APPENDIX 'F' GEOTECHNICAL REPORT



PUBLIC WORKS DEPARTMENT • SERVICE DES TRAVAUX PUBLICS

Engineering Division • Division de l'ingénierie

GEOTECHNICAL INVESTIGATION

STREET RECONSTRUCTION

Revised October 28th, 2008

<u>Fieldwork</u>

- 1. Clear all underground services at each testhole location.
- 2. Test holes required every 50 m with a minimum of 3 test holes per street.
- 3. Record location of testhole (offset from curb, distance from cross street and house number).
- 4. Drill 150 mm-diameter core in pavement.
- 5. Drill 125 mm-diameter testhole into fill materials and subgrade
- 6. If a service trench backfilled with granular materials is encountered, another hole shall be drilled to define the existing sub-surface conditions.
- 7. Testhole to be drilled to depth of 2 m \pm 150 mm below surface of the pavement.
- 8. Recover pavement core sample and representative samples of soil (fill materials, pavement structure materials and subgrade).
- 9. Measure and record pavement section exposed in the testhole (thickness of concrete or asphalt and different types of pavement structure materials).
- 10. Pavement structure materials to be identified as crushed limestone or granular fill and the maximum aggregate size of the material (20 mm, 50 mm or 150 mm).
- 11. Log soil profile for the subgrade.
- 12. Representative samples of soil must be obtained at the following depths below the bottom of the pavement structure materials 0.1 m, 0.4 m, 0.7 m, 1.0 m, 1.3 m, 1.6 m, etc. Ensure a sample is obtained from each soil type encountered in the testhole.
- 13. Make note of any water seepage into the testhole.
- 14. Backfill testhole with native materials and additional granular fill, if required. Patch pavement surface with hot mix asphalt or high strength durable concrete mix.
- 15. Return core sample from the pavement and soil samples to the laboratory.

Lab Work

- 1. Test all soil samples for moisture content.
- 2. Photograph core samples recovered from the pavement surface.
- 3. Conduct tests for plasticity index and hydrometer analysis on selected soil samples which are between 0.5 m and 1 m below top of pavement (this is the sub-grade on which the pavement and sub-base will be built). The selection will be based upon visual classification and moisture content test results, with a minimum of one sample of each soil type per street to be tested.
- 4. Prepare testhole logs and classify subgrade (based on hydrometer) as follows;

< 30% silt - classify as clay 30% - 50% silt - classify as silty clay 50% - 70% silt - classify as clayey silt > 70% silt - classify as silt

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

Embrace the Spirit · Vivez l'esprit

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

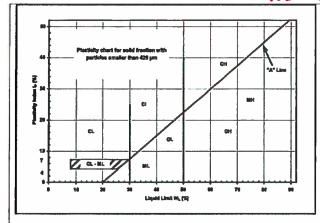
				UMA	USCS		Laborator	y Classification Crit	eria
		Descripti	on	Log Symbols	Classification	Fines (%)	Grading	Plasticity	Notes
		CLEAN GRAVELS	Well graded gravels, sandy gravels, with little or no fines	2021	GW	0-5	C _U > 4 1 < C _C < 3		
	GRAVELS (More than 50% of coarse	(Little or no fines)	Poorly graded gravels, sandy gravels, with little or no fines		GP	0-5	Not satisfying GW requirements		Dual symbols if 5-
OILS	fraction of gravel size)	DIRTY GRAVELS	Silty gravels, silty sandy gravels	M	GM	> 12		Atterberg limits below "A" line or W _P <4	12% fines. Dual symbols if above "A" line and
COARSE GRAINED SOILS		(With some fines)	Clayey gravels, clayey sandy gravels		GC	> 12		Atterberg limits above "A" line or W _P <7	4 <w<sub>P<7</w<sub>
ARSE GR		CLEAN SANDS	Well graded sands, gravelly sands, with little or no fines	60 M	sw	0-5	C _U > 6 1 < C _C < 3		$C_U = \frac{D_{60}}{D_{10}}$
CO	SANDS (More than 50% of	(Little or no fines)	Poorly graded sands, gravelly sands, with little or no fines	000	SP	0-5	Not satisfying SW requirements		$C_U = \frac{D_{60}}{D_{10}}$ $C_C = \frac{(D_{30})^2}{D_{10} x D_{60}}$
	coarse fraction of sand size)	DIRTY SANDS	Silty sands, sand-silt mixtures	BB	SM	> 12		Atterberg limits below "A" line or W _P <4	
		(With some fines)	Clayey sands, sand-clay mixtures		sc	> 12		Atterberg limits above "A" line or W _P <7	
	SILTS (Below 'A' line	W _L <50	Inorganic silts, silty or clayey fine sands, with slight plasticity		ML				
	negligible organic content)	W _L >50	Inorganic silts of high plasticity		МН				
SOILS	CLAYS	WL<30	Inorganic clays, silty clays, sandy clays of low plasticity, lean clays		CL				
FINE GRAINED SOILS	(Above 'A' line negligible organic	30 <w<sub>L<50</w<sub>	Inorganic clays and slity clays of medium plasticity		CI			Classification is Based upon Plasticity Chart	
FINE (content)	W _L >50	Inorganic clays of high plasticity, fat clays		СН				
	ORGANIC SILTS & CLAYS	₩ .<50	Organic sitts and organic sitty clays of low plasticity		OL				
	(Below 'A'	W _L >50	Organic clays of high plasticity		он				
Н	HIGHLY ORGA	NIC SOILS	Peat and other highly organic soils		Pt		on Post ification Limit		r odour, and often s texture
		Asphałt		Till					
[Concrete		Bedrock lifferentiated)			1741	AE	COM
×	₩	Fill		Bedrock imestone)					

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

Not used to classify subgrade. Refrence to city of Winnipeg Specs for Greatechnical Investigation street reconstruction (Oct. 2008),

NOT USED TO CLASSIFY SUBGRADE, REFER TO CITY OF WINNIPER SPECS FOR GEOTECHNICAL INVESTIGATION STREET

RECONSTRUCTION (OCT. 2008)



	FRAC	CTION	SEIVE !	SIZE (mm)	PERCENTAG	RANGES OF E BY WEIGHT OMPONENTS
- [Passing	Retained	Percent	Identifier
ſ	Gravel	Coarse	76	. 19	35-50	and
ı	Gravei	Fine	19	4.75	33-30	and
1		Coarse	4.75	2.00	20-35	Full on four? \$
	Sand	Medium	2.00	0.425	20-35	"y" or "ey" "
		Fine	0.425	0.075	10.20	same
		n-plastic) (plastic)		75 mm	1-10	trace
			Definitio	gravelly, sand		
			BOULDE	RS: >300mm	diameter	

LEGEND OF SYMBOLS

Laboratory and field tests are identified as follows:

qu - undrained shear strength (kPa) derived from unconfined compression testing.

