

# **APPENDIX 'A'**

# **GEO TECHNICAL REPORT**

## APPENDIX 'A' - GEOTECHNICAL REPORT

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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.

### Geotechnical Report for Century Street Northbound

#### Test Hole Locations



 <p><b>THE NATIONAL TESTING LABORATORIES LIMITED</b>          Established in 1923</p>	Project No. KGS-1307 Date: Oct. 18, 2013	Drawn by: SB Reviewed by: GL	Figure: 1 Scale: NTS	Testhole Location Plan 2013 Regional Streets Program Century St. N/B at Saskatchewan Ave. Winnipeg, Manitoba
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**Test Hole Log for TH01**

**TESTHOLE TH01**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 186.7 m South from SE corner of Century St & Saskatchewan Ave, 1 m West from East curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	● Water Content (%)			
				25	50	75	100
0.0 - 0.05		Asphalt					
0.05 - 0.1		Concrete					
0.1 - 0.5		Clay Fill - black, firm, moist, medium plasticity - some medium to coarse grained sand - trace silt	BS		●30		
0.5 - 0.9		Clay - black, firm, moist, high plasticity - brown and stiff below 0.9 m	BS		●32		
0.9 - 1.1			BS		●35		
1.1 - 1.3			BS		●36		
1.3 - 1.5			BS		●40		
1.5 - 1.7			BS		●39		
1.7 - 2.1			BS		●42		
2.1 - 2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>					

**Test Hole Log for TH02**

**TESTHOLE TH02**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 146.2 m South from SE corner of Century St & Saskatchewan Ave, 1.0 m West from East curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	Particle Size Distribution				Water Content (%)					
				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	PL		LL			
										25	50	75	100
		<b>Asphalt</b>											
		<b>Concrete</b>											
0.5		<b>Clay</b> - black, firm, moist, high plasticity	BS										●33
		<b>Clayey Silt</b> - brown, firm, moist, medium plasticity - trace sand	BS	0.4	9.3	58.1	32.2						●241
1.0		<b>Clay</b> - brown, stiff, moist, high plasticity	BS										●29
1.5		<b>Clay</b> - brown, stiff, moist, high plasticity	BS										●38
		<b>Silty Clay</b> - tan, firm, moist, high plasticity	BS										●39
2.0		<b>Clay</b> - brown, stiff, moist, high plasticity	BS										●38
		<b>Clay</b> - brown, stiff, moist, high plasticity	BS										●39
2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>											

**Test Hole Log for TH03**

<b>TESTHOLE TH03</b>				
<b>Project Name: 2013 Regional Streets Program</b> <b>Project Location: Century Street Northbound at Saskatchewan Avenue</b> <b>Client: KGS Group Inc.</b> <b>Drilling Contractor: Active Drilling and Piling</b> <b>Drilling Method: 125 mm Solid Stem Auger</b> <b>Testhole Location: 80.2 m South from SE corner of Century St &amp; Saskatchewan Ave, 0.5 m East from East curb</b>		<b>Date Drilled: October 3, 2013</b> <b>Depth of Testhole: 2.1 m</b> <b>Logged by: Sothea Bun</b> <b>Reviewed by: German Leal</b>		
Depth (m)	Symbol	Description	Sample Type	● Water Content (%)
				25   50   75   100
		<b>Topsoil</b>		
0.5		<b>Clay Fill</b> - brown, firm, moist, medium plasticity - some medium to coarse grained sand - some organic material - trace silt	BS	●52
			BS	●28
			BS	●25
1.0		<b>Clay</b> - brown, firm, moist, high plasticity - stiff below 2.0 m	BS	●36
			BS	●41
1.5			BS	●34
			BS	●37
2.0			BS	●42
2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>		

**Test Hole Log for TH04**

**TESTHOLE TH04**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 75.4 m South from SW corner of Century St & Saskatchewan Ave, 1.0 m East from West curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	● Water Content (%)			
				25	50	75	100
		<b>Asphalt</b>					
		<b>Concrete</b>					
		<b>Granular Fill</b> - 50 mm maximum aggregate size	BS ●5				
0.5		<b>Clay Fill</b> - grey, firm, moist, medium plasticity - some medium to coarse grained sand - trace fine gravel	BS ●27				
1.0		<b>Silty Clay</b> - brown, soft, moist, medium plasticity	BS ●30				
			BS ●39				
			BS ●37				
1.5		<b>Clay</b> - brown, stiff, moist, high plasticity	BS ●36				
2.0			BS ●41				
			BS ●41				
2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>					

