APPENDIX 'A'

GEOTECHNICAL INVESTIGATION

ENG-TECH CONSULTING LIMITED

420 Turenne Street, Winnipeg, Manitoba R2J 3W8
Phone: (204) 233-1694 Fax: (204) 235-1579
Email: engtech@mymts.net
www.eng-tech.ca

Table 2

File No.: 17-035-02

Summary of Pavement Structure

East and West bound Lanes on Henlow Bay between Fultz Boulevard and Scurfield Boulevard

Core Number	Core Location	GPS Coordinates		Pavement Surface	
		14U	UTM	Type	Thickness (mm)
PC01	41.1 m (2.5 m north of the curve) East of northeast corner of the intersection of Fultz Boulevard and Henlow Bay – westbound lane of Henlow Bay.	5519511	630222	Concrete	205
PC02	129.15 m (2.5 m south of the curve) East of northeast corner of the intersection of Fultz Boulevard and Henlow Bay, 89.25 m West of the northwest corner of Dovercourt Drive Westbound lane of Henlow Bay	5519559	630297	Concrete	195
PC03	8.35 m (2.5 m north of the curve) East of the northwest corner of Dovercourt Drive. Westbound lane of Henlow Bay Boulevard	5519602	630384	Concrete	215

ENG-TECH CONSULTING LIMITED

420 Turenne Street, Winnipeg, Manitoba R2J 3W8
Phone: (204) 233-1694 Fax: (204) 235-1579
Email: engtech@mymts.net
www.eng-tech.ca

Table 4
Summary of Pavement Structure

File No.: 17-035-02

Henlow Bay: From Dovercourt to Scurfield Boulevard

Test Hole	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	5519653	0630468	Concrete	190	Gravel Fill (20 mm)	150	Gravel Fill	0.1	25.9							
							Clay Fill	0.4	37.5							
								0.7	34.5	0.0	1.3	28.5	70.2	82	24	58
							Silty Clay	1.0	36.2	0.0	1.7	31.6	66.7	72	22	50
								1.3	21.8							
								1.6	22.7							
							Clay	1.9	34.5							
2	5519704	0630570	Concrete	202	Gravel Fill (20 mm)	150	Gravel Fill	0.1	32.7							
							Clay Fill	0.4	31.6							
								0.7	32.5							
							Clay	1.0	34.9	0.0	0.9	22.2	76.9	80	26	54
								1.3	37.1							
								1.6	33.8							
								1.9	25.9							

Notes:

- No water seepage was encountered in the test holes.

Table 4 - Summary of Pavement Structure
Henlow Bay: From Dovercourt Drive to Scurfield Boulevard

Test Hole	GPS Coordinates		Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
	14U	UTM	Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
3	5519757	0630614	Concrete	185	Gravel Fill (20 mm)	50	Gravel Fill	0.1	8.6							
							Silty Clay Fill	0.4	31.3							
								0.7	27.9	0.0	4.7	41.2	54.1	60	18	42
							Clay	1.0	23.7							
								1.3	26.1							
								1.6	31.7							
								1.9	36.2							
4	5519820	0630571	Concrete	202	Gravel Fill (20 mm)	150	Gravel Fill	0.1	26.8							
							Clay Fill	0.4	28.6							
								0.7	29.1							
							Clay	1.0	29.8	0.0	1.5	16.8	81.7	76	26	50
								1.3	29.0							
								1.6	38.5							
								1.9	41.2							

Notes:

- No water seepage was encountered in the test holes.

Table 4 - Summary of Pavement Structure
Henlow Bay: From Dovercourt Drive to Scurfield Boulevard

Test Hole	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	5519924	0630553	Concrete	190	Gravel Fill (20 mm)	150	Gravel Fill	0.1	21.5							
							Clay Fill	0.4	41.3							
								0.7	32.9	0.0	1.7	29.8	68.5	80	30	50
							Clay	1.0	31.0							
								1.3	30.0							
								1.6	33.4							
								1.9	42.8							

Notes:

- No water seepage was encountered in the test holes.

ENG-TECH CONSULTING LIMITED

420 Turenne Street, Winnipeg, Manitoba R2J 3W8
Phone: (204) 233-1694 Fax: (204) 235-1579
Email: engtech@mymts.net
www.eng-tech.ca

Table 5
Summary of Pavement Structure

File No.: 17-035-02

Higgins Avenue: From Princess Street to Henry Avenue

Test Hole	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	5530045	0633076	Concrete	187	Gravel Fill (20 mm)	150	Gravel Fill	0.1	5.4							
								0.4	6.2							
								0.7	4.4							
								1.0	5.9							
							Clayey Silt	1.3	22.8							
								1.6	23.6							
								1.9	25.5							
2	5530014	0633165	Asphalt	120	Granular Fill (20 mm)	50	Clay Fill	0.1	32.1							
								0.4	31.3							
								0.7	29.9							
							Clay	1.0	31.0	0.0	5.5	29.9	64.6	72	24	48
								1.3	36.9							
			Concrete Rubble	200			Clayey Silt	1.6	22.7							
							Clay	1.9	34.5							

Notes:
- No water seepage was encountered in the test holes.

Test Hole	GPS Coordinates		Pavement Surface		Pavement Structure Material		Subgrade Description	Sample Depth (m)	Moisture Content (%)	Hydrometer Analysis				Atterberg Limits		
	14U	UTM	Type	Thickness (mm)	Type	Thickness (mm)				Gravel (%)	Sand (%)	Silt (%)	Clay (%)	Liquid Limit	Plastic Limit	Plasticity Index
3	5529905	0633241	Asphalt	64	Gravel Fill (20 mm)	150	Clay Fill	0.1	24.6							
			Concrete Rubble	220			Silt	0.4	26.6							
								0.7	21.4	0.0	1.9	79.4	18.7	26	20	6
								1.0	21.7							
								1.3	22.1							
							Clay	1.6	36.0							
								1.9	43.5							
4	5529900	0633393	Asphalt	86	Gravel Fill (20 mm)	150	Silt	0.1	20.2							
			Concrete Rubble	165				0.4	20.4							
								0.7	20.9							
								1.0	21.0	0.0	6.5	74.7	18.8	28	19	9
							Clay	1.3	40.3							
								1.6	46.5							
								1.9	49.8							

Notes:

- No water seepage was encountered in the test holes.

Test Hole	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	5529900	0633393	Asphalt	86	Gravel Fill (20 mm)	203	Gravel Fill	0.1	35.2							
			Concrete Rubble	165			Silty Clay	0.4	34.3							
								0.7	33.2	0.1	3.0	39.6	57.3	58	21	37
							Clayey Silt	1.0	27.6	0.0	1.6	66.9	31.5	37	19	18
								1.3	26.0							
							Clay	1.6	39.9							
								1.9	44.8							
6	5529842	0633533	Asphalt	50	Gravel Fill (20 mm)	150	Clay Fill	0.1	32.6							
			Concrete Rubble	150				0.4	33.1							
								0.7	32.4							
							Clay	1.0	29.2	0.0	2.3	22.9	74.8	72	24	18
								1.3	28.7							
								1.6	34.6							
								1.9	35.1							

Notes:

- No water seepage was encountered in the test holes.

Test Hole	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	5529007	0633626	Asphalt	132	Gravel Fill (20 mm)	150	Clay Fill	0.1	11.1							
			Concrete Rubble	180			Silty Clay	0.4	27.9							
								0.7	31.0							
								1.0	35.9	0.0	8.1	33.2	58.7	78	29	49
								1.3	33.0							
							Clay	1.6	31.7							
								1.9	32.8							
8	5529774	0633664	Asphalt	125	Gravel Fill (20 mm)	50	Clay Fill	0.1	21.8							
			Concrete	225			Silty Clay	0.4	19.0							
							Clay	0.7	21.5							
								1.0	39.0	0.0	4.5	75.7	19.8	26	20	6
								1.3	41.9							
								1.6	46.7							
								1.9	48.3							

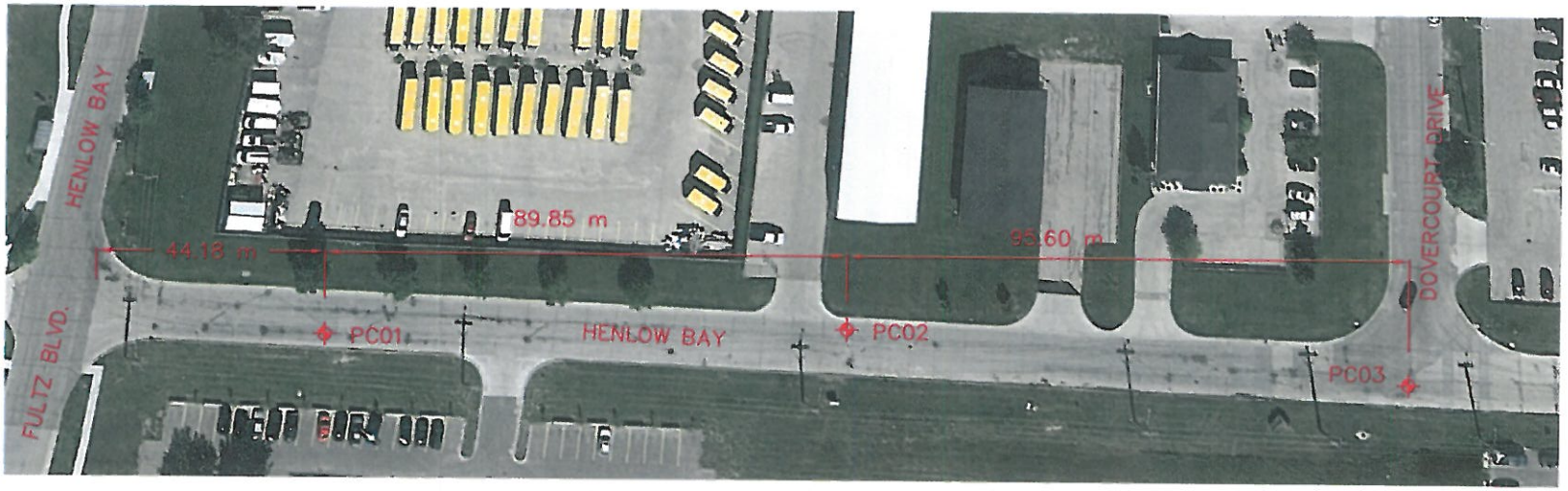
Notes:

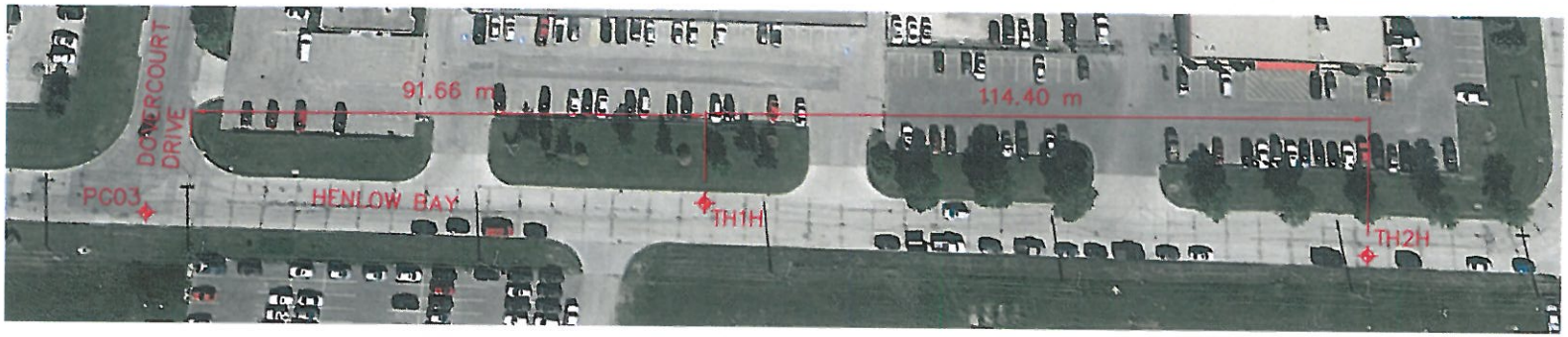
- No water seepage was encountered in the test holes.