T_v - undrained shear strength (kPa) measured using a torvane

pp - undrained shear strength (kPa) measured using a pocket penetrometer.

L_v - undrained shear strength (kPa) measured using a lab vane.

F_v - undrained shear strength (kPa) measured using a field vane.

γ - bulk unit weight (kN/m³).

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.

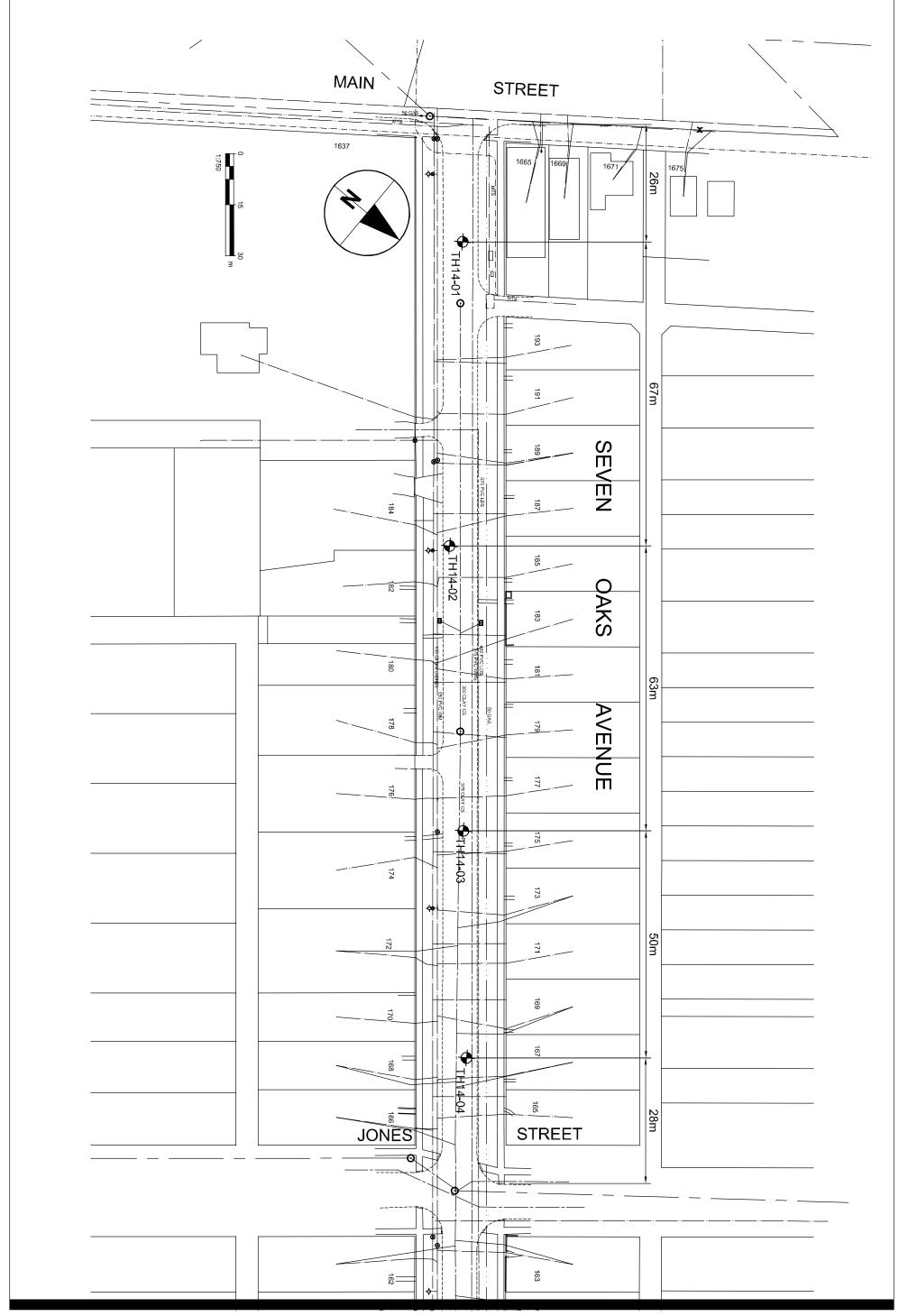
w - moisture content (WL, WP)

The undrained shear strength (Su) of a cohesive soil can be related to its consistency as follows:

Su (kPa)	CONSISTENCY
<12	very soft
12 – 25	soft
25 – 50	medium or firm
50 - 100	stiff
100 – 200	very stiff
200	hard

The resistance (N) of a non-cohesive soil can be related to compactness condition as follows

N - BLOWS/0.30 m	COMPACTNESS
0 - 4	very loose
4 - 10	loose
10 - 30	compact
30 - 50	dense
50	very dense