**Test Hole Log for TH05**

**TESTHOLE TH05**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 47.3 m South from SE corner of Century St & Saskatchewan Ave, 2.5 m East from East curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	● Water Content (%)				
				25	50	75	100	
		<b>Topsoil</b>						
		<b>Clay Fill</b> - black, firm, moist, medium plasticity - some medium to fine grained sand - some silt	BS	●29				
0.5			BS	●21				
			BS	●17				
1.0		<b>Clay</b> - grey, stiff, moist, high plasticity - brown and some silt below 1.6 m	BS	●31				
			BS	●35				
1.5			BS	●37				
			BS	●39				
2.0			BS	●42				
		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>						
2.5								

**Test Hole Log for TH06**

<b>TESTHOLE TH06</b>													
<b>Project Name: 2013 Regional Streets Program</b> <b>Project Location: Century Street Northbound at Saskatchewan Avenue</b> <b>Client: KGS Group Inc.</b> <b>Drilling Contractor: Active Drilling and Piling</b> <b>Drilling Method: 125 mm Solid Stem Auger</b> <b>Testhole Location: 20.6 m South from SE corner of Century St &amp; Saskatchewan Ave, 1.0 m East from West curb</b>		<b>Date Drilled: October 3, 2013</b> <b>Depth of Testhole: 2.1 m</b> <b>Logged by: Sothea Bun</b> <b>Reviewed by: German Leal</b>											
Depth (m)	Symbol	Description	Sample Type	Particle Size Distribution				Water Content (%)					
				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	PL		LL			
		<b>Asphalt</b>											
		<b>Concrete</b>											
0.5		<b>Granular Fill</b> - 20 mm maximum aggregate size	BS									5	
			BS									8	
1.0		<b>Clay</b> - grey, stiff, moist, high plasticity - some sand - some silt - brown below 1.5 m	BS	0.8	16.9	14.4	67.9					32	
			BS									39	
1.5			BS									42	
			BS									40	
2.0			BS									40	
2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>											

**Test Hole Log for TH07**

**TESTHOLE TH07**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 13.3 m South from SE corner of Century St & Saskatchewan Ave, 4.0 m East from East curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	● Water Content (%)			
				25	50	75	100
		<b>Topsoil</b>					
0.5		<b>Clay Fill</b> - black, stiff, moist, medium plasticity - some medium to coarse grained sand - some organic material	BS		●27		
		<b>Clay</b> - grey, stiff, moist, high plasticity	BS		●24		
1.0		<b>Clay</b> - grey, stiff, moist, high plasticity	BS		●30		
		<b>Clay</b> - grey, stiff, moist, high plasticity	BS		●32		
1.5		<b>Silty Clay</b> - tan, firm, moist, high plasticity	BS		●33		
		<b>Clay</b> - brown, firm, moist, high plasticity	BS		●36		
2.0		<b>Clay</b> - brown, firm, moist, high plasticity	BS		●40		
2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>					

**Test Hole Log for TH08**

**TESTHOLE TH08**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 7.3 m East from NE corner of Border St & Saskatchewan Ave, 9.4 m North from North curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	Particle Size Distribution				Water Content (%)					
				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	PL	LL				
		<b>Topsoil</b>											
		<b>Clay Fill</b> - black, stiff, moist, high plasticity - some medium to coarse grained sand - some silt - some fine gravel - some organic material	BS										
0.5			BS	14.1	29.1	20.6	36.2			47			
		<b>Clay</b> - grey, stiff, moist, high plasticity	BS										
1.0			BS										
1.5			BS										
2.0			BS										
		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>											