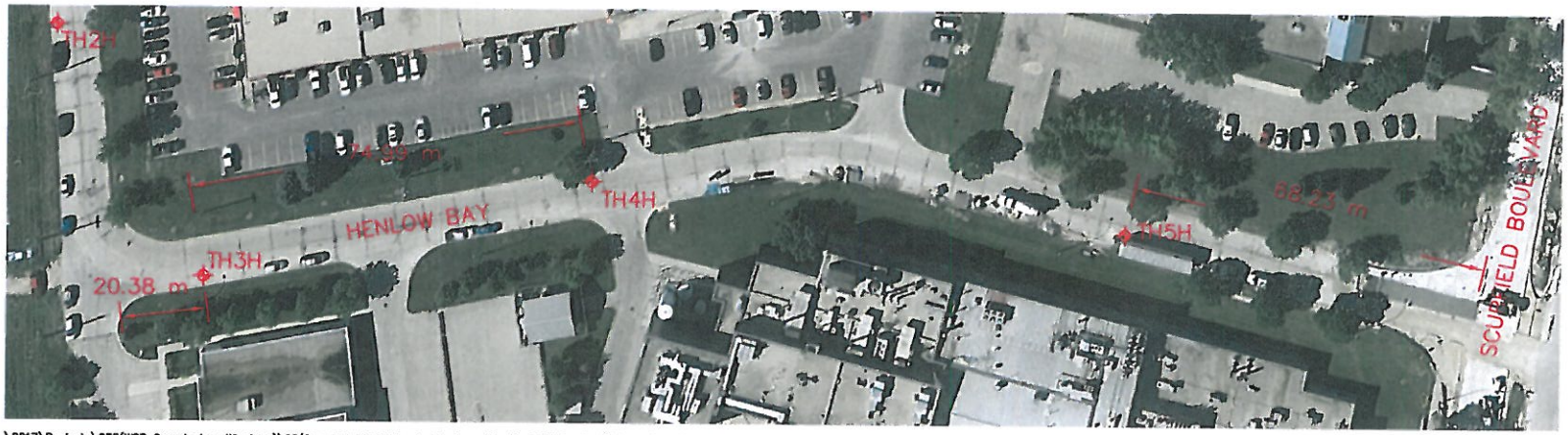
CORE LOCATION TABLE	
HOLE #	OFFSET OF TEST HOLE
PC01	2.3 m NORTH OF SOUTH CURB
PC02	2.3 m SOUTH OF NORTH CURB
PC03	2.3 m NORTH OF SOUTH CURB

CORE LOCATION TABLE	
HOLE #	OFFSET OF TEST HOLE
TH1H	2.0 m SOUTH OF NORTH CURB
TH2H	1.5 m SOUTH OF NORTH CURB
TH3H	1.5 m SOUTH OF NORTH CURB

CORE LOCATION TABLE	
HOLE #	OFFSET OF TEST HOLE
TH4H	2.0 m EAST OF WEST CURB
TH5H	2.0 m WEST OF EAST CURB







LEGEND

PC01 PAVEMENT CORES

TH1H TEST HOLE

TEST HOLE LOCATION TABLE

HOLE #	GPS COORDINATES OF TEST HOLES	
	UTM	14U
PC01	5519511	0630222
PC02	5519559	0630297
PC03	5519602	0630384
TH1H	5519653	0630468
TH2H	5519704	0630570
TH3H	5519757	0630614
TH4H	5519820	0630571
TH5H	5519942	0630553

NO.	DATE	ISSUE / REVISION
0	Feb. 2018	report

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, MB
R2J 3W8
Phone: (204) 233-1694
Fax: (204) 235-1579

ENG. STAMP:

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
ENG-TECH Consulting Limited
No.2475

CLIENT: WSP CANADA GROUP INC.

PROJECT: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE WINNIPEG, MANITOBA

DWG DESCRIPTION: PAVEMENT CORE AND TEST HOLE LOCATION PLAN - HENLOW BAY

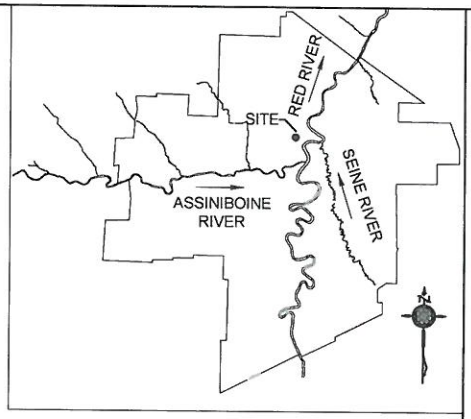
SCALE: NTS

DRAWN BY:	DATE:
TDR	FEBRUARY 2018
FILE No.: 17-035-02	CLIENT DWG/FIG. No.:
ENG-TECH DWG/FIG. No.: 2	NO.:

P:\2017\Projects\035(WSP Canada Inc. Winnipeg)\02(Geo_Industrial Streets Package 18-RL-02)\Drawings\Figure 2 - Pavement Cores and Test Hole Location Plan(Henlow Bay).dwg

TEST HOLE LOCATION TABLE		
HOLE #	GPS COORDINATES OF TEST HOLES	
	UTM	14U
TH1	5530045	0633076
TH2	5530014	0633165
TH3	5529905	0633241
TH4	5529855	0633505
TH5	5529900	0633393
TH6	5529842	0633533
TH7	5529798	0633622
TH8	5529774	0633664

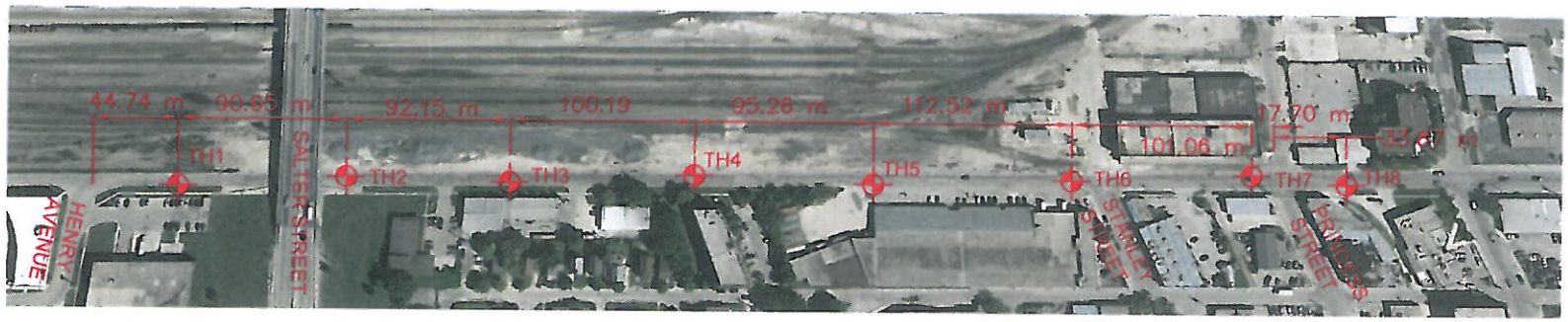
TEST HOLE LOCATION TABLE	
HOLE #	OFFSET OF TEST HOLE
TH1	0.8 m NORTH OF SOUTH EDGE
TH2	1.2 m SOUTH OF NORTH EDGE
TH3	1.3 m NORTH OF SOUTH EDGE
TH4	1.8 m SOUTH OF NORTH EDGE
TH5	0.9 m NORTH OF SOUTH EDGE
TH6	0.9 m SOUTH OF NORTH EDGE
TH7	1.5 m SOUTH OF NORTH EDGE
TH8	0.9 m SOUTH OF NORTH CURB



KEYMAP

LEGEND

TH1 TEST HOLE



NO.	DATE	ISSUE / REVISION
0	Feb. 2018	report

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, MB
R2J 3W8
Phone: (204) 233-1694
Fax: (204) 235-1579

ENG. STAMP:

ENGINEERS GEOSCIENTISTS MANITOBA
Certificate of Authorization
ENG-TECII Consulting Limited
No.2475

CLIENT: WSP CANADA GROUP LIMITED

PROJECT: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE WINNIPEG, MANITOBA