Photograph 1. Seven Oaks Avenue – TH14-01



Photograph 2. Seven Oaks Avenue - TH14-02



Photograph 3. Seven Oaks Avenue – TH14-03



Photograph 4. Seven Oaks Avenue – TH14-04

PROJ	ECT:	Local street Package 14-R-03	CLIE	NT:	Cit	y of \	Vinni	peg						TES	STHOLE NO: TH14-0	1
LOCA	TION	: Seven Oaks ;5 m South of North Curb				, -		1 J							OJECT NO.: 6031228	
CONT	RAC	TOR: Paddock Drilling Ltd	MET	HOD	: 1	25 n	nm SS	SA w	ith 1	50 r	nm C	oring		ELF	EVATION (m):	
SAMF	LE T	YPE GRAB SHELBY TUBE	SF					BU						ECOVER	RY CORE	
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION		SAMPLE TYPE	SAIVIFLE	◆ SP ⁻¹ D 20 16 17	Dyna Γ (Stand (Blows 0 40 ■ Tota (k 18 astic	ecker: mic Co dard P s/300n 60 I Unit \ N/m³)	₩ one ◇ en Te nm) 0 80 Wt ■	st) ♦		+ To X □ Lal △ Pocl ♣ Fiel	orvane + QU × o Vane [ket Pen. d Vane kPa)	□ △ �	COMMENTS	ОЕРТН
0		CONCRETE (thickness = 121 mm)				20	. 40	- 60) 100			100	150 200		_
- - -		CLAY (Fill) - some gravel, trace sand - brown - frozen to 1.67 m , moist when thawed - high plasticity		G	49		•									- -
-		CLAY - trace sand - grayish brown - frozen to 1.67 m , moist when thawed - high plasticity		G	50		⊢●		-1						Clay: 63.9%, Silt: 28.4%, Sand: 7.7%, Gravel: 0.0%	- - -
- 1 -		- brown below 1.0 m		G	51		•									1-
GDT 3/5/14		- silty, light brown, intermediate plasticity below 1.25 m		G:			•									- - -
PJ UMA WINN.		-soft to firm below 1.67m. SILT - clayey, - light brown,														-
ND ARMSTRONG.G		- soft, moist to wet - low plasticity		G	54											2 —
S SEVEN OAKS AN				G			•									-
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA WINN.GDT 3/8/14 R C C C C C C C C C C C		END OF TEST HOLE AT 2.44 m IN SILT. NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuttings, sand and asphalt cold pate to surface. 4. Drilled with 150 mm diamond core to 0.28 m, solid stem augers to m.														- - -
# 		A=COA4					GED								ETION DEPTH: 2.44 m	
98		AECOM					JECT				iälli			COIVIPLI	ETION DATE: 2/3/14	1 of 1
┚ ┖							J_U	-140	¥∟l	_: \.			1		i aye	1 01 1

PROJ	ECT:	Local street Package 14-R-03	CLIE	NT:	Ci	ty of	Winr	nipeg	1					TE	STHOLE NO: TH14-02	2
		: Seven Oaks ;8 m South of North Curb												PR	OJECT NO.: 6031228	5
CONT	RAC	ГОR: Paddock Drilling Ltd		HOD						150	mm (EVATION (m):	
SAMF	LE T	YPE GRAB SHELBY TUBE	SF	PLIT SI	PO	ON		В	ULK				☑NO F	RECOVE	RY CORE	
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION		SAMPLE TYPE	SAMPLE #	◆ SF 0 :	♦ Dyn PT (Star (Blov 20 4 ■ Tot (7 18	Becke amic (ndard ws/30(0 6 al Uni (kN/m	r ₩ Cone < Pen T Omm) 60 t Wt ■ 0)	> (est) \Pi	0	+ T × □ La △ Poo ♣ Fie	orvane - QU X ab Vane cket Pen eld Vane (kPa)	□ . △ �	COMMENTS	DEPTH
0	4	CONCRETE (thickness = 140 mm)					20 4	0 - 6	50	80 100	0	50	100	150 200)	
_																-
- - -		CLAY (Fill) - trace sand - black to dark brown, - frozen to 1.5 m, moist when thawed - high plasticity		G	557											- - -
-		CLAY - trace sand, trace oxidation, - dark brown, - frozen to 1.5 m, moist when thawed													01 00 00/ 0/11 00 00/	-
-		- high plasticity		G	558										Clay: 69.2%, Silt: 26.2% , Sand: 4.6% , Gravel: 0.0%	-
- 1				G	59		•		· · · · · · · · · · · · · · · · · · ·							1 - -
- - -				G	60											-
WINN.GDT 3/5/		- brown, firm, below 1.5 m		G	61		•									-
NG.GPJ UMA\																-
-2				G	62		•									2
EVEN OAKS A					63		•									-
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA WINN.GDT 3/8/14 C		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. No sloughing observed. 2. No seepage observed.	Lak	G	664											-
E SIREEI PAC		Test hole backfilled with auger cuttings, sand and asphalt cold patto surface. Drilled with 150 mm diamond core to 0.330 m, solid stem augers to 2.4														-
로 등 3																-
		. =				LO	GGED	BY:	Sab	a Ibra	ahim	•		COMPL	ETION DEPTH: 2.44 m	
P P		A ECOM				RE\	/IEWE	ED B	Y: F	aris K					ETION DATE: 2/3/14	
ŏ		2 0 1				PR	DJEC.	T EN	GINE	ER:					Page	1 of 1

PROJ	ECT:	Local street Package 14-R-03	CLIE	ENT	Γ: Ci	ity (of Winnipeg			TE	STHOLE NO: TH14-03	3
		: Seven Oaks ;4 m South of North Curb								PR	OJECT NO.: 6031228	5
		TOR: Paddock Drilling Ltd					mm SSA with	150 r			EVATION (m):	
SAMF	LE T	YPE GRAB SHELBY TUBE	SI	PLIT	SPO	ON	BULK		☑ NO RI	ECOVE	RY CORE	
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION		SAMPLE TYPE	SAMPLE#	0	Plastic MC Liqu	≎ Test) ♦ 80 100 I	□ Lab Vane □ △ Pocket Pen ♣ Field Vane € (kPa)] △	COMMENTS	DEPTH
0		ASHPHALT (thickness = 140 mm)										
-		CLAY (Fill) - some sand, trace gravel - black, - frozen to 1.67 m, moist when thawed - high plasticity			G65		•					-
-		SAND(FILL) - some gravel, - light brown, - frozen to 1.67 m, dry to moist when thawed			G66		•					-
- - -1		CLAY -silty, some sand, - grayish brown, - frozen to 1.5 m, moist when thawed - intermediate plasticity			G67						Clay: 39.0%, Silt: 46.0% , Sand: 14.1% , Gravel: 0.8%	1-
-					G68		•					-
WINN.GD 3/5/14		- soft to firm below 1.5 m SILT - clayey,			G69		•					-
CONG. GPJ UMAY		- light brown - soft, moist to wet -low plasticity			G70							-
- 2		CLAY dark brown, - stiff, moist , - high plasticity			G71		•					2
LOG OF TEST HOLE. SI REE PACKAGE 14-R-03 SEVEN DARKS AND ARMIS INONG, GPJ UMA W		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuttings, sand and asphalt cold properties. 4. Drilled with 150 mm diamond core to 0.330 m, solid stem augers 2.4			G72		•					- - - -
3						1,)CCED DV 0-1	: a lh	him C	:	ETION DEDTIL 0.44 ==	
-		A=COM				_	DGGED BY: Sab EVIEWED BY: F				ETION DEPTH: 2.44 m ETION DATE: 2/3/14	
		A_CO//1				_	ROJECT ENGINE			CIVII L		1 of 1