**Test Hole Log for TH09**

<b>TESTHOLE TH09</b>				
<b>Project Name: 2013 Regional Streets Program</b> <b>Project Location: Century Street Northbound at Saskatchewan Avenue</b> <b>Client: KGS Group Inc.</b> <b>Drilling Contractor: Active Drilling and Piling</b> <b>Drilling Method: 125 mm Solid Stem Auger</b> <b>Testhole Location: 77.1 m North from NE corner of Border St &amp; Saskatchewan Ave, 1.0 m West from East curb</b>		<b>Date Drilled: October 3, 2013</b> <b>Depth of Testhole: 2.1 m</b> <b>Logged by: Sothea Bun</b> <b>Reviewed by: German Leal</b>		
Depth (m)	Symbol	Description	Sample Type	● Water Content (%)
				25   50   75   100
	[Asphalt Symbol]	<b>Asphalt</b>		
	[Concrete Symbol]	<b>Concrete</b>		
0.5	[Granular Fill Symbol]	<b>Granular Fill</b> - 20 mm maximum aggregate size	BS ●6	
			BS ●8	
1.0	[Clay Fill Symbol]	<b>Clay Fill</b> - black, stiff, moist, high plasticity - some medium to coarse grained sand	BS ●27	
1.5	[Clayey Silt Symbol]	<b>Clayey Silt</b> - brown, firm, moist, medium plasticity - trace sand - trace fine gravel	BS ●16	
			BS ●26	
2.0	[Silt Symbol]	<b>Silt</b> - tan, soft, moist, low plasticity	BS ●21	
	[Clay Symbol]	<b>Clay</b> - grey, firm, moist, high plasticity	BS ●34	
2.5		<ul style="list-style-type: none"> <li>• No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>• Testhole terminated at a depth of 2.1 m.</li> </ul>		

**Test Hole Log for TH10**

**TESTHOLE TH10**



**Project Name:** 2013 Regional Streets Program  
**Project Location:** Century Street Northbound at Saskatchewan Avenue  
**Client:** KGS Group Inc.  
**Drilling Contractor:** Active Drilling and Piling  
**Drilling Method:** 125 mm Solid Stem Auger  
**Testhole Location:** 37.2 m North from NW corner of Century St & Saskatchewan Ave, 1.0 m East from West curb

**Date Drilled:** October 3, 2013  
**Depth of Testhole:** 2.1 m  
**Logged by:** Sothea Bun  
**Reviewed by:** German Leal

Depth (m)	Symbol	Description	Sample Type	● Water Content (%)			
				25	50	75	100
0.0 - 0.1		Asphalt					
0.1 - 0.2		Concrete					
0.2 - 1.2		Granular Fill - 20 mm maximum aggregate size	BS ●4 BS ●5 BS ●5				
1.2 - 2.1		Clay - grey, stiff, moist, high plasticity	BS ●20 BS ●32 BS ●33 BS ●30				
2.1 - 2.5		<ul style="list-style-type: none"> <li>No groundwater seepage or soil sloughing was observed during or upon completion of drilling.</li> <li>Testhole terminated at a depth of 2.1 m.</li> </ul>					

**Particle Size Analysis for TH02**



**PARTICLE SIZE ANALYSIS  
 ASTM D422**

KGS Group Inc.  
 3rd Floor - 865 Waverly Street  
 Winnipeg, MB  
 R3T 5P4

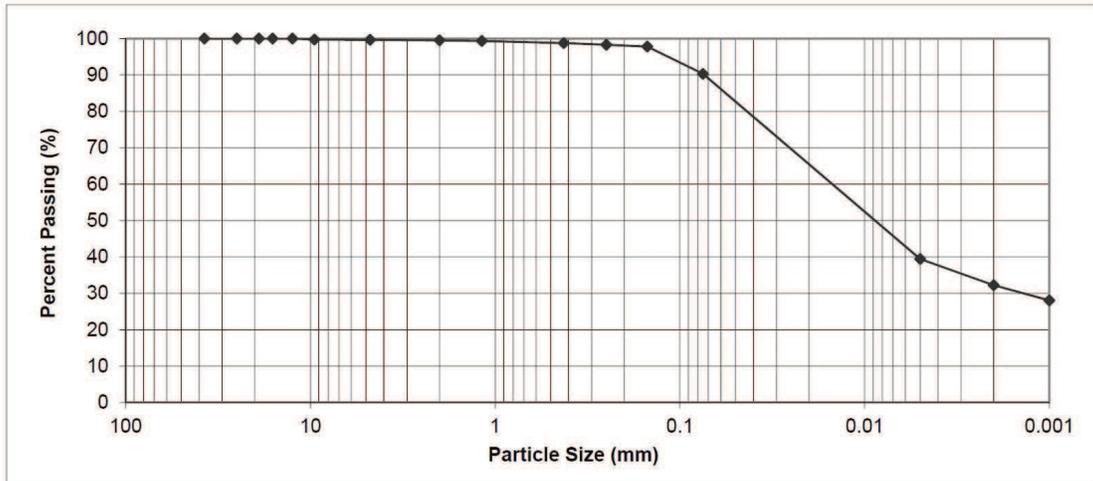
PROJECT: 2013 Regional Streets Program  
 Century Street Northbound  
 at Saskatchewan Avenue

