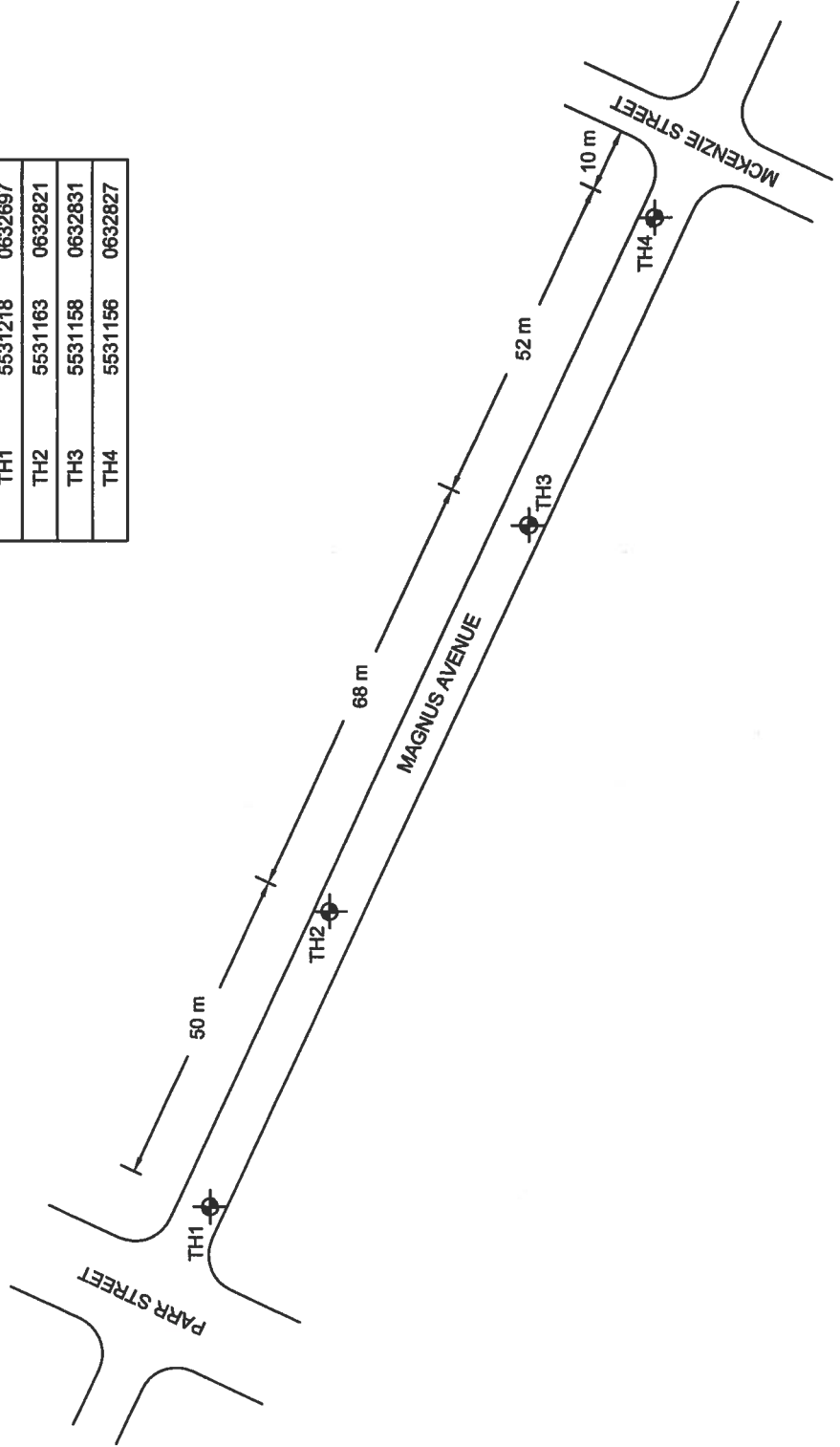
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TEST HOLE