-		Local street Package 14-R-03	CLII	EN	Γ: Ci	ty of	Winn	ipeg						STHOLE NO: TH14-	
		Seven Oaks ;3 m South of North Curb						. .						DJECT NO.: 603122	285
SAME		FOR: Paddock Drilling Ltd ✓PE						SA wi		mm C		NO REC		EVATION (m):	
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTIO		SAMPLE TYPE	# 111	◆ SI 0	PENETR # I Dyna T (Star (Blov 00 44) Tota (7 18) Plastic	ATION T Becker * amic Cor ndard Pe vs/300mi 0 60 al Unit W kN/m³) 19 MC	ESTS (ine	00	H Torv X Qi □ Lab \\ △ Pocket ★ Field \\ (kP	EAR STRE ane + U × /ane □ t Pen. △ Vane ❤	ENGTH	COMMENTS	DEPTH
0	4.4	CONCRETE (thickness = 115 mm)					20 4	60	80 10	00 5	50 10	0 150	200		
- - -		CLAY - trace sand, trace oxidation - dark brown to brown - frozen to 1.4 m, moist when thawed - high plasticity			G73		•								-
-					G74		•								-
- 1 -					G75										1-
-		SILT - clayey, trace sand, trace oxidation			G76		•								-
WINN.GDT 3/5/14		- brown to light brown - soft, moist - low plasticity CLAY - silty, trace sand			G77		•								-
RONG GPJ UMA		- brown - soft to stiff , moist - intermediate plasticity			G78		•								-
VEN OAKS AND ARMSTR					G79		•								2
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA WINN.GDT 3/8/14 C		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuttings, sand and to surface. 4. Drilled with 150 mm diamond core to 0.305 m, soli 2.4 m.			G80										-
3						10	CCED	₽V- ∩	aba Ibr	ahim	: :	100	MDI L	TION DEPTH: 2.44 m	
유		AECOM							Faris I					TION DEPTH: 2.44 m	
50									NEER:						e 1 of 1