DWG DESCRIPTION: TEST HOLE LOCATION PLAN - HIGGINS AVENUE

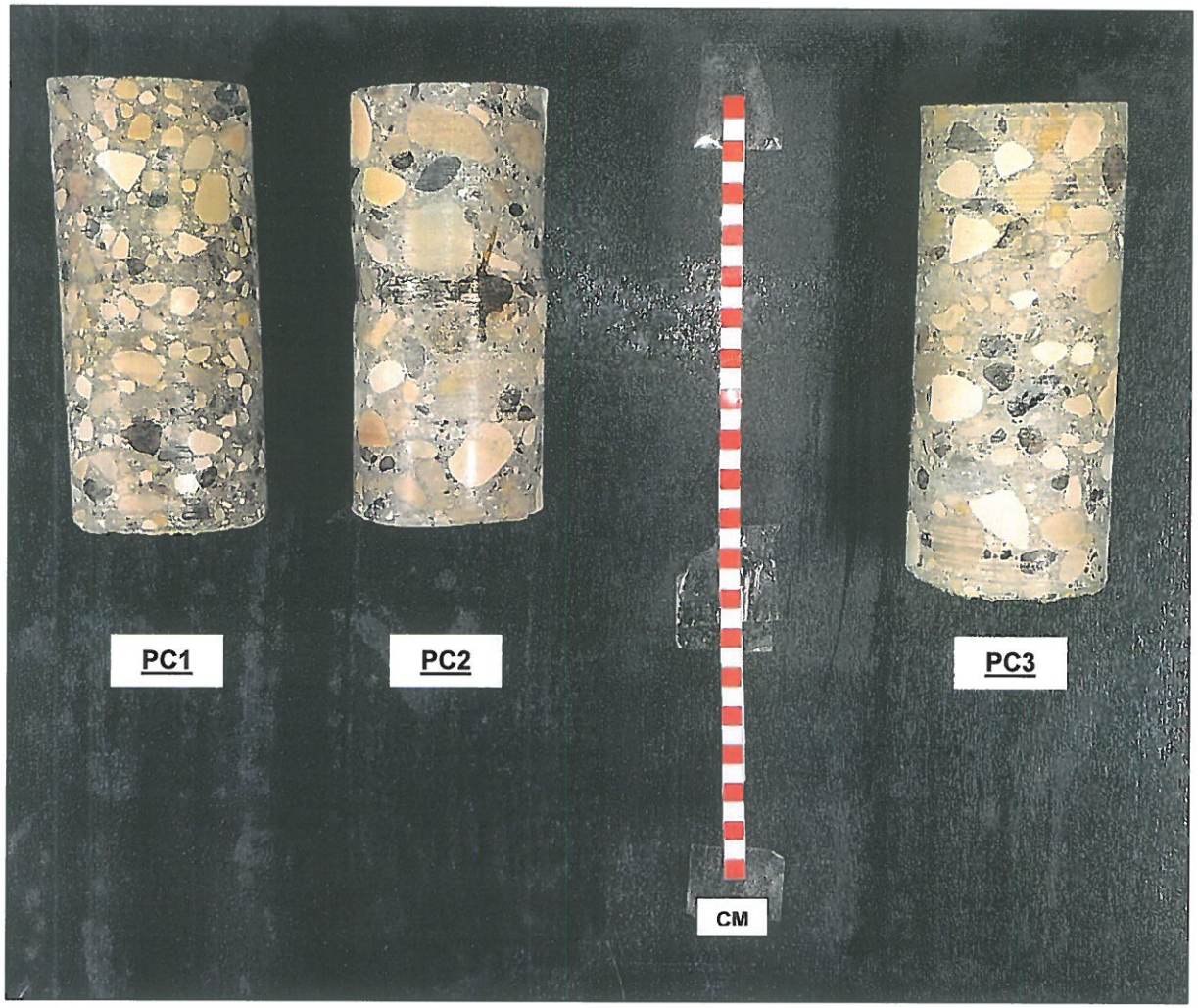
SCALE: NTS

DRAWN BY:	DATE:
TDR	FEBRUARY 2018

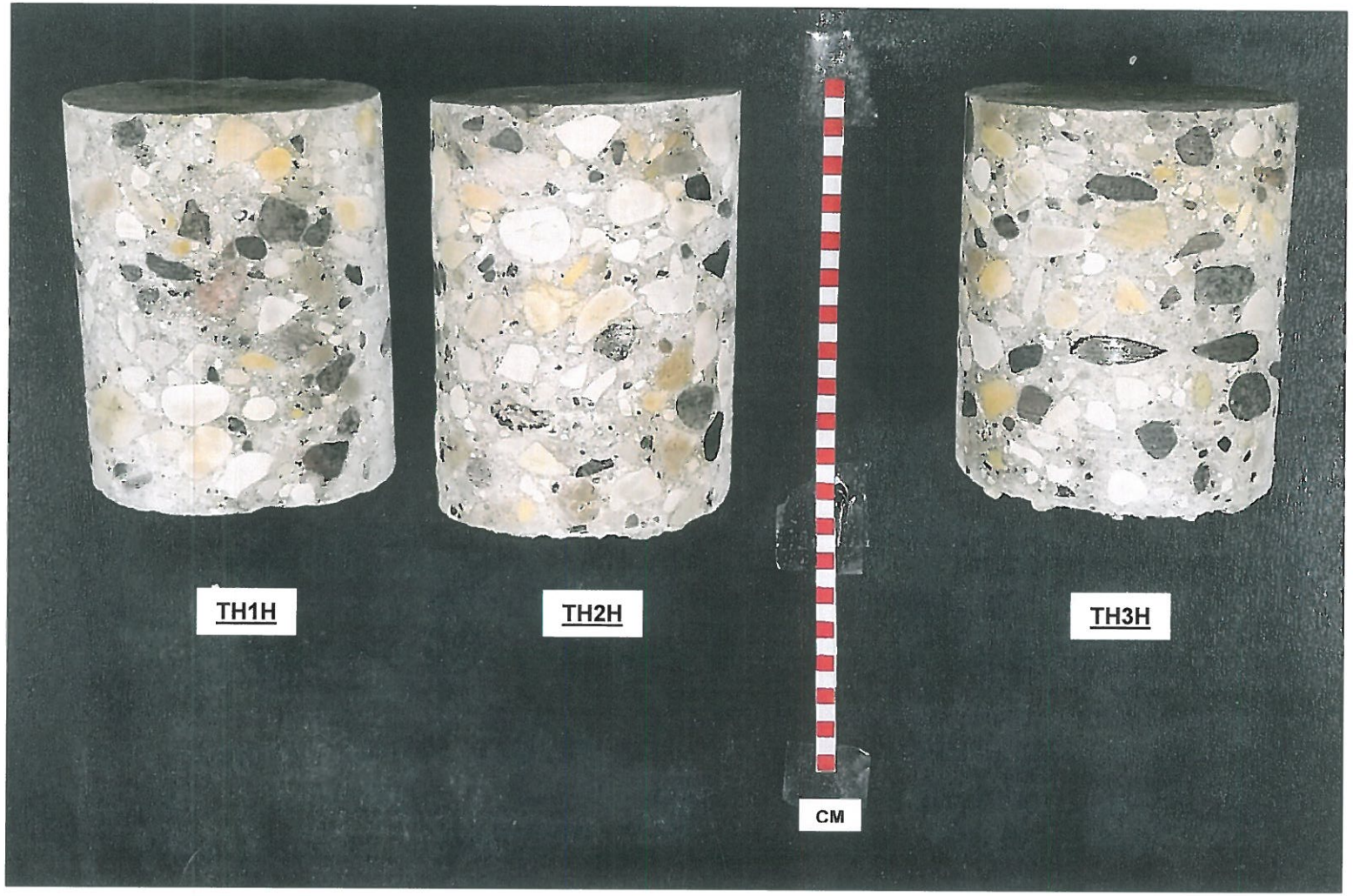
FILE No.:	CLIENT DWG/FIG. No.:
17-035-02	

ENG-TECH DWG/FIG. No.:	NO.:
3	

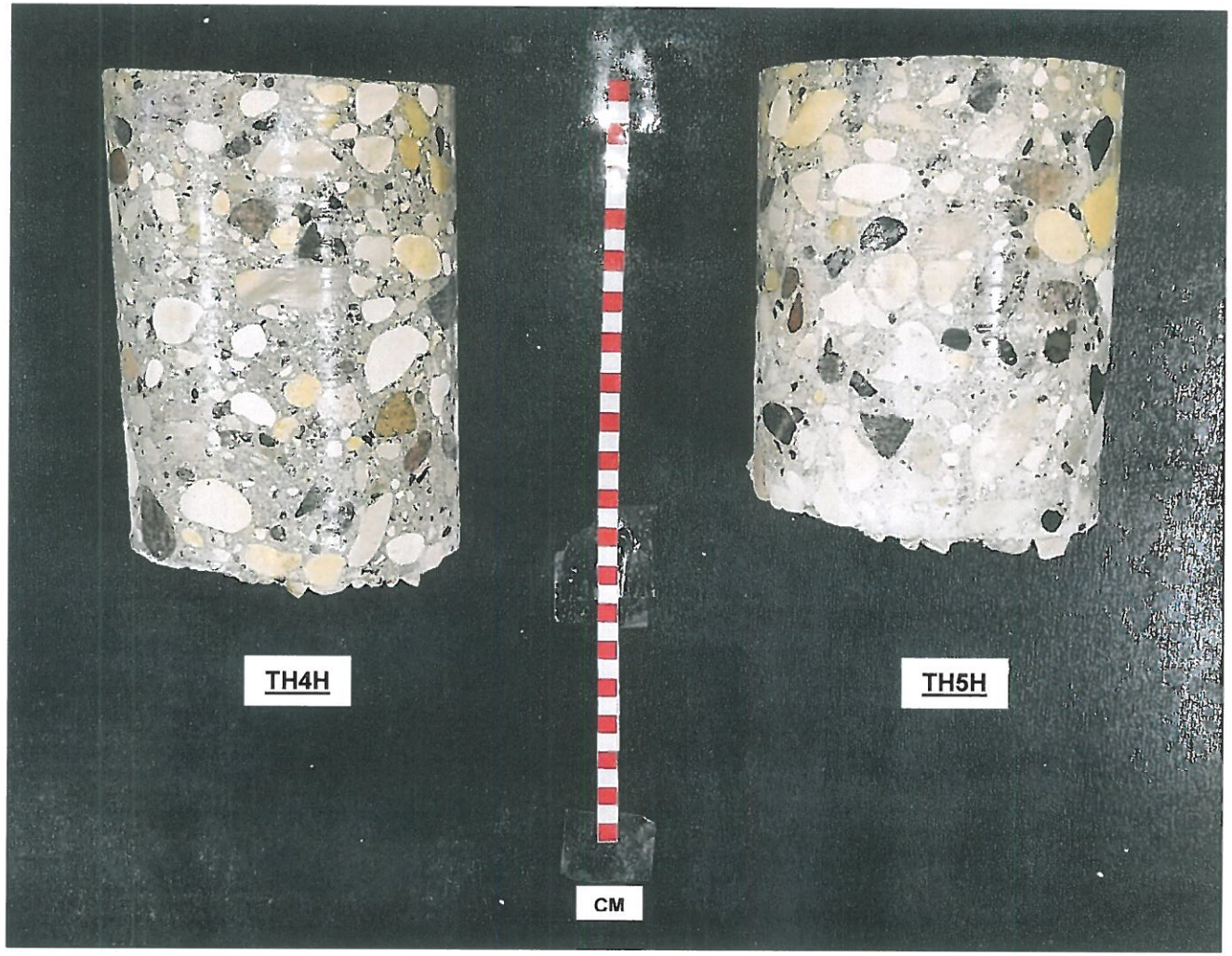
P:\2017\Projects\035(WSP Canada Inc. Winnipeg)\02(Geo_Industrial Streets Package 18-RL-02)\Drawings\Figure 3 - Pavement Cores and Test Hole Location Plan(Higgins).dwg



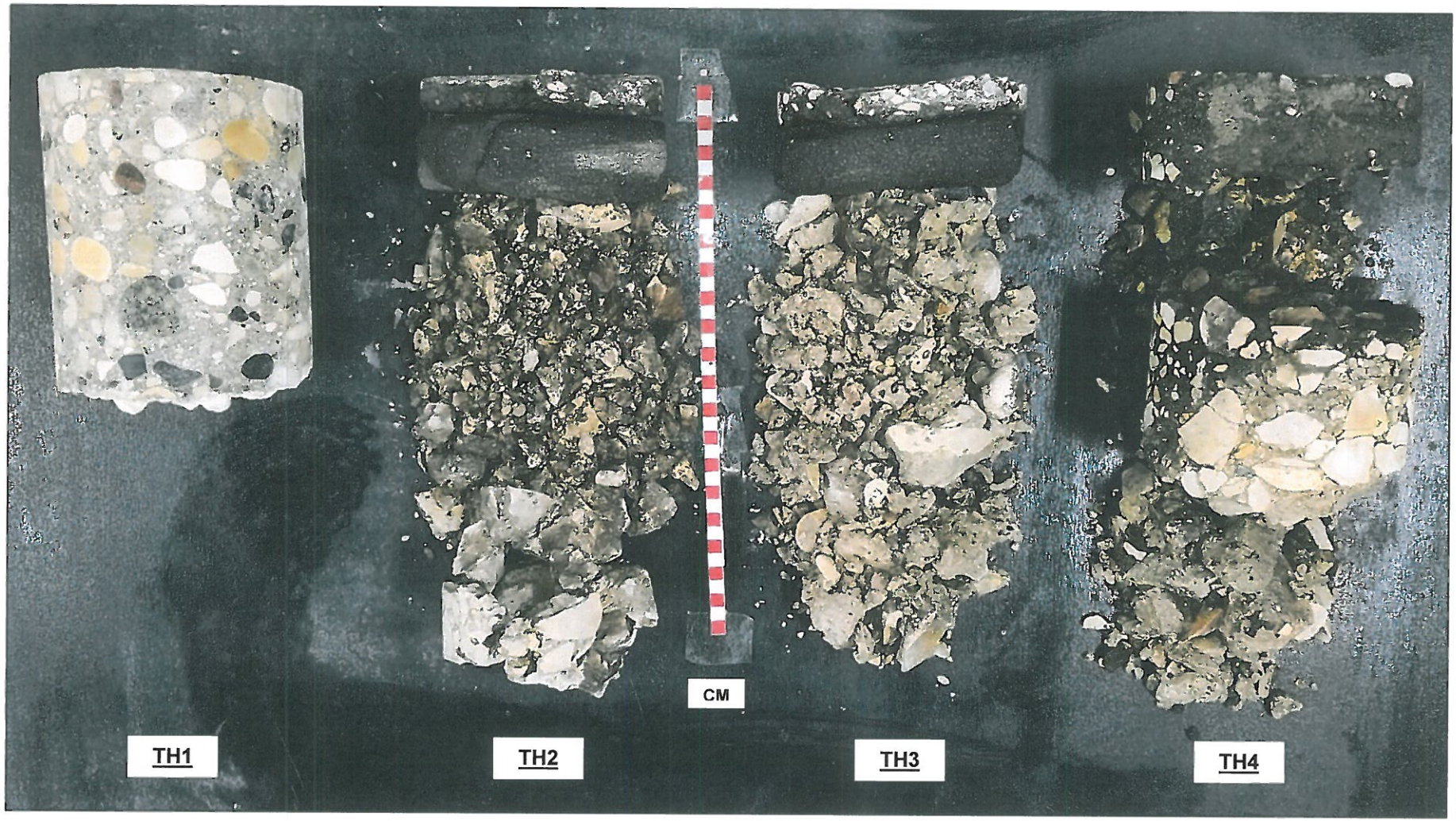
HENLOW BAY



HENLOW BAY



HENLOW BAY



HIGGINS AVENUE

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75 µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75 mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} > 4$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ TO 3
			GP		POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75 mm	CLEAN SANDS (TRACE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_U = \frac{D_{60}}{D_{10}} > 6$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ TO 3
			SP		POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM		SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75 µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	LL ≤ 50%	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHTY PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		LL > 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	LL ≤ 30%	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		30% < LL ≤ 50%	CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		LL > 50%	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SILTS & CLAYS BELOW "A" LINE	LL < 50%	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	
		LL > 50%	OH		ORGANIC CLAYS OF HIGH PLASTICITY	
HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