TEST HOLE No.	OFFSET OF TEST HOLES
TH1	WEST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH2	WEST BOUND LANE 1.5 m NORTH OF CENTRE LINE
TH3	WEST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH4	WEST BOUND LANE 1.5 m NORTH OF CENTRE LINE

GPS COORDINATES OF TEST HOLES			
TEST HOLE No.	UTM	14U	
TH1	5531218	0632697	
TH2	5531163	0632821	
TH3	5531158	0632831	
TH4	5531156	0632827	



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ENG. STAMP:



CLIENT:
CITY OF WINNIPEG

PROJECT:
CITY OF WINNIPEG
STREET RENEWAL PROGRAM

DWG DESCRIPTION:
TEST HOLE LOCATION PLAN -
MAGNUS AVENUE

SCALE:
NTS

DRAWN BY:
ALH

DATE:
JANUARY 2013

FILE NO.:
12-037-02

ENG-TECH DWG/FRG. NO.:

NO.:

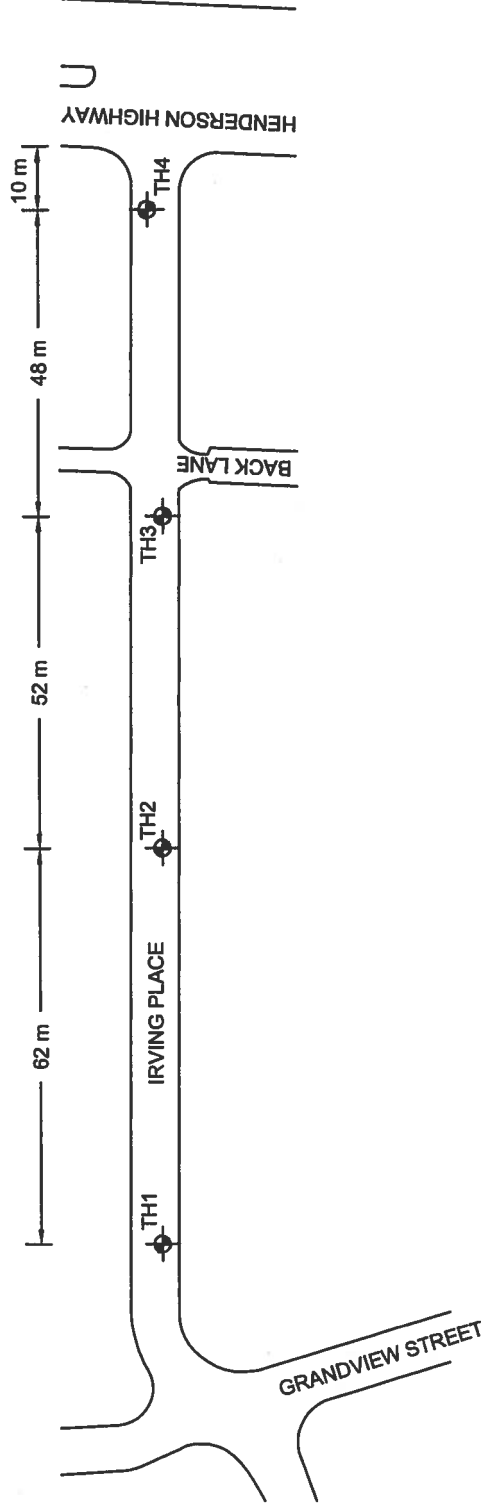
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TEST HOLE

TEST HOLE No.	OFFSET OF TEST HOLES
TH1	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH2	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH3	EAST BOUND LANE 1.5 m SOUTH OF CENTRE LINE
TH4	WEST BOUND LANE 1.5 m NORTH OF CENTRE LINE

GPS COORDINATES OF TEST HOLES			
TEST HOLE No.	UTM	14U	
TH1	5533786	0636950	
TH2	5533746	0637018	
TH3	5533731	0637065	
TH4	5533712	0637102	