Attention: Michael Turko

PROJECT NO.: KGS-1307

SAMPLED BY: Sothea Bun  
 SAMPLE ID: TH 2 at 0.6 m

DATE RECEIVED: October 3, 2013  
 TESTED BY: Nestor Abarca



PARTICLE SIZE		PERCENT PASSING	PARTICLE SIZE		PERCENT PASSING
37.50 mm		100.0	1.18 mm		99.3
25.00 mm		100.0	0.425 mm		98.7
19.00 mm		100.0	0.250 mm		98.3
16.00 mm		100.0	0.150 mm		97.8
12.50 mm		100.0	0.075 mm		90.3
9.50 mm		99.7	0.005 mm		39.4
4.75 mm		99.6	0.002 mm		32.2
2.00 mm		99.5	0.001 mm		28.0
Gravel, % 75 to 4.75 mm		0.4	Silt, % <0.075 to 0.002 mm		58.1
Sand, %			Clay, % <0.002 mm		32.2
Coarse <4.75 to 2.0 mm	0.1	Medium <2.0 to 0.425 mm	0.8	Colloids, % < 0.001 mm	28.0
		Fine <0.425 to 0.075 mm	8.4		

October 17, 2013

REVIEWED BY: German E. Leal, B.Sc., P. Eng.

**Particle Size Analysis for TH06**



**PARTICLE SIZE ANALYSIS  
 ASTM D422**

KGS Group Inc.  
 3rd Floor - 865 Waverly Street  
 Winnipeg, MB  
 R3T 5P4

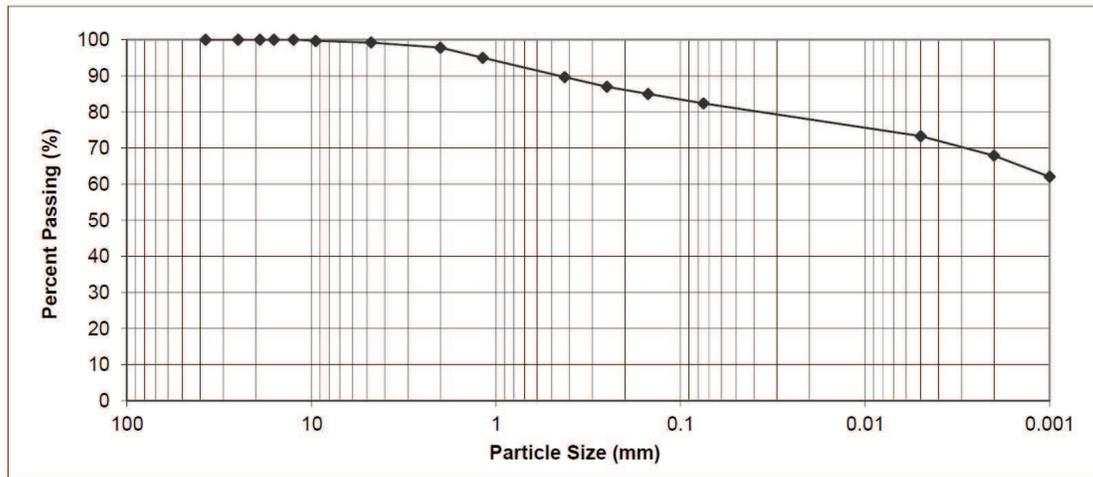
PROJECT: 2013 Regional Streets Program  
 Century Street Northbound  
 at Saskatchewan Avenue

Attention: Michael Turko

PROJECT NO.: KGS-1307

SAMPLED BY: Sothea Bun  
 SAMPLE ID: TH 6 at 0.9 m

DATE RECEIVED: October 3, 2013  
 TESTED BY: Nestor Abarca



PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0
25.00 mm	100.0
19.00 mm	100.0
16.00 mm	100.0
12.50 mm	100.0
9.50 mm	99.7
4.75 mm	99.2
2.00 mm	97.8

PARTICLE SIZE	PERCENT PASSING
1.18 mm	95.0
0.425 mm	89.6
0.250 mm	86.9
0.150 mm	85.0
0.075 mm	82.3
0.005 mm	73.3
0.002 mm	67.9
0.001 mm	62.0

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
0.8	1.4	8.2	7.3	14.4	67.9	62.0

October 17, 2013

REVIEWED BY: German E. Leal, B.Sc., P. Eng.