ADDITIONAL SYMBOLS

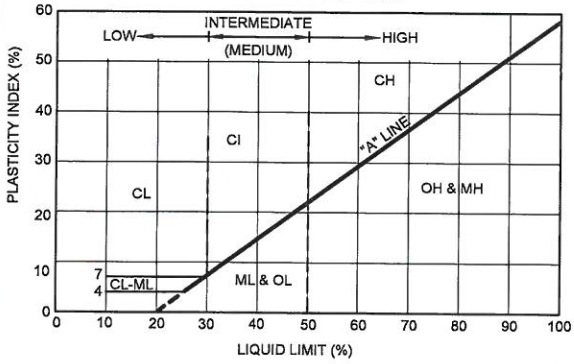
TILL, SANDSTONE, GRANITE, FILL, TOPSOIL, CONCRETE, SHALE, LIMESTONE

PLASTIC SOILS

MOISTURE	PLASTICITY	INTRUSIONS	CONSISTENCY	POCKET PEN (TSF)	(N)
DRY	LOW	ROOTLETS	VERY SOFT		< 2
DAMP	MEDIUM	OXIDES	SOFT	0 - 0.5	2 - 4
MOIST	HIGH	MICA	FIRM	0.5 - 1.0	4 - 8
WET		GYPSUM	STIFF	1.0 - 2.0	8 - 15
		ETC.	VERY STIFF	2.0 - 4.0	15 - 30
			HARD	> 4.0	> 30

TSF x 95.8 = kPa (q_U) $S_U = \frac{1}{2} \times q_U$

PLASTICITY CHART FOR SOILS PASSING 425 µm SIEVE



SOIL DESCRIPTIONS

TRACE:	0 - 10%	BOULDERS:	> 200 mm	COARSE SAND:	2 - 4.75 mm
SOME:	10 - 20%	COBBLES:	75 - 200 mm	MEDIUM SAND:	0.425 - 2 mm
WITH:	20 - 35%	COURSE GRAVEL:	19 - 75 mm	FINE SAND:	0.075 - 0.425 mm
AND:	35 - 50%	FINE GRAVEL	4.75 - 19 mm	FINES:	< 0.075 mm

GRANULAR SOILS

MOISTURE	DENSITY	GRADATION	INTRUSIONS	SPT (N)
DRY	VERY LOOSE	POORLY	ROOTLETS	0 - 4
DAMP	LOOSE	WELL	OXIDES	4 - 10
MOIST	MED. DENSE		MICA	10 - 30
WET	DENSE		FINES	30 - 50
	VERY DENSE		ETC.	> 50

DEFINITIONS

LL = LIQUID LIMIT
P.I. = PLASTICITY INDEX
C_U = COEFFICIENT OF UNIFORMITY
q_U = UNCONFINED COMPRESSIVE STRENGTH
S_U = UNDRAINED SHEAR STRENGTH
C_C = COMPRESSION INDEX
PL = PLASTIC LIMIT

ENG-TECH CONSULTING LIMITED

420 Turenne Street
Winnipeg, MB R2J 3W8
Phone: (204) 233-1694
Fax: (204) 235-1579

F:\Drafting\SOIL CLASSIFICATIONS\SOIL CLASSIFICATIONS.dwg

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH1H

Client: WSP Canada Inc.
Site: Henlow Bay, Winnipeg, Manitoba
Location: See Figure 2
Project: Geotechnical Investigation - Industrial Streets Package, 18-RL-02

File No.: 17-035-02
Date Drilled: December 18, 2017
Grade Elevation: 100.0 m
Water Elevation: - -

Depth (m)	Description	Elevation (m)
0.0	Ground Surface	100.0
	Concrete (190 mm)	
	Gravel Fill (150 mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.	
	Clay Fill (CH) - dark brown, moist, firm, highly plastic, trace sand, and clay.	
1.0	***Silt Clay (CH)*** - medium brown, moist, soft, highly plastic, trace sand, and clay.	99.0
	Clay (CH) - dark brown, moist, stiff, highly plastic, trace silt.	
2.0		98.0
3.0	***End of Test Hole*** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0
4.0		96.0
5.0		95.0

Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
S1	Auger Cuttings	25.9	
S2	Auger Cuttings	37.5	
S3	Auger Cuttings	34.5	
S4	Auger Cuttings	36.2	
S5	Auger Cuttings	21.8	
S6	Auger Cuttings	22.7	
S7	Auger Cuttings	34.5	

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen, Torvane, UC

ENG- TECH Consulting Limited
Logged by: TDR
Reviewed by: CrA

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL, SHELBY TUBE, AUGER CUTTINGS, SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH2H

Client: WSP Canada Inc.

Site: Henlow Bay, Winnipeg, Manitoba

Location: See Figure 2

Project: Geotechnical Investigation - Industrial Streets Package, 18-RL-02

File No.: 17-035-02

Date Drilled: December 18, 2017

Grade Elevation: 100.0 m

Water Elevation: - -

Depth (m)	Description	Elevation (m)	Sample No.	Moisture Content (%)
0.0	Ground Surface	100.0		
	Concrete (202 mm)			
	Gravel Fill (50 mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.		S1	32.7
	Clay Fill (CI) - dark brown, moist, firm, medium plastic, trace silt.		S2	31.6
1.0	*Clay (CH)* - dark brown, moist, stiff, highly plastic, trace sand, and clay.	99.0	S3	32.5
			S4	34.9
			S5	37.1
			S6	33.8
2.0		98.0	S7	25.9
3.0	*End of Test Hole* - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0		
4.0		96.0		
5.0		95.0		

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CA

Drilled By: Subterranean (Manitoba) Ltd.

Drill Rig: CME 75

Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH3H

Client: WSP Canada Inc.
Site: Henlow Bay, Winnipeg, Manitoba
Location: See Figure 2
Project: Geotechnical Investigation - Industrial Streets Package- 18-RL-02

File No.: 17-035-02
Date Drilled: December 18, 2017
Grade Elevation: 100.0 m
Water Elevation: - -

Depth (m)	Description	Elevation (m)	Sample No.	Moisture Content (%)
0.0	Ground Surface	100.0		
	Concrete (185 mm)			
	Gravel Fill (150 mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.		S1	8.6
	Silty Clay (CH) - dark brown, moist, frozen, highly plastic, trace silt.		S2	31.3
1.0	***Clay (CH)*** - medium brown, moist, stiff, highly plastic, trace silt.	99.0	S3	27.9
			S4	23.7
	- below 1.5 m, dark brown.		S5	26.1
2.0		98.0	S6	31.7
			S7	36.2
3.0	***End of Test Hole*** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0		
4.0		96.0		
5.0		95.0		

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH4H

Client: WSP Canada Inc.
Site: Henlow Bay, Winnipeg, Manitoba
Location: See Figure 2
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: December 18, 2017
Grade Elevation: 100.0 m
Water Elevation: - -

Depth (m)	Description	Elevation (m)	Sample No.	Moisture Content (%)
0.0	Ground Surface	100.0		
	Concrete (185 mm)			
	Gravel Fill (50mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.		S1	26.8
	Clay Fill (CI) - dark brown, moist, frozen, medium plastic, trace silt.		S2	28.6
1.0		99.0	S3	29.1
	Clay (CH) - medium brown, moist, stiff, highly plastic, trace sand, and clay.		S4	29.8
	- below 1.5 m, dark brown.		S5	29.0
2.0		98.0	S6	38.5
			S7	41.2
3.0	**End of Test Hole** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0		
4.0		96.0		
5.0		95.0		

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CHA

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH5H

Client: WSP Canada Inc.
Site: Henlow Bay, Winnipeg, Manitoba
Location: See Figure 2
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: December 18, 2017
Grade Elevation: 100.0 m
Water Elevation: - -

Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
0.0		Ground Surface	100.0				
		Concrete (190 mm)					
		Gravel Fill (150 mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.					
		Clay Fill (CH) - dark brown, moist, frozen to 0.50 m, highly plastic, trace gravel, and clay.					
1.0		***Clay (CH)*** - medium brown, moist, stiff, highly plastic, trace silt.	99.0	S1		21.5	
				S2		41.3	
				S3		32.9	
				S4		31.0	
				S5		30.0	
2.0				S6		33.4	
			98.0	S7		42.8	
3.0		***End of Test Hole*** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0				
4.0			96.0				
5.0			95.0				

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH1

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 18, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)	Sample No.	Moisture Content (%)
0.0	Ground Surface	100.0		
	Concrete (187 mm)			
	Gravel Fill (GP) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.		S1	5.4
1.0		99.0	S2	6.2
			S3	4.4
			S4	5.9
	Clayey Silt (CL) - medium brown, moist, soft, low plastic, trace clay.		S5	22.8
2.0		98.0	S6	23.6
			S7	25.5
3.0	**End of Test Hole** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0		
4.0		96.0		
5.0		95.0		

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen, Torvane, UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

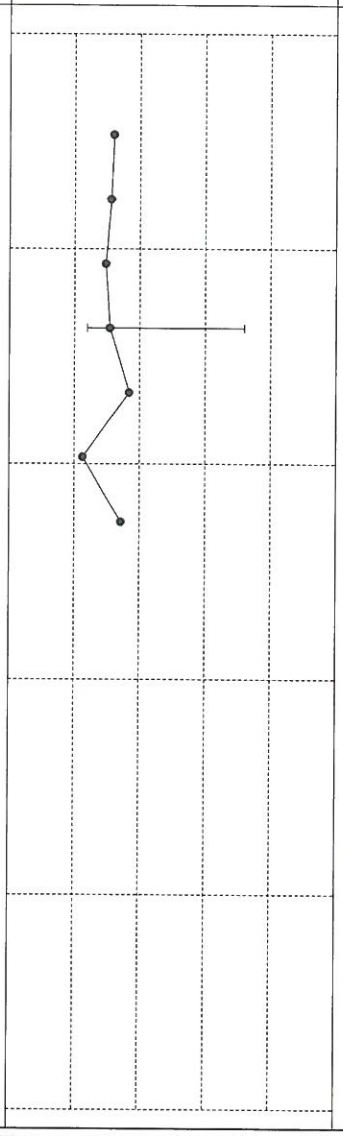
Test Hole #: TH2

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 16, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)
0.0	Ground Surface	100.0
	Asphalt (120 mm)	
	Concrete Rubble (200 mm)	
	Gravel Fill (50 mm) - medium brown, moist, porrly graded, frozen, fined grained.	
1.0	*Clay Fill (CH)* - black, moist, frozen, highly plastic, trace silt.	99.0
	Clay (CH) - dark brown, moist, stiff, highly plastic, trace silt	
	Clayey Silt (CH) - tan, moist, soft, highly plastic, trace sand, and clay	
2.0	*Clay (CH)* - medium brown, moist, stiff, highly plastic, trace silt.	98.0
3.0	*End of Test Hole* - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0
4.0		96.0
5.0		95.0

Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
S1	Auger Cuttings	32.1	
S2	Auger Cuttings	31.3	
S3	Auger Cuttings	29.8	
S4	Auger Cuttings	31.0	
S5	Auger Cuttings	36.9	
S6	Auger Cuttings	22.7	
S7	Auger Cuttings	34.5	



SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

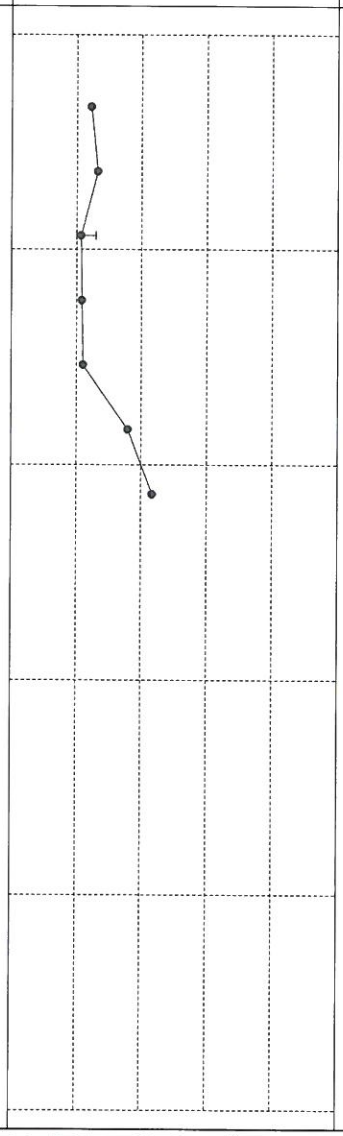
Test Hole #: TH3

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 16, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)
0.0	Ground Surface	100.0
	Asphalt (86 mm)	
	Concrete (165 mm)	
	Gravel Fill (GP) (150 mm) - medium brown, moist, frozen, poorly graded, fine grained.	
	Clay Fill (CH) - black, moist, frozen, highly plastic, trace silt.	
1.0	***Silt (ML)*** - medium brown, moist, frozen, low plastic, trace sand, some clay	99.0
	Clay (CH) - dark brown, moist, stiff, highly plastic, trace silt.	
2.0		98.0
3.0	***End of Test Hole*** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0
4.0		96.0
5.0		95.0

Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
S1	Auger Cuttings	24.6	
S2	Auger Cuttings	26.6	
S3	Auger Cuttings	21.4	
S4	Auger Cuttings	21.7	
S5	Auger Cuttings	22.1	
S6	Auger Cuttings	36.0	
S7	Auger Cuttings	43.5	



SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

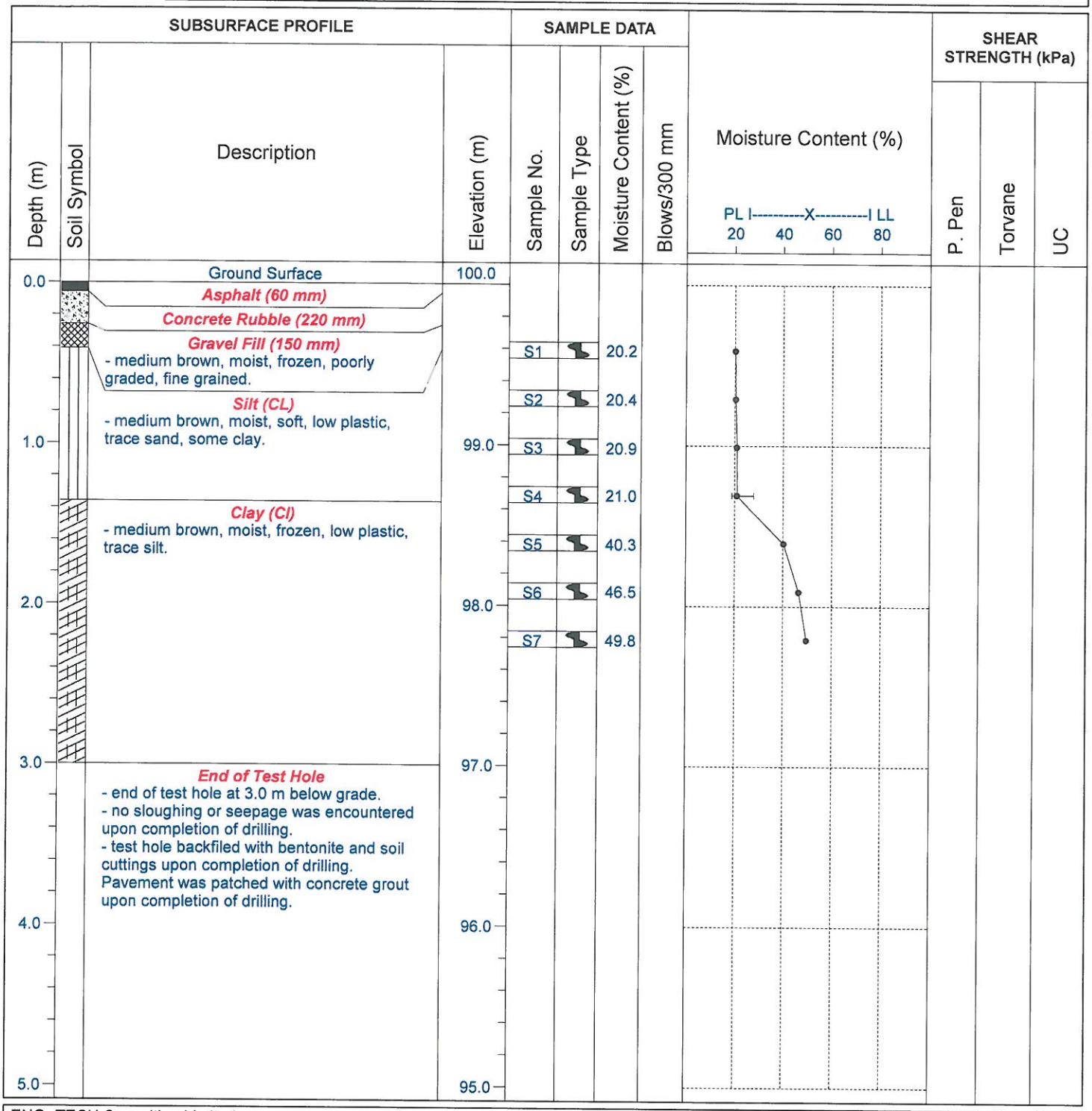
ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH4

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 16, 2018
Grade Elevation: 100.0 m
Water Elevation: --



ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE — SPLIT BARREL — SHELBY TUBE — AUGER CUTTINGS — SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH5

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 16, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)
0.0	Ground Surface	100.0
	Asphalt (50 mm)	
	Concrete Rubble (150 mm)	
	Gravel Fill (203 mm) - medium brown, moist, frozen, poorly graded, fine grained, trace clay.	
	Silty Clay Fill (CH) - black, moist, frozen, highly plastic, trace silt.	
1.0	**Clayey Silt (Cl)** - light brown, moist, soft, medium plastic, trace sand, with clay.	99.0
	Clay (Cl) - medium brown, frozen, medium plastic, trace silt. - below 1.5 m, trace silt inclusions.	
2.0		98.0
3.0	**End of Test Hole** - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0
4.0		96.0
5.0		95.0

Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
S1	Split Barrel	35.2	
S2	Split Barrel	34.3	
S3	Split Barrel	33.2	
S4	Split Barrel	27.6	
S5	Split Barrel	26.0	
S6	Split Barrel	39.9	
S7	Split Barrel	44.8	

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited
Logged by: TDR
Reviewed by:

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH6

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 18, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)	Sample No.	Moisture Content (%)
0.0	Ground Surface	100.0		
	Asphalt (50 mm)			
	Concrete Rubble (150 mm)			
	Clay Fill (CH) - black, moist, frozen, highly plastic, trace sand, and clay.		S1	32.6
			S2	33.1
1.0		99.0	S3	32.4
	Clay (CI) - medium brown, moist, firm, medium plastic, trace silt. - silt pockets from 1.6 m to 1.7 m.		S4	29.2
			S5	28.7
	- silt pockets from 2.4 m to 2.5 m.		S6	34.6
2.0		98.0		
			S7	35.1
3.0	*End of Test Hole* - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0		
4.0		96.0		
5.0		95.0		

Moisture Content (%): PL I----------X----------I LL; 20 40 60 80

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

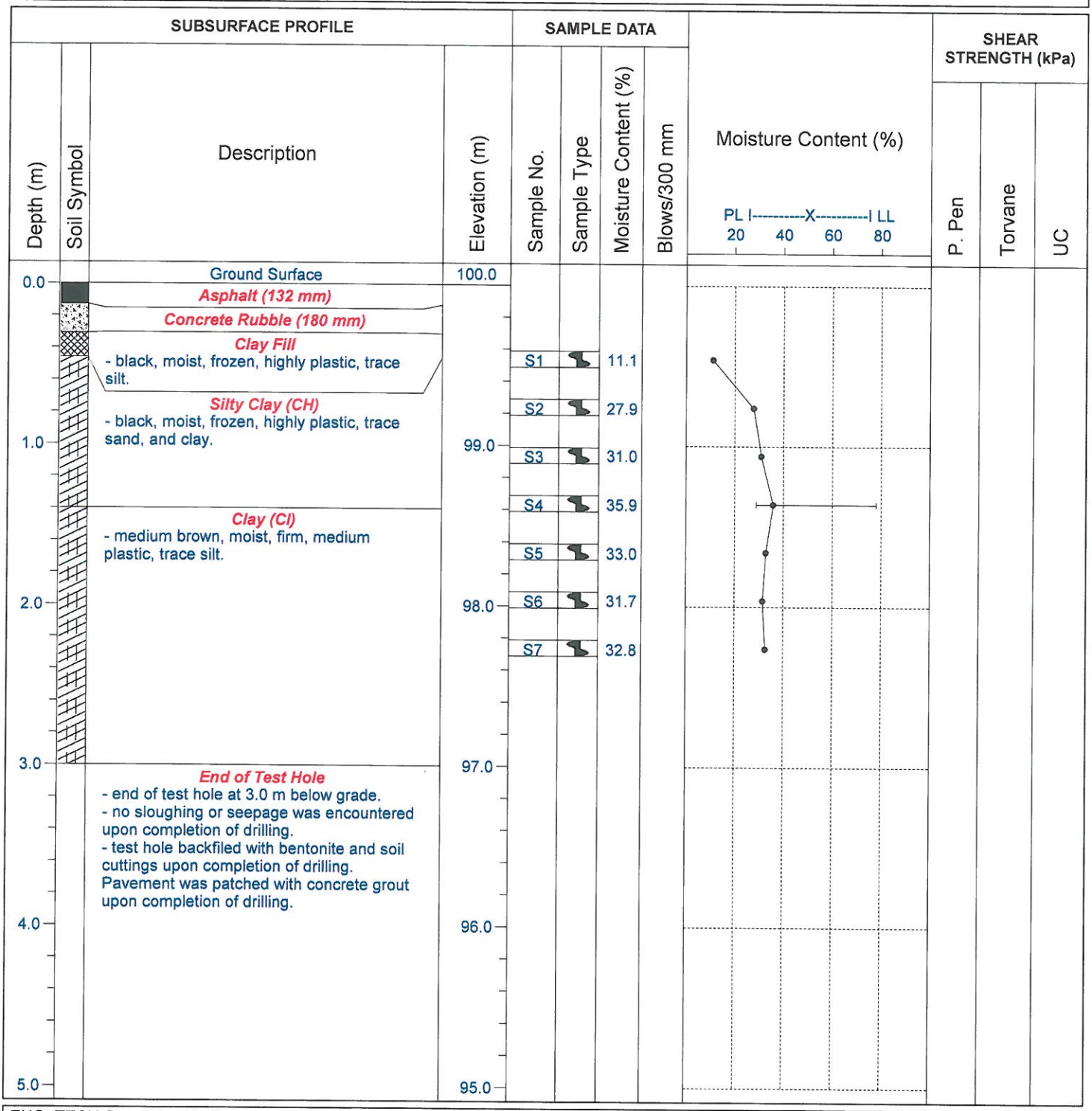
ENG-TECH Consulting Limited

Engineering And Testing Solutions That Work For You

Test Hole #: TH7

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 18, 2018
Grade Elevation: 100.0 m
Water Elevation: --



ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE — SPLIT BARREL — SHELBY TUBE — AUGER CUTTINGS — SPLIT SPOON

ENG-TECH CONSULTING LIMITED

Engineering And Testing Solutions That Work For You

Test Hole #: TH8

Client: WSP Canada Inc.
Site: Higgins Avenue, Winnipeg, Manitoba
Location: See Figure 3
Project: Geotechnical Investigation - Industrial Streets Package 18-RL-02

File No.: 17-035-02
Date Drilled: January 18, 2018
Grade Elevation: 100.0 m
Water Elevation: --

Depth (m)	Description	Elevation (m)
0.0	Ground Surface	100.0
	Asphalt (125 mm)	
	Concrete (225 mm)	
	Gravel Fill (50 mm) - medium brown, moist, , poorly graded,frozen, medium to fine grained.	
1.0	*Clay Fill (CH)* - black, moist, frozen, highly plastic, trace silt.	99.0
	Silt (CL) - medium brown, moist, firm, low plastic, trace sand, some clay.	
2.0		98.0
3.0	*End of Test Hole* - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole backfiled with bentonite and soil cuttings upon completion of drilling. Pavement was patched with concrete grout upon completion of drilling.	97.0
4.0		96.0
5.0		95.0

Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm
S1	Auger Cuttings	21.8	
S2	Auger Cuttings	19.0	
S3	Auger Cuttings	21.5	
S4	Auger Cuttings	39.0	
S5	Auger Cuttings	41.9	
S6	Auger Cuttings	46.7	
S7	Auger Cuttings	48.3	

Moisture Content (%): PL I----------X----------I LL (20, 40, 60, 80)

SHEAR STRENGTH (kPa): P. Pen | Torvane | UC

ENG- TECH Consulting Limited

Logged by: TDR

Reviewed by: CH

Drilled By: Subterranean (Manitoba) Ltd.
Drill Rig: CME 75
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m
Completion Elevation: 97.0 m
Sheet: 1 of 1

SAMPLE TYPE: SPLIT BARREL | SHELBY TUBE | AUGER CUTTINGS | SPLIT SPOON

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

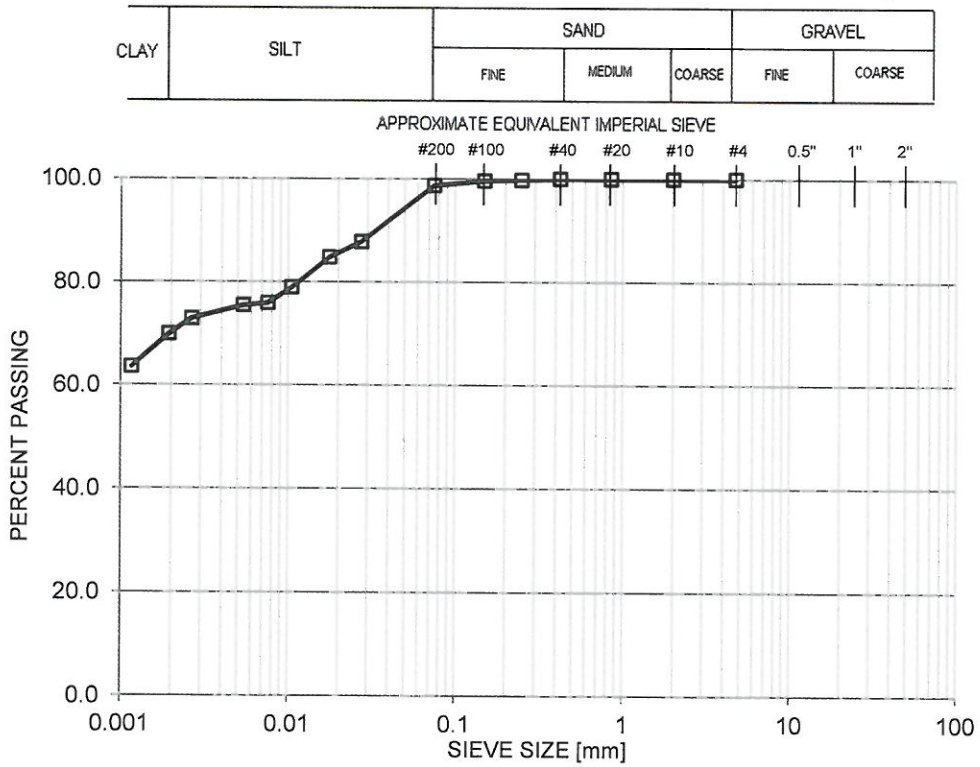
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-3

Attention: Joel Piwniuk, E.I.T.

Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE. 18-RL-02

Test Hole No. TH1H **Sample No.** 3 **Depth:** 0.7 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Henlow Bay
Date Sampled: Dec 18/17 **Date Received:** Dec 18/17 **Date Tested:** Jan 9/18
Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	99.8
0.150	99.6
0.075	98.7
0.028	87.8
0.018	84.8
0.011	78.9
0.008	75.9
0.005	75.4
0.003	72.9
0.002	69.9
0.001	63.5

Percent of: GRAVEL (0.0 %), SAND (1.3 %), SILT (28.5 %), CLAY (70.2 %)
Sample Description:
Comments: Insitu Moisture content is 34.5%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M. Sc., P. Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

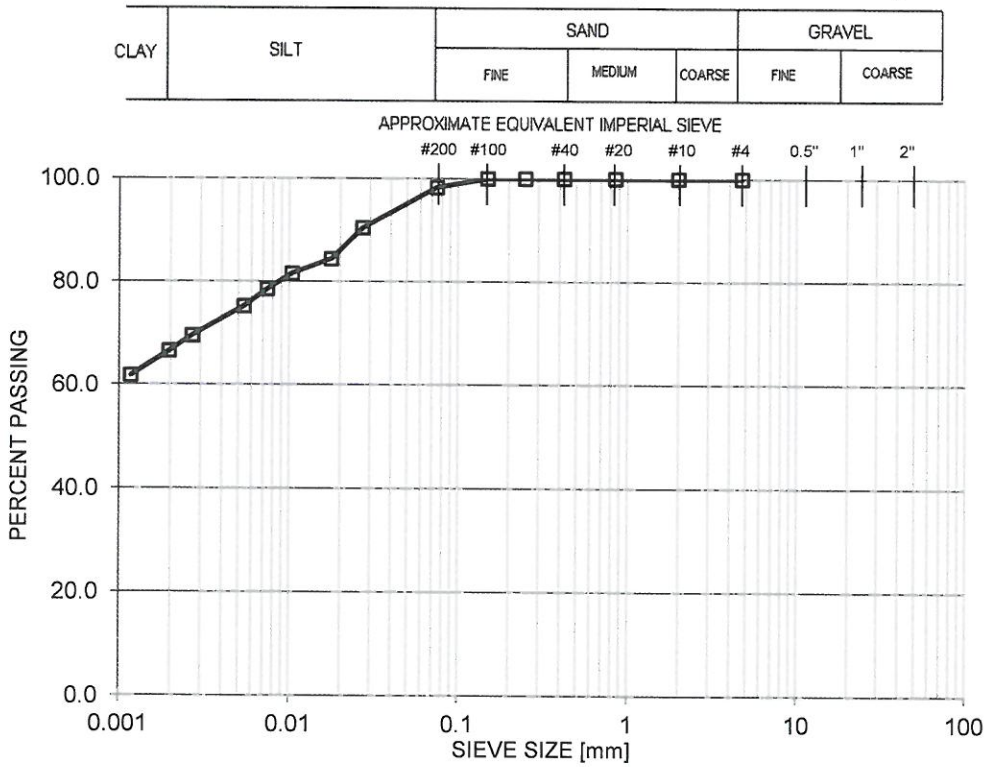
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-5

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH1H **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Henlow Bay
Date Sampled: Dec 18/17 **Date Received:** Dec 18/17 **Date Tested:** Jan 9/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	100.0
0.150	100.0
0.075	98.3
0.027	90.4
0.018	84.4
0.010	81.5
0.007	78.5
0.005	75.2
0.003	69.6
0.002	66.6
0.001	61.8

Percent of: GRAVEL (0.0 %), SAND (1.7 %), SILT (31.6 %), CLAY (66.7 %)
Sample Description:
Comments: Insitu Moisture content is 36.2%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

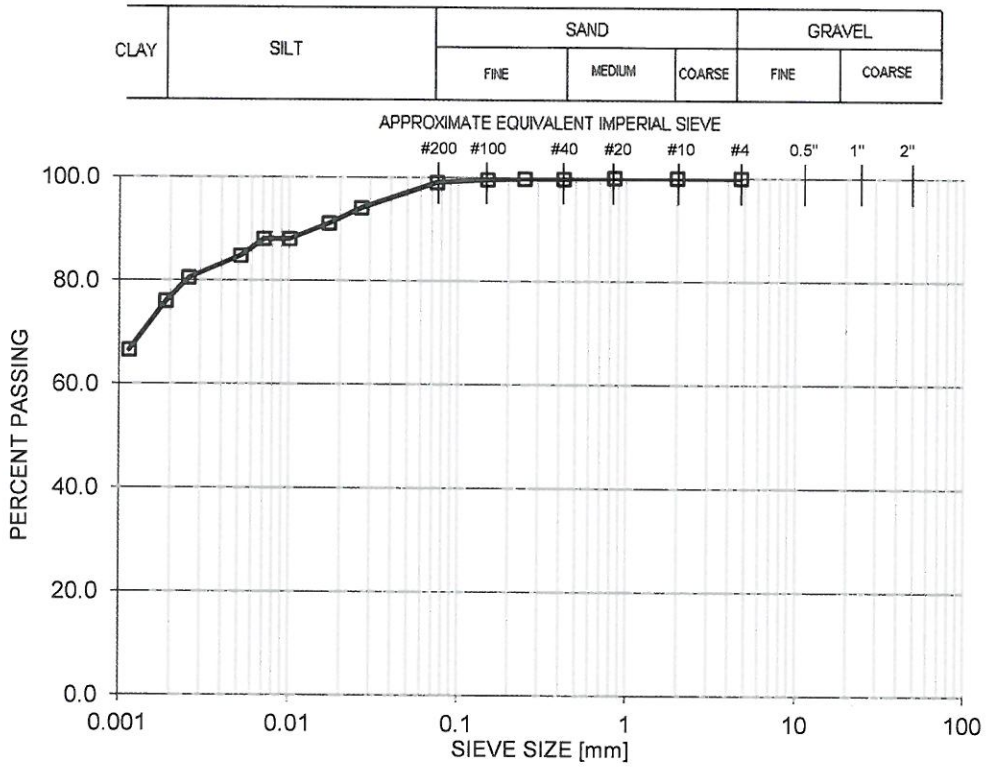
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-7

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH2H **Sample No.** 4 **Depth:** 1.0 meters
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Henlow Bay
Date Sampled: Dec 18/17 **Date Received:** Dec 18/17 **Date Tested:** Jan 9/14

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	100.0
0.425	99.8
0.250	99.8
0.150	99.6
0.075	99.1
0.027	94.1
0.017	91.1
0.010	88.1
0.007	88.1
0.005	84.8
0.003	80.5
0.002	76.0
0.001	66.5

Percent of: GRAVEL (0.0 %), SAND (0.9 %), SILT (22.2 %), CLAY (76.9 %)
Sample Description:

Comments: Insitu Moisture content is 34.9%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P. Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