NO.	DATE	ISSUE / REVISION
0	Jan 16/13	review / approval
 <p>46 - 854 Marison Street Winnipeg, MB R2J 0K4 Phone: (204) 233-1684 Fax: (204) 235-1579</p>		
 <p>Certificate of Authorization ENG-TECH Consulting Limited No.2475 Expiry: April 30, 2013</p>		
CLIENT:		CITY OF WINNIPEG
PROJECT:		CITY OF WINNIPEG STREET RENEWAL PROGRAM
DWG DESCRIPTION: TEST HOLE LOCATION PLAN - IRVING PLACE		
SCALE: NTS		
DRAWN BY:	DATE:	
ALH	JANUARY 2013	
FILE No.:	CLIENT DWG/FRG. No.:	
12-037-02		
ENG-TECH DWG/FRG. No.:		NO.:
		3

LEGEND

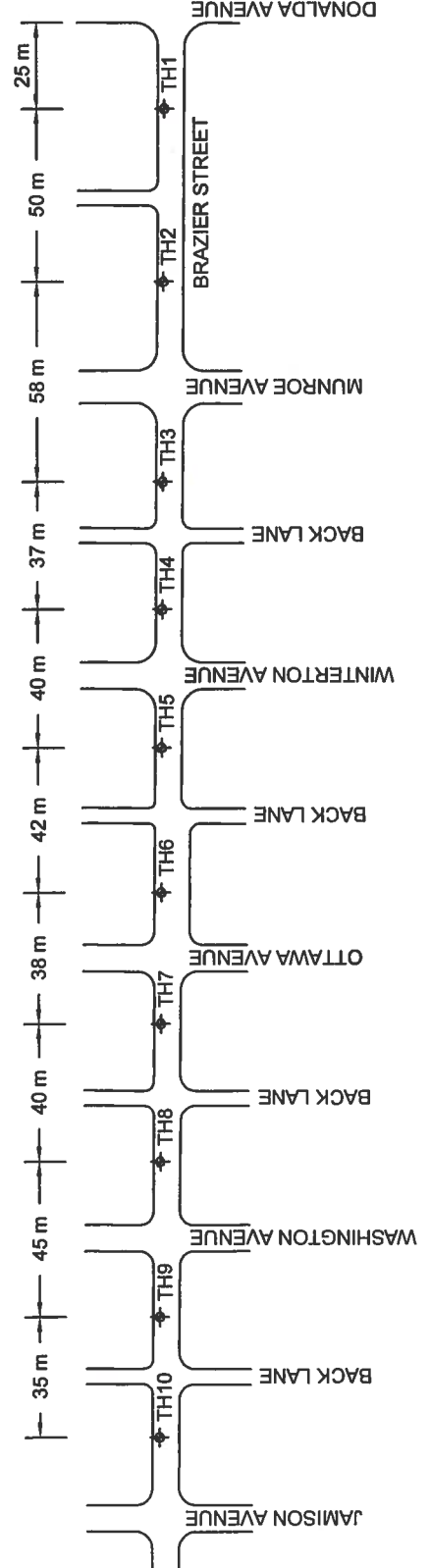


TEST HOLE



TEST HOLE No.	OFFSET OF TEST HOLES
TH1	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH2	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH3	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH4	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH5	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH6	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH7	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH8	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH9	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE
TH10	SOUTH BOUND LANE 1.5 m WEST OF CENTRE LINE

GPS COORDINATES OF TEST HOLES		
TEST HOLE No.	UTM	14U
TH1	5531344	0636041
TH2	5531304	0636017
TH3	5531250	0635997
TH4	5531207	0635975
TH5	5531180	0635964
TH6	5531146	0635944
TH7	5531109	0635919
TH8	5531063	0635906
TH9	5531028	0635892
TH10	5530997	0635872



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ENG-TECH
CONSULTING LIMITED

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CLIENT:
CITY OF WINNIPEG

PROJECT:
CITY OF WINNIPEG
STREET RENEWAL PROGRAM

DWG DESCRIPTION:
TEST HOLE LOCATION PLAN -
BRAZIER STREET

SCALE:
NTS

DATE:
JANUARY 2013

DRAWN BY:
ALH

FILE NO.:
12-037-02

ENG-TECH DWG/FIG. NO.:

NO.:

**Table 1
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 1 of 3

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index						
1	Burrows Avenue	Asphalt	77	Granular (Maximum Size 20mm)	152	Silty Clay (Fill)	0.1	39.7													
							0.4	38.9													
							0.7	40.7													
						Silt	1.0	39.9													
						Silty Clay	1.3	23.7													
						Silty Clay	1.6	40.8													
						Silty Clay	1.9	41.8													
						Silty Clay (Fill)	0.1	25.9	0.2	5.9	63.0	30.9	39	18	21						
						Silt	0.4	19.8	0.0	9.3	85.8	4.9	26	17	9						
						Clayey Silt	0.7	18.9													
2	Burrows Avenue	Asphalt Concrete	120 228	-	-	Silty Clay	1.0	27.9													
							1.3	39.5													
							1.6	49.6													
							1.9	52.7													



**Table 1
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 2 of 3

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
3	Burrows Avenue	Asphalt Concrete	72 182	Granular (Maximum Size 9.5mm)	51	Silty Clay (Fill)	0.1	46.9									
							0.4	37.8	0.0	1.9	25.2	72.9	72	37	35		
							0.7	36.9									
							1.0	34.9									
							1.3	44.8									
							1.6	43.7									
4	Burrows Avenue	Asphalt Concrete	99 130	-	-	Silty Clay (Fill)	0.1	28.1									
							0.4	17.6									
							0.7	27.9	0.0	5.1	43.3	51.6	35	15	20		
							1.0	30.0									
							1.3	23.9									
							1.6	23.9									



**Table 1
Summary of Pavement Structure**

City of Winnipeg 2013 Residential Street Renewal Program

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index	
5	Burrows Avenue	Asphalt Concrete	112 127	-	-	Silt (Fill)	0.1	27.6								
						Silt	0.4	23.6								
						Clayey Silt	0.7	34.9	0.0	6.5	53.8	39.7	33	15	18	
						Silt	1.0	24.0								
						Silt	1.3	23.4								
6	Burrows Avenue	Asphalt Concrete	99 178	Granular (Maximum Size 12.5mm)	51	Silty Clay	1.6	27.8								
						Silty Clay	1.9	45.1								
						Silty Clay (Fill)	0.1	35.1								
						Silty Clay (Fill)	0.4	32.8								
						Silty Clay (Fill)	0.7	36.9								
6	Burrows Avenue	Asphalt Concrete	99 178	Granular (Maximum Size 12.5mm)	51	Silt	1.0	37.5								
						Silt	1.3	24.5								
						Silty Clay	1.6	39.2								
6	Burrows Avenue	Asphalt Concrete	99 178	Granular (Maximum Size 12.5mm)	51	Silty Clay	1.9	45.5								



**Table 2
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 1 of 2

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
1	Magnus Avenue	Asphalt Concrete	33 184	-	-	Silty Clay (Fill)	0.1	34.9									
							0.4	30.4									
							0.7	15.6									
							1.0	16.2									
							1.3	32.7									
							1.6	26.9									
2	Magnus Avenue	Asphalt Concrete	43 198	-	-	Silty Clay (Fill)	0.1	31.2									
							0.4	28.3	0.1	3.1	41.4	55.4	71	22	49		
							0.7	11.8									
							1.0	31.0									
							1.3	19.4									
							1.6	17.9									
						1.9	33.9										



**Table 2
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 2 of 2

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
3	Magnus Avenue	Asphalt	42	-	-	Silty Clay (Fill)	0.1	25.0									
							Clayey Silt	0.4	24.2	0.0	3.9	59.1	37.0	35	15	20	
		Concrete	222			Silt	0.7	10.2	0.0	8.0	78.8	13.2	NP	NP	NP		
						Silty Clay	1.0	33.8									
							1.3	38.2									
							1.6	38.9									
4	Magnus Avenue	Asphalt	34	-	-	Silty Clay (Fill)	0.1	37.6									
							Clayey Silt	0.4	31.9								
		Concrete	225			Silt	0.7	22.1									
							1.0	15.6									
							1.3	33.2									
							1.6	39.1									
					1.9	47.2											