**Particle Size Analysis for TH08**



**PARTICLE SIZE ANALYSIS  
 ASTM D422**

KGS Group Inc.  
 3rd Floor - 865 Waverly Street  
 Winnipeg, MB  
 R3T 5P4

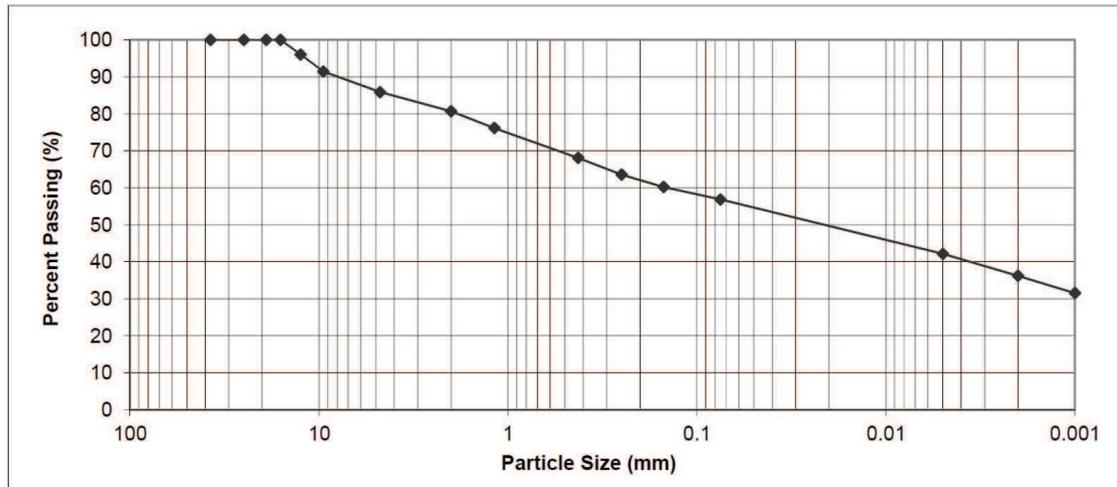
PROJECT: 2013 Regional Streets Program  
 Century Street Northbound  
 at Saskatchewan Avenue

Attention: Michael Turko

PROJECT NO.: KGS-1307

SAMPLED BY: Sothea Bun  
 SAMPLE ID: TH 8 at 0.6 m

DATE RECEIVED: October 3, 2013  
 TESTED BY: Nestor Abarca



PARTICLE SIZE	PERCENT PASSING	PARTICLE SIZE	PERCENT PASSING
37.50 mm	100.0	1.18 mm	76.2
25.00 mm	100.0	0.425 mm	68.1
19.00 mm	100.0	0.250 mm	63.6
16.00 mm	100.0	0.150 mm	60.2
12.50 mm	96.0	0.075 mm	56.8
9.50 mm	91.4	0.005 mm	42.1
4.75 mm	85.9	0.002 mm	36.2
2.00 mm	80.7	0.001 mm	31.5

Gravel, % 75 to 4.75 mm	Sand, %			Silt, % <0.075 to 0.002 mm	Clay, % <0.002 mm	Colloids, % < 0.001 mm
	Coarse <4.75 to 2.0 mm	Medium <2.0 to 0.425 mm	Fine <0.425 to 0.075 mm			
14.1	5.2	12.6	11.3	20.6	36.2	31.5