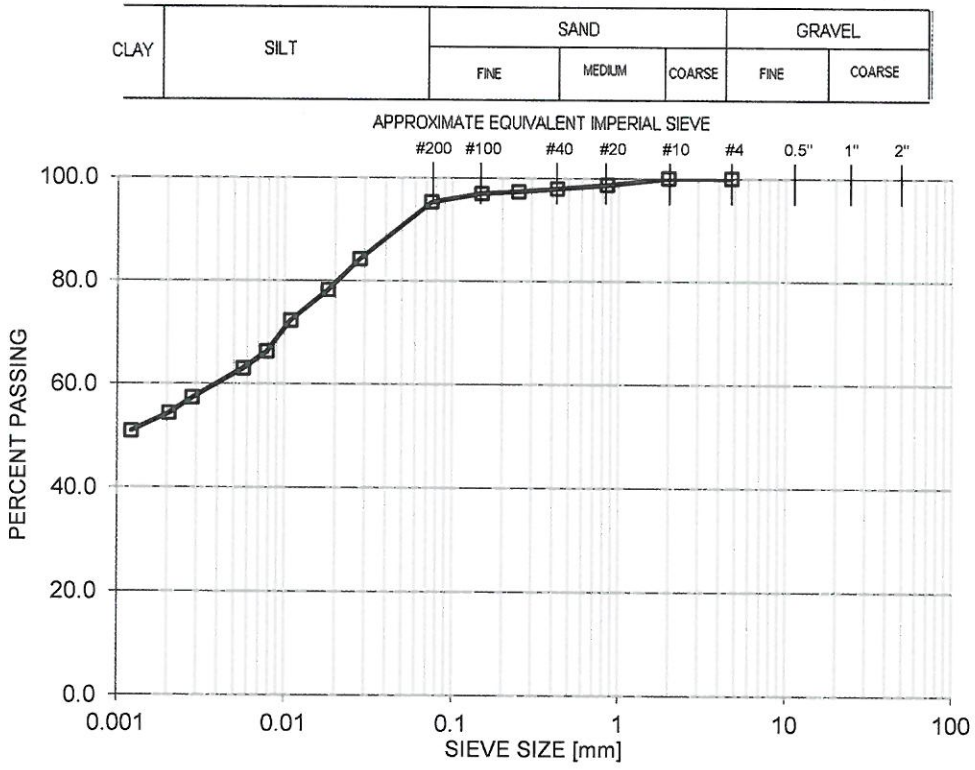
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-9

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No.	TH3H	**Sample No.**	3	**Depth:**	0.7 m
Sample By:	ENG-TECH (Trevor Robertson)	**Type of Sample:**	Auger cutting	**Source:**	Henlow Bay
Date Sampled:	Dec 18/17	**Date Received:**	Dec 18/17	**Date Tested:**	Jan 9/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	98.7
0.425	97.9
0.250	97.4
0.150	97.0
0.075	95.3
0.028	84.2
0.018	78.2
0.011	72.2
0.008	66.3
0.006	63.0
0.003	57.3
0.002	54.3
0.001	50.9

Percent of: GRAVEL (0.0 %), SAND (4.7 %), SILT (41.2 %), CLAY (54.1 %)
Sample Description:
Comments: Insitu Moisture content is 27.9%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

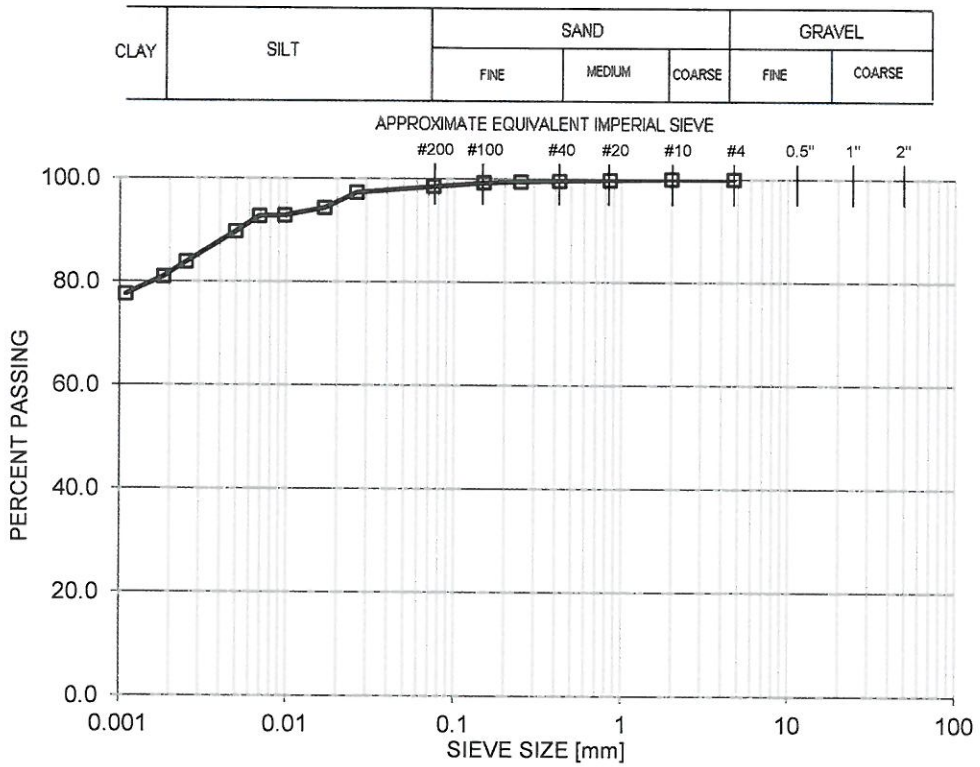
PARTICLE SIZE ANALYSIS

WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-11

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH4H **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Henlow Bay
Date Sampled: Dec 18/17 **Date Received:** Dec 18/17 **Date Tested:** Jan 9/18
Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.8
0.425	99.6
0.250	99.4
0.150	99.3
0.075	98.5
0.026	97.3
0.017	94.3
0.010	92.8
0.007	92.7
0.005	89.7
0.003	83.8
0.002	80.9
0.001	77.5

Percent of: GRAVEL (0.0 %), SAND (1.5 %), SILT (16.8 %), CLAY (81.7 %)
Sample Description:
Comments: Insitu Moisture content is 29.8%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M. Sc., P. Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

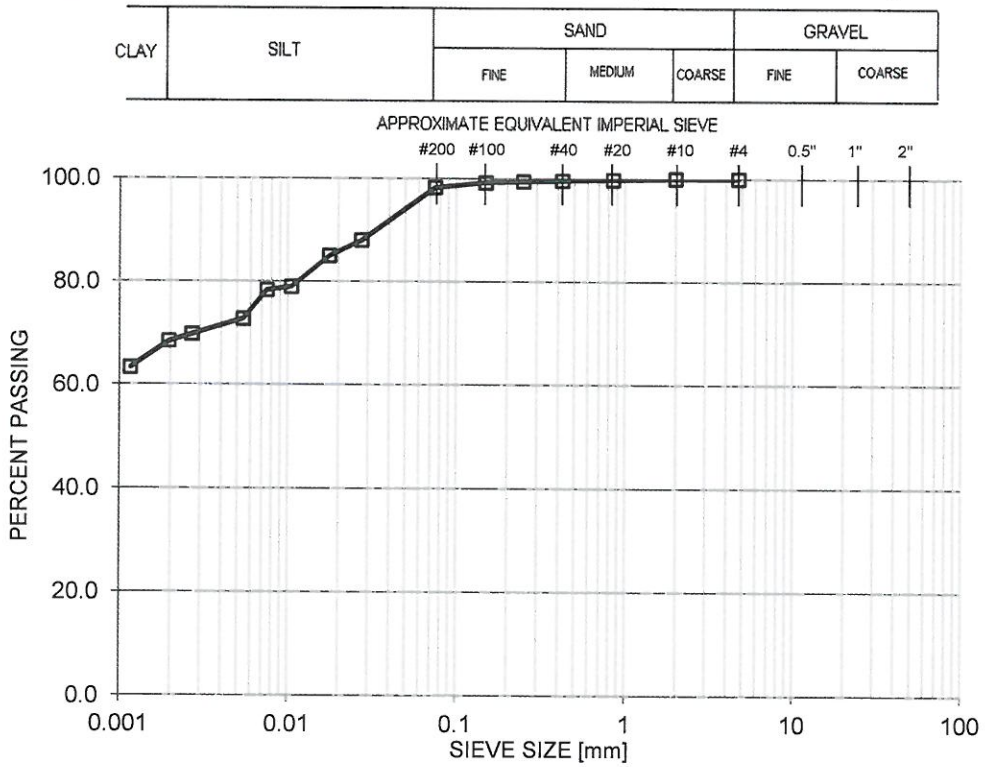
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-13

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH5H **Sample No.** 3 **Depth:** 0.7 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Henlow Bay
Date Sampled: Dec 18/17 **Date Received:** Dec 18/17 **Date Tested:** Jan 9/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.8
0.425	99.6
0.250	99.4
0.150	99.2
0.075	98.3
0.028	88.0
0.018	85.0
0.011	79.0
0.008	78.3
0.005	72.8
0.003	69.8
0.002	68.4
0.001	63.3

Percent of: GRAVEL (0.0 %), SAND (1.7 %), SILT (29.8 %), CLAY (68.5 %)
Sample Description:
Comments: Insitu Moisture content is 32.9%.

ENG-TECH Consulting Limited
Per _____
Clark Hryhoruk, M.Sc., P. Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

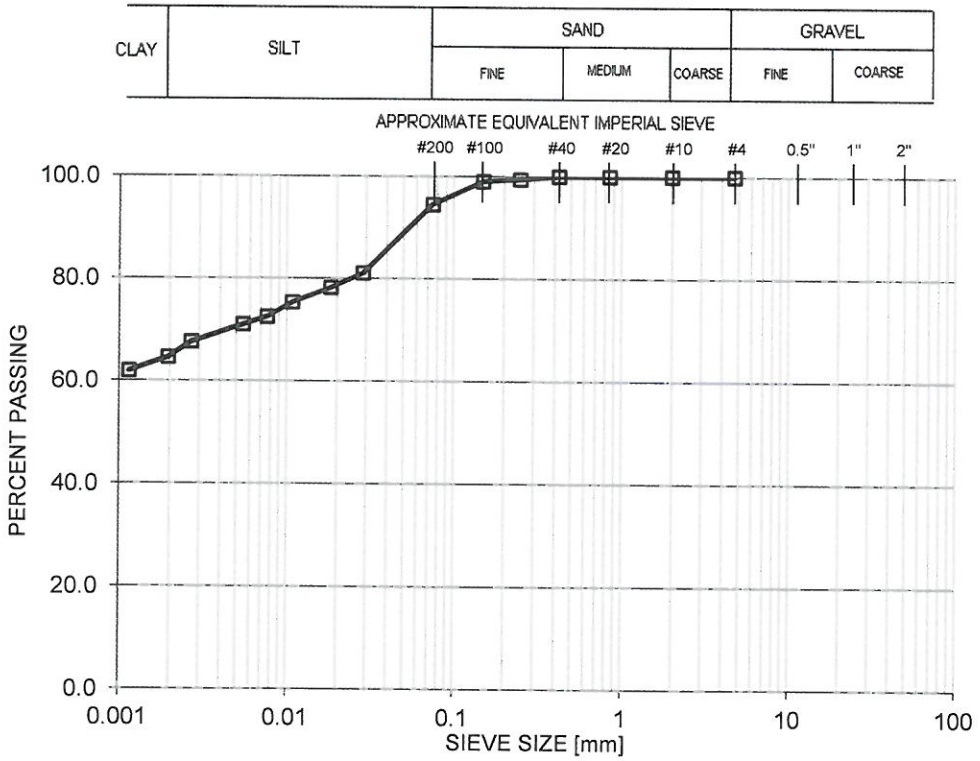
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-47