Note: NP = None Plastic



**Table 3
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 1 of 2

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
1	Irving Place	Concrete	135	-	-	Silty Clay (Fill)	0.1	33.9									
							0.4	31.5	0.9	2.8	27.4	68.9	77	23	54		
							0.7	26.2									
							1.0	31.9									
							1.3	30.9									
2	Irving Place	Concrete	151	-	-	Silty Clay (Fill)	0.1	29.6									
							0.4	29.6									
							0.7	33.2	2.1	3.4	35.4	59.1	62	19	43		
							1.0	30.8									
							1.3	28.7									



**Table 3
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 2 of 2

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index				
3	Irving Place	Concrete	151	-	-	Silty Clay (Fill)	0.1	32.6											
							0.4	31.6											
							0.7	35.8											
							1.0	41.4											
							1.3	29.9											
							1.6	35.0											
4	Irving Place	Concrete	149	-	-	Silty Clay (Fill)	0.1	36.4											
							0.4	37.4											
							0.7	37.5											
							1.0	35.5											
							1.3	35.7											
							1.6	34.4											



**Table 4
Summary of Pavement Structure**

City of Winnipeg 2013 Residential Street Renewal Program

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index			
1	Brazier Street	Asphalt Concrete	43 142	Granular (Maximum Size 40mm)	25	Silty Clay (Fill)	0.1	26.5										
							0.4	28.9										
							0.7	13.0	0.0	4.7	90.5	4.8	21	18			3	
							1.0	23.9										
							1.3	24.5										
							1.6	35.5										
2	Brazier Street	Asphalt Concrete	46 143	Granular (Maximum Size 25mm)	76	Silty Clay (Fill)	0.1	41.3										
							0.4	44.2										
							0.7	31.4										
							1.0	28.2										
							1.3	24.4										
							1.6	39.1										
						1.9	45.1											



**Table 4
Summary of Pavement Structure**

File No.: 12-037-02

City of Winnipeg 2013 Residential Street Renewal Program

Page 2 of 5

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
3	Brazier Street	Asphalt Concrete	26 156	Granular (Maximum Size 12.5mm)	178	Silty Clay (Fill)	0.1	16.8									
							0.4	38.8									
							0.7	35.1									
							1.0	34.6									
							1.3	34.3									
							1.6	27.5									
4	Brazier Street	Asphalt Concrete	32 135	Granular (Maximum Size 12.5mm)	64	Silty Clay (Fill)	0.1	38.6									
							0.4	40.3	0.0	1.7	51.0	47.3	45	18	27		
							0.7	19.9									
							1.0	36.9									
							1.3	36.6									
							1.6	43.5									



**Table 4
Summary of Pavement Structure**

City of Winnipeg 2013 Residential Street Renewal Program

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index					
5	Brazil Street	Asphalt	51	Granular (Maximum Size 12.5mm)	51	Silty Clay (Fill)	0.1	34.3												
			Concrete				139													
6	Brazil Street	Asphalt	22	Granular (Maximum Size 12.5mm)	38	Silty Clay (Fill)	0.1	33.7												
			Concrete				156													



**Table 4
Summary of Pavement Structure**

City of Winnipeg 2013 Residential Street Renewal Program

Test Hole Number	Test Hole Location	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 (%)	Liquid Limit	Plastic Limit	Plasticity Index		
7	Brazier Street	Asphalt Concrete	49 155	Granular (Maximum Size 12.5mm)	51	Silty Clay (Fill)	0.1	30.0									
						Clayey Silt (Fill)	0.4	32.1	5.0	10.4	13.4	54.2	19.8	69	21	48	
						Silty Clay (Fill)	0.7	28.8									
							1.0	21.0									
							1.3	19.6									
							1.6	22.4									
8	Brazier Street	Asphalt Concrete	54 152	Granular (Maximum Size 12.5mm)	25	Silty Clay (Fill)	0.1	40.1									
							0.4	39.5									
							0.7	40.5									
							1.0	32.1									
							1.3	31.6									
							1.6	36.9									
	1.9	38.5															