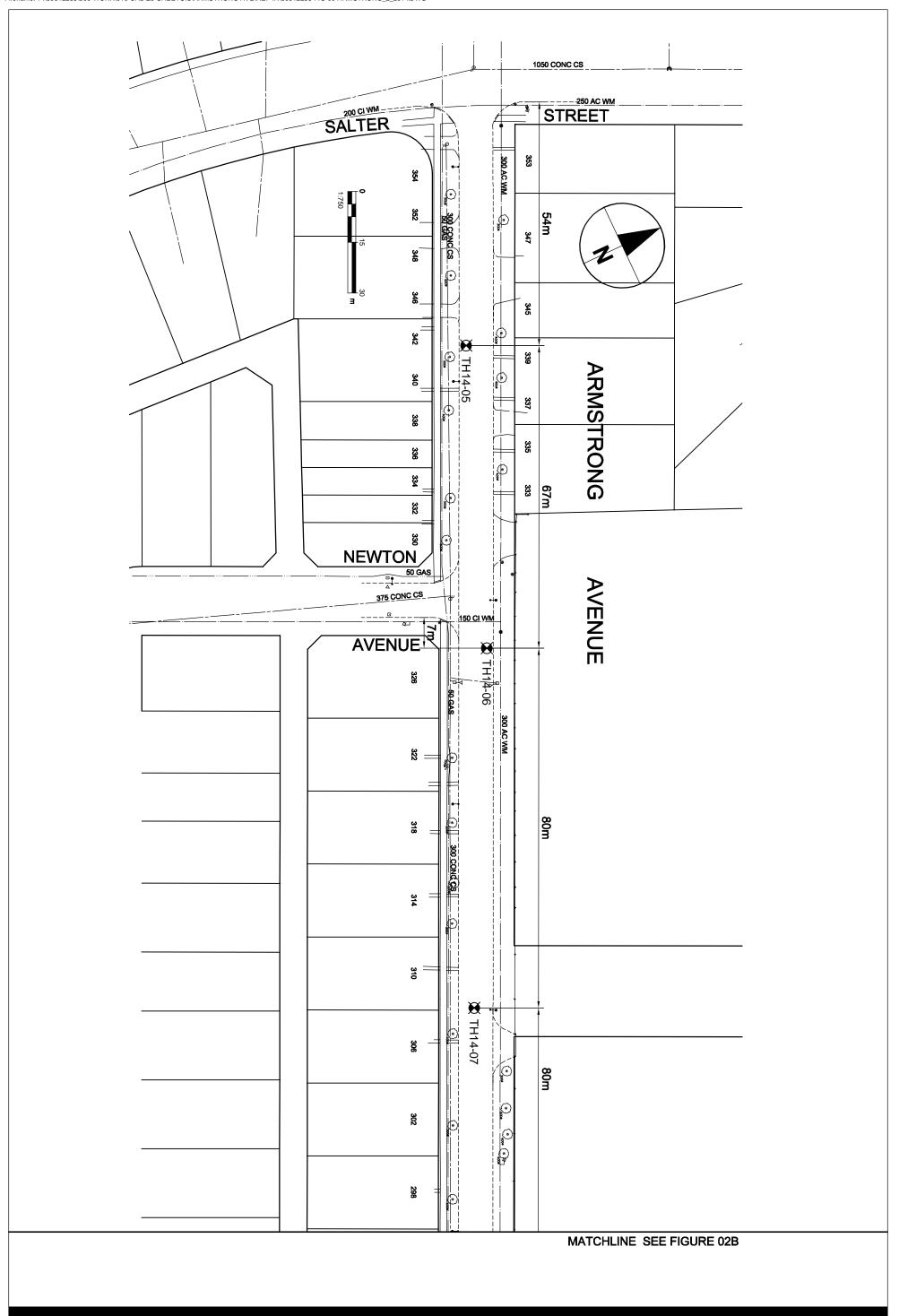
City of Winnipeg

Seven Oaks Avenue - Package 14-R-03

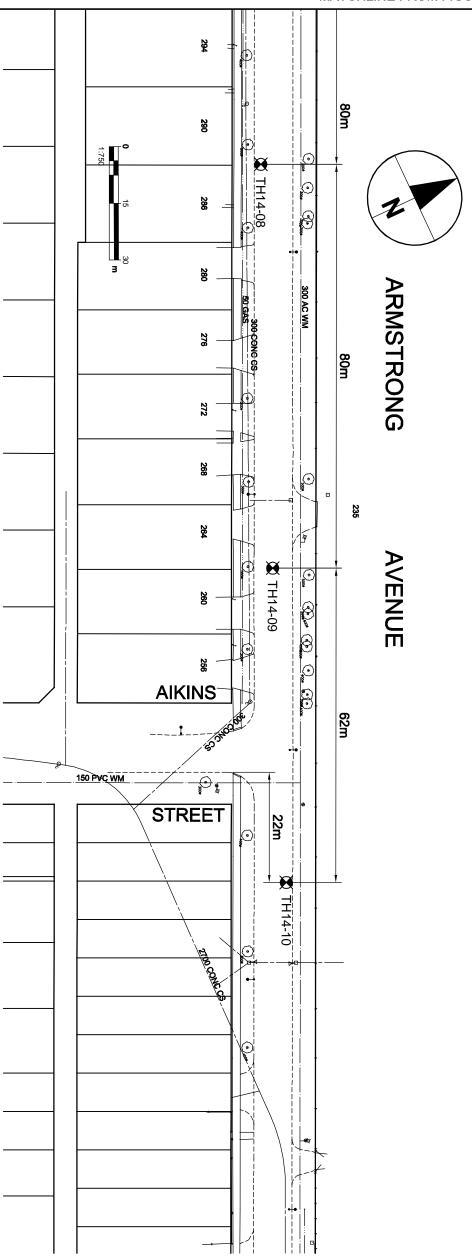
Geotechnical Investigation

Table 01- Summary of Laboratory Soil Testing

Test Hole No.		Pavement :	Surface	Pavement Struc	cture Material	Subgrade	Sample	Moisture		Hydromete	er Analysis		At	terberg Lir	nits
	Testhole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Description	Depth (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
						Clay (Fill)	0.30-0.46	33.8							
		Asphalt	n/a			Clay	0.61-0.76	31.9	0.0	7.7	28.4	63.9	69.2	21.6	47.5
	Savan Oalia Avanua i Fina					Clay	0.91-1.07	29.4							
TH14-01	Seven Oaks Avenue ;5 m South of North Curb			None	n/a	Silty Clay	1.22-1.37	29.0							
1П14-01	South of North Curb			None	П/а	Silty Clay	1.52-1.68	25.8							
		Concrete	121			Clayey Silt	1.83-1.98	23.3							
						Clayey Silt	2.13-2.29	21.8							
						Clayey Silt	2.36-2.44	33.0							
		A avala a lit	- /-			Clay (Fill)	0.38-0.53	29.0							
		Asphalt	n/a			Clay	0.69-0.84	26.9	0.0	4.6	26.2	69.2	75.0	24.6	50.4
						Clay	0.99-1.14	24.7							
	Seven Oaks Avenue ;8 m				,	Clay	1.30-1.45	21.9							
TH14-02	South of North Curb		110	None	n/a	Clay	1.60- 0.75	26.3							
		Concrete	140			Clay	1.91-2.06	28.0							
						Clay	2.21-2.36	30.8							
						Clay	2.36-2.51	29.1							
						Clay (Fill)	0.23-0.38	36.5							
		Asphalt	140			Sand (Fill)	0.53-0.69	29.7							
						Silty Clay	0.84-0.99	32.0	0.8	14.1	46.0	39.0	41.1	17.3	23.8
T114 4 00	Seven Oaks Avenue ;4 m				,	Silty Clay	1.14-1.30	22.9							
TH14-03	South of North Curb		,	None	n/a	Silty Clay	1.45-1.60	26.3							
		Concrete	n/a			Clayey Silt	1.75-1.91	20.8							
						Clay	2.06-2.21	39.0							
						Clay	2.36-2.44	39.8							
		A 1 1:	,			Clay	0.23-0.38	27.2							
		Asphalt	n/a			Clay	0.53-0.69	28.6							
	ِ			1		Clay	0.84-0.99	24.7							
	Seven Oaks Avenue ;3 m					Clay	1.14-1.30	25.3							
TH14-04	South of North Curb			None	n/a	Clayey Silt	1.45-1.60	22.5							
		Concrete	115			Silty Clay	1.75-1.91	22.4							
						Silty Clay	2.06-2.21	22.7							
						Silty Clay	2.36-2.44	31.7							



Last saved by: TORPEYR (2014-03-05) Last Plotted: 2014-03-05 Filename: P:\60312285\900-WORK\910-CAD\20-SHEETS\C\ARMSTRONG AVE\REF-IN\60312285-FIG-00-ARMSTRONG_3_2014.DWG