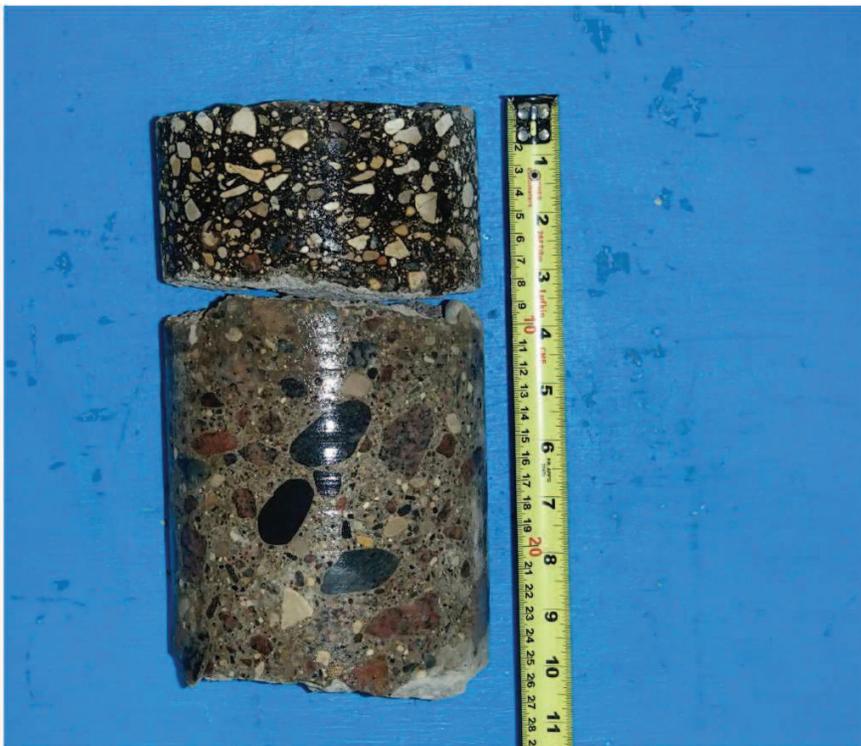
October 17, 2013

REVIEWED BY: German E. Leal, B.Sc., P. Eng.

**Pavement Core Photos**



**Core sample from Testhole TH01**

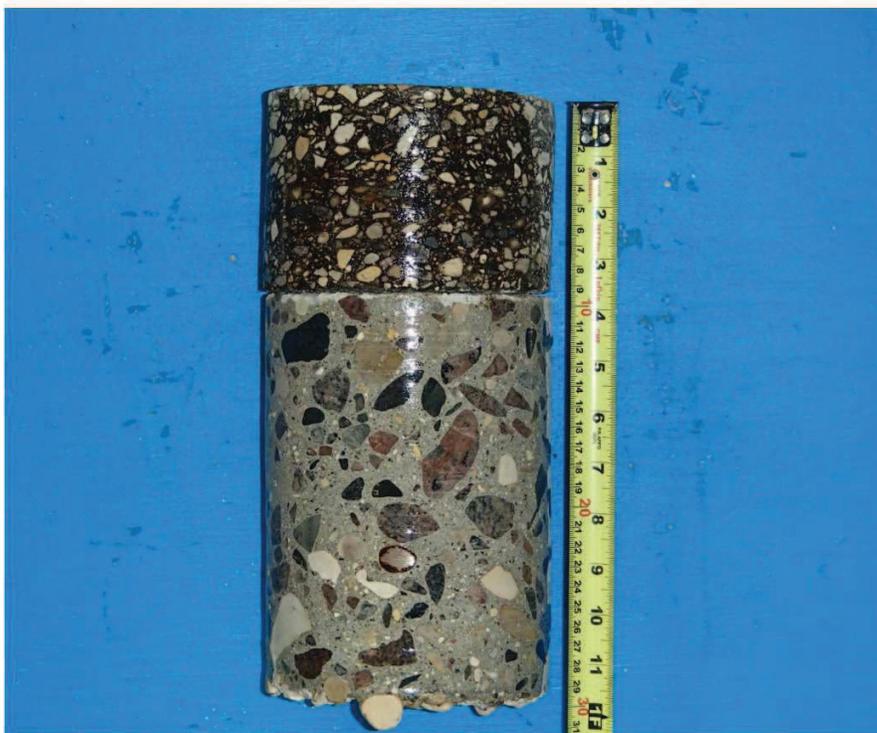


**Core sample from Testhole TH02**

**Pavement Core Photos**



**Core sample from Testhole TH04**



**Core sample from Testhole TH06**

**Pavement Core Photos**



**Core sample from Testhole TH09**



**Core sample from Testhole TH10**