Burrows Avenue
McpPhillips Street to Sgt. Tommy Prince Street



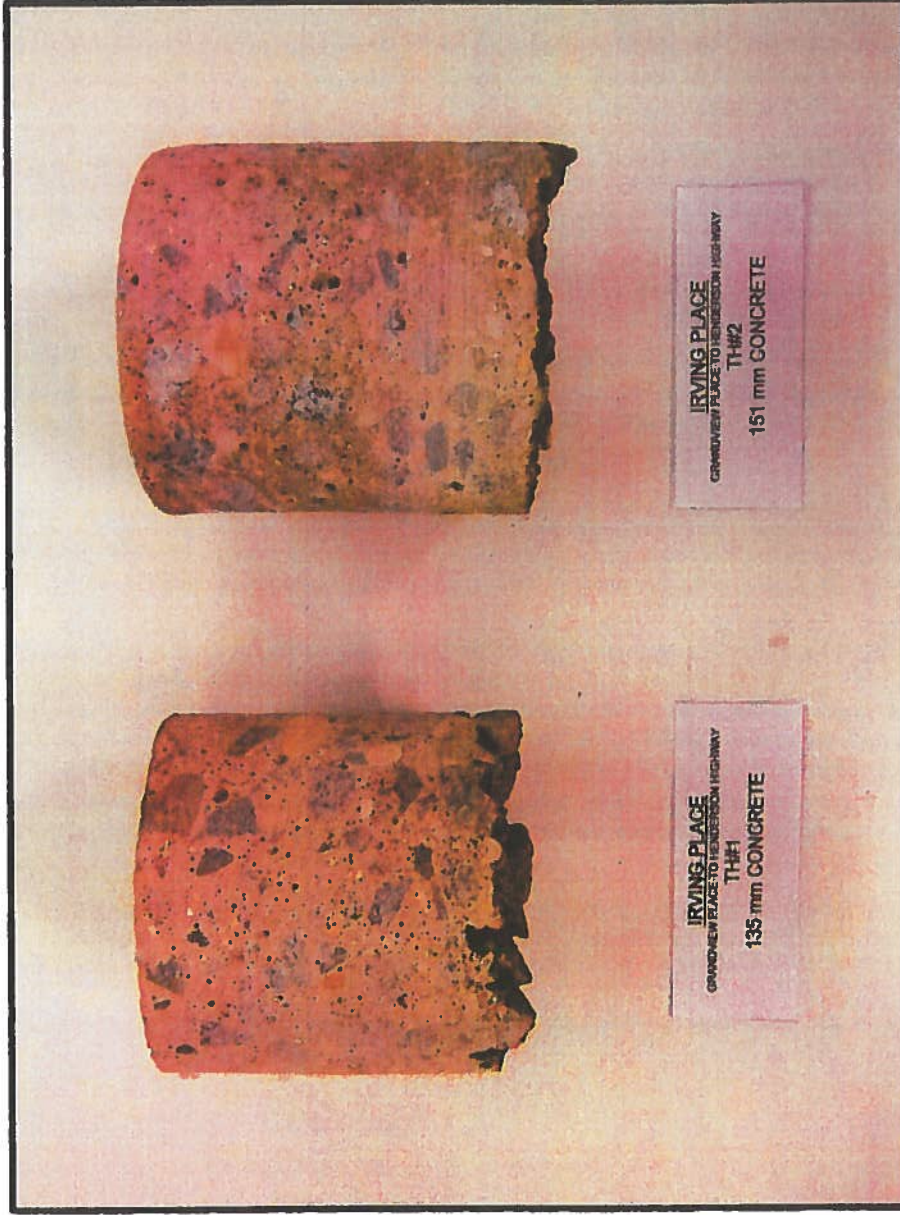
Burrows Avenue
McPhillips Street to Sgt. Tommy Prince Street