Photograph 1. Armstrong Avenue – TH14-05



Photograph 2. Armstrong Avenue – TH14-06



Photograph 3. Armstrong Avenue – TH14-07



Photograph 4. Armstrong Avenue – TH14-08



Photograph 5. Armstrong Avenue – TH14-09



Photograph 6. Armstrong Avenue – TH14-10

		Local street Package 14-R-0		CLII	ENT	T: Ci	ty of	Winni	peg					TES	STHOLE NO: TH14-05	5
		: Armstrong Avenue ;8 m So	uth of North Curb												OJECT NO.: 6031228	5
		TOR: Paddock Drilling Ltd									mm Co				EVATION (m):	
SAMF	LE T	YPE GRAB	SHELBY TUBE	\boxtimes s	PLIT	SPO	ON		BUL	K			IO REC		RY CORE	
DEPTH (m)	SOIL SYMBOL	SOIL DE	SCRIPTION		SAMPLE TYPE	SAMPLE#	◆ SF 0 :	Dynaid Dynai	ecker # mic Con dard Per s/300mn 60 I Unit W :N/m³) 19	e	<u>2</u>	+ Torva	ne + × ane □ Pen. △ ane �		COMMENTS	DEPTH
0		ASPHALT (thickness = 45 mm)								:	1		.,00	200		
-		CONCRETE (thickness = 140 mm							:	:						H
-		CLAY (FILL) - some sand, trace gi - black to light grey - frozen to 1.5 m, moist whe - high plasticity			_	G40										- - -
- - -		CLAY - trace sand - grey to dark brown, - frozen to 1.5 m, moist whe - high plasticity	n thawed			G41		l		4					Clay: 70.8%, Silt: 24.7%, Sand: 4.5%, Gravel: 0.0%	-
-1 -		- brown below 1.25 m				G42		•								1-
INN.GDT 3/5/14		- silty, trace oxidation, light brown	, firm below 1.5 m			G43		•								- - -
S.GPJ UMA WINN.G						G45										-
S AND ARMSTRONG						G46		•								2 —
SEVEN OAK						G47 G48		•								-
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA W		END OF TEST HOLE AT 2.44 m I NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger of to surface. 4. Drilled with 150 mm diamond of 2.4 m.	cuttings, sand and asphalt cold p													- - - -
빝		A = CO	\ ⊿							aba Ibra					ETION DEPTH: 2.44 m	
Ö Ö		A=CO/	VI							Faris K	halil		CO	MPLE	ETION DATE: 2/3/14	4
<u>ا</u> ك							PR(DJECT	ENGII	NEER:					Page	1 of 1

		Local street Package 14-R-0		CLIE	ENT:	Cit	y of	Winn	ipeg								O: TH14 -	
		: Armstrong Avenue ;2 m Soi	uth of North Curb														0.: 603122	285
		FOR: Paddock Drilling Ltd								ith 150) mn	n Cori				/ATION (
DEPTH (m)	SOIL SYMBOL		SCRIPTION	SI		SAMPLE #	◆ SP 0 2 16 17	ENETR Both Control Control Energy ENETR Control Energy Energy	s/300m 60 Il Unit W (N/m³) 19	FESTS k ne <> ne Test) im) 80 1 Vt = 20 Liquid	◆ 100 21	+ □ △F	D SHEAR Torvane X QU X Lab Van Pocket Pe Field Var (kPa)	< le □ en. △ ne �	STH		CORE	ОЕРТН
0		-\ASPHALT (thickness = 25 mm)					2	0 40	60	80 1	100	50	100	150	200			
'	1	CONCRETE (thickness = 76 mm)								:				:				_
		CLAY - trace sand, trace gravel, t - grey,	race oxidation									• • • • • • • • • • • • • • • • • • • •						
-		- grey, - frozen to 1.5 m, moist whe - high plasticity	n thawed		G	632		•										-
								_	:				:					
-					G	333												_
-																		-
-1					G	634		•	· · · · · · · · · · · · · · · · · · ·									1-
_									<u>.</u> .									-
-					G	35		•										-
INN.GDT 3/5/14		- brown, firm below 1.5 m.			G	36		•										-
ığ -		- silty, light brown, soft, moist to w	et. intermediate plasticity below	1.7 m														-
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA W		, , , , , , , , , , , , , , , , , , , ,	· · · · · · · · · · · · · · · · · · ·		G	37		•										-
ARMSTRON -2																		2
OAKS AND					G	38												_
R-03 SEVEN		END OF TEST HOLE AT 2.44 m I	N CLAY.		G	39		•										-
CKAGE 14-F		NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger of		atch														-
REET PA		to surface. 4. Drilled with 150 mm diamond of 2.4								:								-
T HOLE STR		۷.٦																-
SHES		4 = 400								Saba Ib							TH: 2.44 m)
9		A=CO/	M							Faris		il		COM	IPLE ⁷	TION DAT		
Ŏ							PRC	JECT	ENG	INEER	<u>.</u>						Pag	e 1 of 1

PROJ	ECT:	Local street Package 14-R-03	}	CLI	ENT:	Ci	ty of	Winni	peg				TES	STHOLE NO: TH14-0	7
LOCA	TION	: Armstrong Avenue ;6 m Sout	th of North Curb				-,		1 J					OJECT NO.: 6031228	
CONT	TRAC [*]	TOR: Paddock Drilling Ltd		ME	THOI	D:	125 r	nm S	SA wit	h 150	mm Co	ring	ELF	EVATION (m):	
SAMF	LE T	YPE GRAB	SHELBY TUBE	\boxtimes s					BUL				RECOVER	RY CORE	
DEPTH (m)	SOIL SYMBOL	SOIL DES	CRIPTION		SAMPLE TYPE	SAMPLE #	◆ SP 0 2 16 1		s/300mn 60 I Unit W :N/m³) 19	e	. [0 \(\triangle \)	HED SHEAR S	+ □ □ 1. △ æ �	COMMENTS	ОЕРТН
0	4	ASPHALT (thickness = 26 mm)						0 40	60	80 10	0 50	100	150 200		
_	*	GRAVEL (thickness = 167 mm)							:			:	:		-
- - -		CLAY (FILL)- some sand - dark brown to brown, - frozen to 1.5 m, moist when - high plasticity	thawed			G24		•							- - -
-		CLAY - trace sand -dark brown, - frozen to 1.5 m, moist when - high plasticity	thawed			G25		i●		4				Clay: 75.4%, Silt: 22.3% , Sand: 2.3% , Gravel: 0.0%	- - - 1-
						G26 G27		•							- - -
G.GPJ UMA WINN.GDT 3/8/		- silty, soft , moist to wet below 1.5	m.		(G28		•							- - -
VEN OAKS AND ARMSTRON		- firm to stiff, moist between 2.1 to 2	2.25 m.			G29 G30		•							2
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG GPJ UMA WINN, GDT 3/5/14 R		END OF TEST HOLE AT 2.44 m IN NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuto surface. 4. Drilled with 150 mm diamond cor 2.4	ıttings, sand and asphalt cold p			G31									- - - -
	1		_				LOC	GED	BY: Sa	aba Ibra	ahim	-	COMPLI	ETION DEPTH: 2.44 m	
P P		A=COA	1							Faris K	halil			ETION DATE: 2/3/14	
ŏ		<i>z</i> == 007.	_				PRO	JECT	ENGI	NEER:				Page	1 of 1