Magnus Avenue
Parr Street to Mckenzie Street

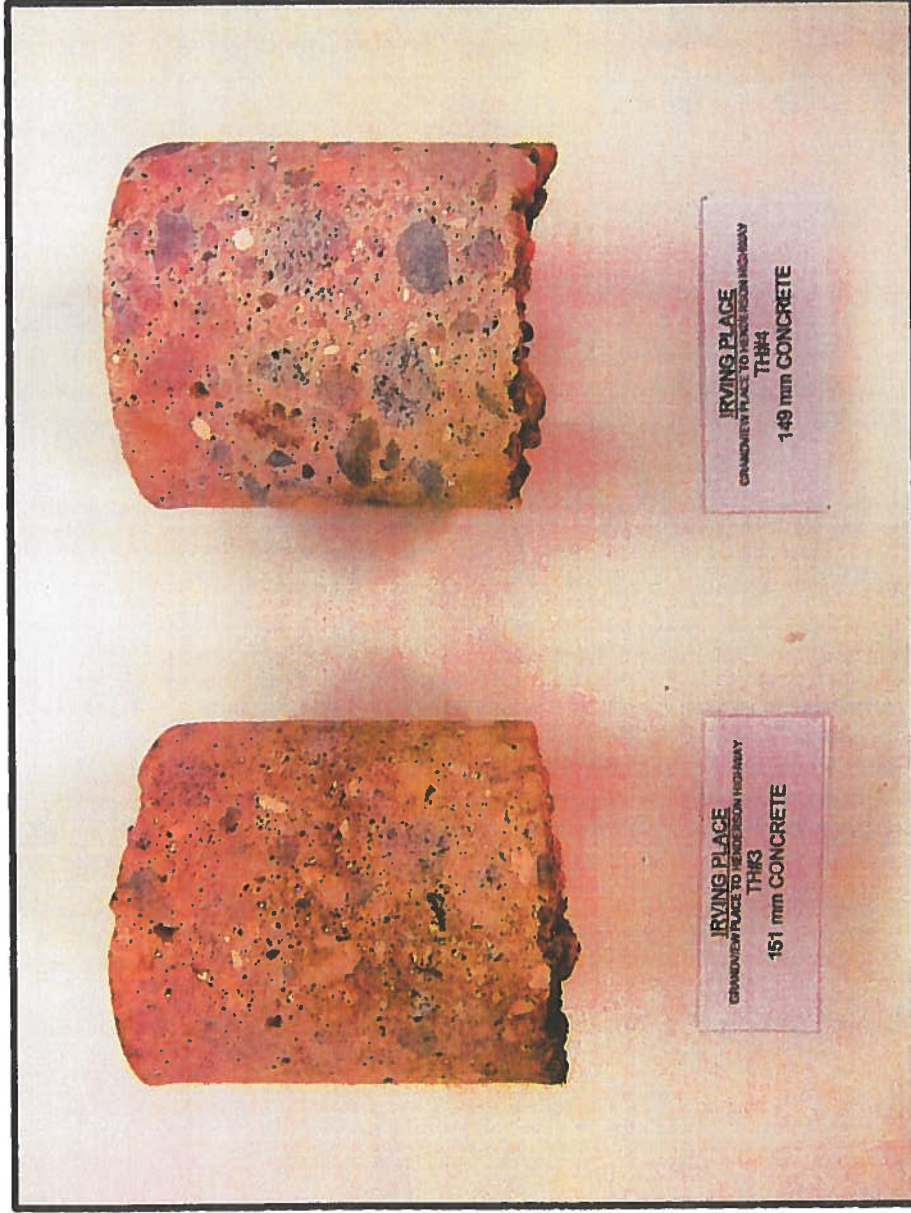


Magnus Avenue
Parr Street to Mckenzie Street



Irving Place
Grandview Street to Henderson Highway





Irving Place
Grandview Street to Henderson Highway





Brazier Street
Jamison Avenue to Donaldda Street





Brazier Street
Jamison Avenue to Donalda Street





Brazier Street
Jamison Avenue to Donalda Street



Brazier Street
Jamison Avenue to Donald Street