PROJ		CLII	CLIENT: City of Winnipeg										TESTHOLE NO: TH14-08					
		: Armstrong Avenue ;8 m Sou	uth of North Curb											PROJECT NO.: 60312285				
		TOR: Paddock Drilling Ltd							SA wi ⊟BUL	th 150	mm C			ELEVATION (m):				
DEPTH (m)	SOIL SYMBOL	-	SCRIPTION		SAMPLE TYPE	SAMPLE #	PENETRA # Be Dynar SPT (Stance (Blows) 20 40 Total (kl) 16 17 18 Plastic		RATION TESTS Becker hamic Cone hamic Cone hamic Test) ws/300mm) 40 60 80 100 tal Unit Wt (kN/m²)		000	H Tor X C □ Lab △ Pocke	NO RE EAR STR vane + 2U × Vane □ et Pen. △ Vane ◆ Pa)	ENGTH	Y TCORE COMMENTS	DEPTH		
0		ASPHALT (thickness = 52 mm)					2	0 40	60	80 10	00	50 1	00 15	0 200				
	4	CONCRETE (thickness = 127 mm)							:		:						
- - - -		CLAY (FILL) - some sand, trace or - black to dark brown, - frozen to 1.8 m, moist whe - high plasticity			G	316		•										
-		- sandy below 0.8 m			G	617		•										
1 -		CLAY- silty, trace sand - dark grey, - frozen to 1.8 m, moist whe - high plasticity	en thawed		G	G18		•								1		
INN.GD1 3/5/14					G	619		•										
GPJ UMA WINN.C		- dark brown below 1.5 m			G	G20		•										
D ARMSTRONG.					G	621		•								2		
SEVEN OAKS AN						622 623		•										
LOG OF TEST HOLE. SI REE L'ACKAGE 14-R-03 SEVEN OAKS AND ARMSI RONG, GPJ UMA W		END OF TEST HOLE AT 2.44 m I NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger of to surface. 4. Drilled with 150 mm diamond oc 2.4.	cuttings, sand and asphalt cold p			<u></u>												
<u> </u>		A = CO								aba Ibr					TION DEPTH: 2.4			
5 2		A=CO/	VI							Faris k	Khalil		C	OMPLE	TION DATE: 2/3/1			
اك			PROJECT ENGINEER:								Page 1 of 1							

PROJ	ECT:	Local street Package 14-R-03	CLI	ENT	T: Ci	ty of	Winn	ipeg						TES	THOLE NO: TH14-0	9	
LOCA	TION	: Armstrong Avenue ;5 m South of Nor						1-5							DJECT NO.: 6031228		
CONT	TRAC [*]	ΓOR: Paddock Drilling Ltd	ME	THO	DD:	125	mm S	SA w	ith 15	i0 m	m Co	ring		ELE	VATION (m):		
SAMF	LE T	YPE GRAB	SHELBY TUBE S					BU	LK				O RECO	COVERY CORE			
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIP	TION	SAMPLE TYPE	SAMPLE #	◆ SI 0		### Becker ### Dynamic Cone Standard Pen Test) ### Blows/300mm) ### 60 80 100 Total Unit Wt ### (kN/m³) 18 19 20 2- ic MC Liquid			[HED SHEA + Torvar × QU □ Lab Va Pocket F • Field Va (kPa)	ne + × ne □ Pen. △ ane •		COMMENTS	DEPTH	
0	-	ASPHALT (thickness = 26 mm)				ļ	20 40	60	80	100	50	100	150	200			
-	•	CONCRETE (thickness = 140 mm)					: :	:	:		:	:	:			-	
- - -		CLAY (FILL) - trace sand, trace oxidation - black to dark brown, - frozen to 1.5 m, moist when thawed - high plasticity			G8											-	
-		CLAY -trace gravel - grey, - frozen to 1.5, moist when thawed			G9											-	
- - -1 -		- high plasticity - brown below 1.0 m			G10		•									1-	
MA WINN. GDT 3/5/14		- firm below 1.5 m.			G11		•									-	
ND ARMSTRONG.GPJ U		- firm to stiff below 2 m			G13		•									2-	
EVEN OAKS A		- silty, light brown, soft to firm below 2.2 m			G14		•									-	
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OAKS AND ARMSTRONG.GPJ UMA WINN, GDT 3/6/14 C C C C C C C C C C C C		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuttings, sar to surface. 4. Drilled with 150 mm diamond core to 0.305 2.4			G15											-	
<u> </u>		A=C044					GGED								TION DEPTH: 2.44 m		
2		AECOM				_	VIEWE				alli		CON	/IPLE	TION DATE: 2/3/14	1 of 1	
ĭI						rr	Ju⊑Ul	LING	III I	١.					rage	1 of 1	

PROJ	ECT:	Local street Package 14-R-03	CLI	EN	T: C	ity o	f Winr	nipe	1					TES	STHOLE NO: TH14-10	0			
LOCA	TION	: Armstrong Avenue ;2 m South of North Curb													OJECT NO.: 6031228				
CONT	RAC	FOR: Paddock Drilling Ltd					mm S	SSA	with	150 r	nm C				EVATION (m):				
SAMF	LE T	YPE GRAB SHELBY TUBE	\boxtimes s	PLI	SPC	OON BULK						\subseteq	NO R	ECOVE	COVERY CORE				
DEPTH (m)	SOIL SYMBOL	SOIL DESCRIPTION		SAMPLE TYPE	SAMPLE #	◆ S 0	Plastic MC Li		er ₩ Cone < Pen T 0mm) 60	> (est) 4 (80 100)	☐ Lab Vane ☐ △ Pocket Pe ☑ Field Van (kPa)		rvane + QU × Vane □ tet Pen. d Vane 6 kPa)	□ △	COMMENTS	DEPTH			
0		ASPHALT (thickness = 38 mm)					20 4	10 (: 00	: 100		50	100	150 200					
_		CONCRETE (thickness = 153 mm)					:	:	:	:		:	:	:		-			
-		SAND (FILL) - gravelly, - black to dark brown - frozen to 1.5 m, moist when thawed			G1											-			
-		CLAY (FILL) - trace sand - black to dark brown, - frozen to 1.5 m, moist when thawed - high plasticity														- - -			
- 1		CLAY - trace gravel			G2		+								Clay: 77.1%, Silt: 20.4%, Sand: 2.5%, Gravel: 0.0%	- 1 			
-		 dark grey, frozen to 1.5 m, moist when thawed high plasticity 			G3		•												
4A WINN. GDT 3/5/14		- firm to stiff below 1.5 m			G4		•									-			
KMSTRONG.GPJ UN					G5		•									2 -			
AKS AND A		- brown ,intermediate plasticity below 2.1 m			G6		•									-			
3 SEVEN O		- stiff below 2.2 m			G7		•									-			
LOG OF TEST HOLE STREET PACKAGE 14-R-03 SEVEN OARS AND ARMST RONG, GPJ UMA WINN, GDT 3/8/14		END OF TEST HOLE AT 2.44 m IN CLAY. NOTES: 1. No sloughing observed. 2. No seepage observed. 3. Test hole backfilled with auger cuttings, sand and asphalt cold to surface. 4. Drilled with 150 mm diamond core to 0.305 m, solid stem auge 2.4																	
3							:	:	:	:		:	:	:					
# #		A=CO44				_	GGED								ETION DEPTH: 2.44 m				
06 6		AECOM				_	VIEW				ııdlli			JUIVIPLI	ETION DATE: 2/3/14	1 of 1			
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City of Winnipeg

Armstrong Avenue - Package 14-R-03

Geotechnical Investigation

Table 02- Summary of Laboratory Soil Testing

Test		Pavement Surface		Pavement Structure Material		Subgrade	Sample	Moisture		Hydrometo	Atterberg Limits				
Hole No.	Testhole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Description	Depth (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
						Clay Fill	0.38-0.53	34.9							
		Asphalt	45	None	n/a	Clay	0.69-0.84	29.7	0.0	4.5	24.7	70.8	73.6	23.2	50.5
	A otu o u o A o u . o . o . o .					Clay	0.99-1.14	27.5							
TH14-05	Armstrong Avenue ;8 m South of North Curb					Clay	1.30-1.45	28.2							
1114-05	South of North Curb					Silty Clay	1.60-1.75	25.1							
		Concrete	140			Silty Clay	1.91-2.06	23.9							
						Silty Clay	2.21-2.29	23.0							
						Silty Clay	2.36-2.44	21.9							
		Asphalt	25		n/a	Clay	0.23-0.38	30.8							
	Armstrong Avenue ; 2 m South of North Curb	Aspilalt	25	None		Clay	0.53-0.69	30.8							
						Clay	0.84-0.99	30.1							
TH14-06						Clay	1.14-1.30	30.0							
1114-00	South of North Curb	Concrete	76		II/ a	Clay	1.45-1.60	30.0							
		Concrete				Silty Clay	1.75-1.91	23.8							
						Silty Clay	2.06-2.21	22.9							
						Silty Clay	2.36-2.44	22.2							
	Armstrong Avenue ; 6 m South of North Curb	Asphalt	26	None	n/a -	Clay Fill	0.38-0.53	30.1							
		Aspilait				Clay	0.69-0.84	29.7	0.0	2.3	22.3	75.4	72.4	22.5	49.9
			167			Clay	0.99-1.14	29.5							
TH14-07						Clay	1.30-1.45	29.3							
11114-07						Silty Clay	1.60-1.75	23.2							
		Concrete				Silty Clay	1.91-2.06	22.2							
						Silty Clay	2.21-2.29	31.5							
						Silty Clay	2.36-2.44	23.0							
		Asphalt	52			Clay Fill	0.38-0.53	30.0							
		Aspilait	32			Clay Fill	0.69-0.84	26.6							
	Armstrong Avenue; 8 m					Silty Clay	0.99-1.14	29.7							
TH14-08	South of North Curb			None	n/a	Silty Clay	1.30-1.45	30.2							
11114-00	South of North Curb	Concrete	127	None	n/a	Silty Clay	1.60-1.75	29.9							
		Concrete				Silty Clay	1.91-2.06	29.9							
						Silty Clay	2.21-2.29	32.7							
						Silty Clay	2.36-2.44	33.3							



Test		Pavement Surface		Pavement Structure Material			Sample	Moisture		Hydromet	er Analysis	Atterberg Limits			
Hole No.	Testhole Location	Туре	Thickness (mm)	Туре	Thickness (mm)	Description	Depth (m)	Content (%)	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
			26			Clay Fill	0.38-0.53	34.5							
	Armstrong Avenue ;5 m South of North Curb	Asphalt		None		Clay	0.69-0.84	30.2							
TH14-09						Clay	0.99-1.14	29.2							
			140		n/a -	Clay	1.30-1.45	29.6							
1114-09						Clay	1.60-1.75	28.7							
		Concrete				Clay	1.91-2.06	32.0							
						Silty Clay	2.21-2.29	25.2							
						Silty Clay	2.36-2.44	26.2							
		Asphalt	38		n/a	Sand (Fill)	0.23-0.38	40.1							
						Clay (Fill)	0.84-0.99	34.4	0.0	2.5	20.4	77.1	84	26.5	57.6
	Armstrong Avenue; 2 m					Clay	1.14-1.30	35.1							
TH14-10	South of North Curb			None		Clay	1.45-1.60	34.7							
		Concrete	153			Clay	1.75-1.91	34.6							
						Clay	2.06-2.21	32.6							
						Clay	2.29-2.44	30.0							