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH2 **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	100.0
0.425	100.0
0.250	99.4
0.150	99.1
0.075	94.5
0.029	81.0
0.018	78.2
0.011	75.3
0.008	72.5
0.005	71.0
0.003	67.5
0.002	64.5
0.001	61.8

Percent of: GRAVEL (0.0 %), SAND (5.5 %), SILT (29.8 %), CLAY (64.7 %)
Sample Description:
Comments: Insitu Moisture content is 31.0%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

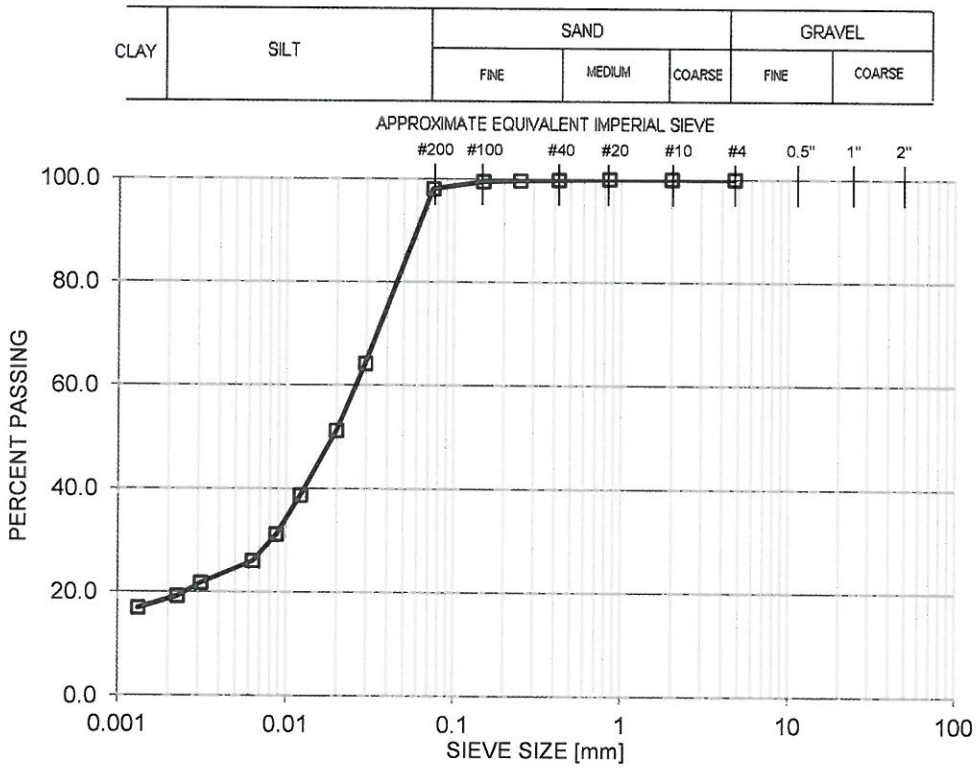
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-48

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH3 **Sample No.** 3 **Depth:** 0.7 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	100.0
0.425	99.8
0.250	99.7
0.150	99.5
0.075	98.1
0.030	64.2
0.020	51.2
0.012	38.7
0.009	31.1
0.006	26.0
0.003	21.8
0.002	19.2
0.001	16.9

Percent of: GRAVEL (0.0 %), SAND (1.9 %), SILT (79.4 %), CLAY (18.7 %)
Sample Description:
Comments: Insitu Moisture content is 20.9%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

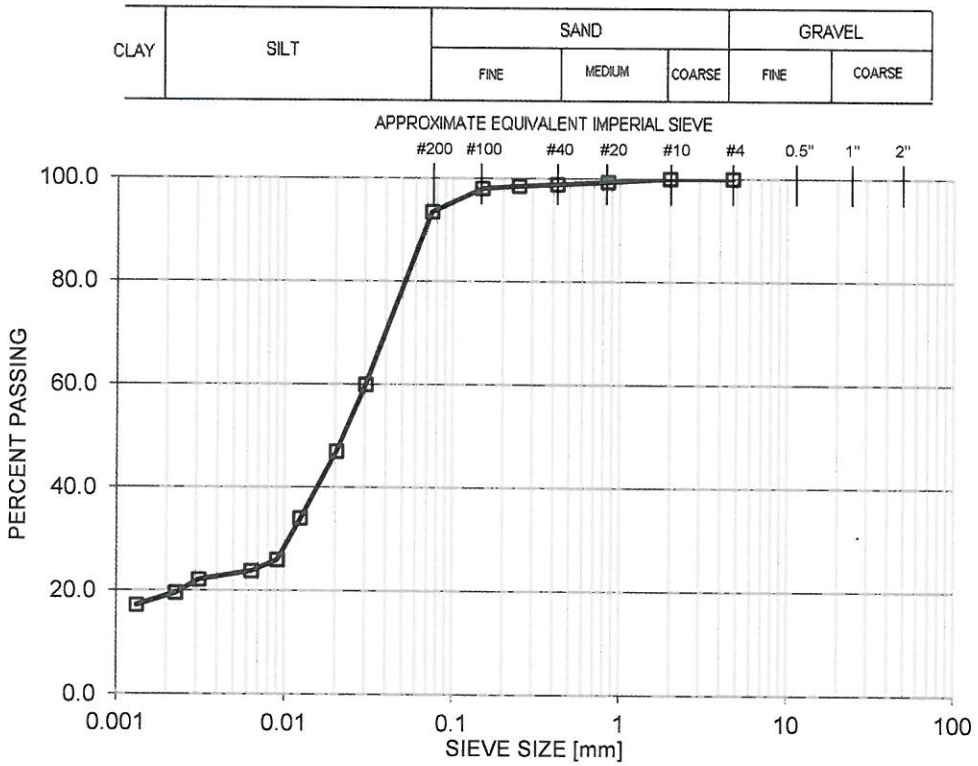
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-49

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH4 **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.3
0.425	98.9
0.250	98.5
0.150	98.0
0.075	93.5
0.030	59.9
0.020	47.0
0.012	34.0
0.009	26.0
0.006	23.8
0.003	22.1
0.002	19.5
0.001	17.1

Percent of: GRAVEL (0.0 %), SAND (6.5 %), SILT (74.6 %), CLAY (18.9 %)
Sample Description:
Comments: Insitu Moisture content is 21.0%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

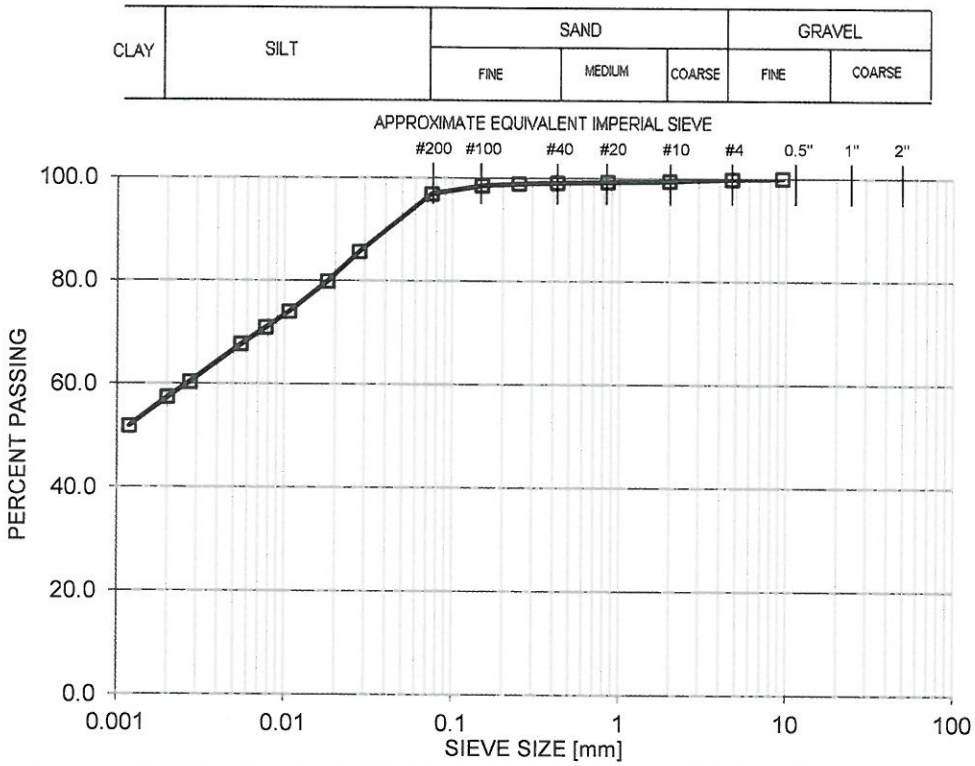
WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-50

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH5 **Sample No.** 3 **Depth:** 0.7 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
9.50	100.0
4.75	99.9
2.0	99.5
0.850	99.3
0.425	99.1
0.250	98.9
0.150	98.5
0.075	96.9
0.028	85.6
0.018	79.9
0.011	74.0
0.008	70.9
0.006	67.7
0.003	60.3
0.002	57.4
0.001	51.8

Percent of: GRAVEL (0.1 %), SAND (3.0 %), SILT (39.6 %), CLAY (57.3 %)
Sample Description:
Comments: Insitu Moisture content is 33.2%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

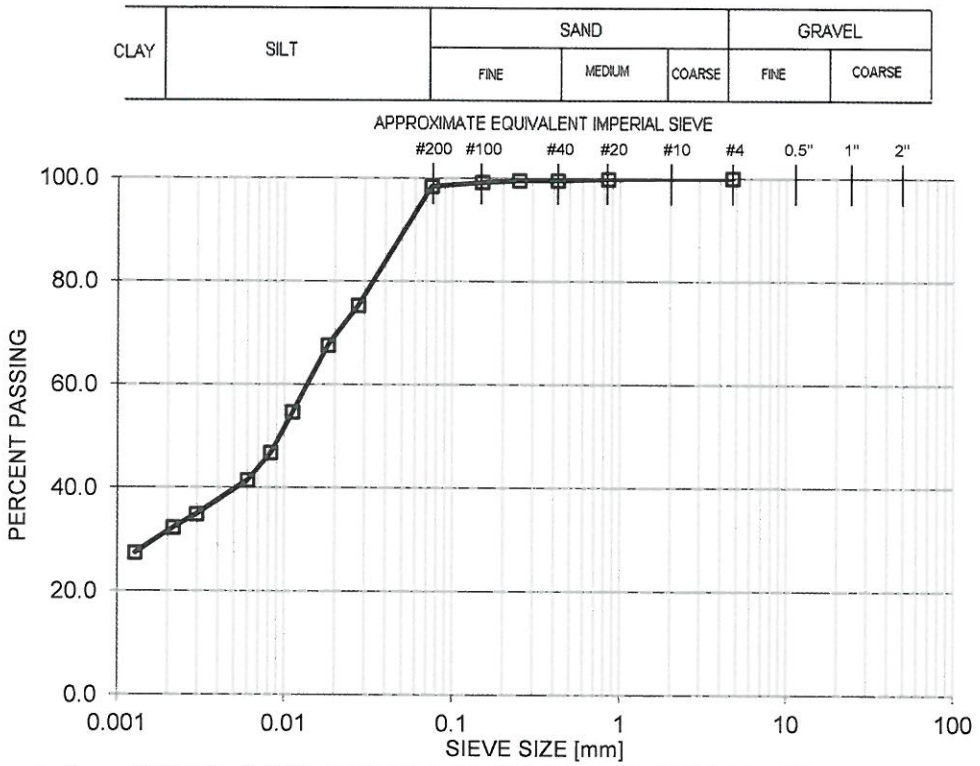
File No.: 17-035-02
Ref. No.: 17-35-2-51

Attention: Joel Piwniuk, E.I.T.

Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH5 **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.9
0.425	99.5
0.250	99.5
0.150	99.2
0.075	98.4
0.028	75.3
0.018	67.5
0.011	54.6
0.008	46.7
0.006	41.4
0.003	34.9
0.002	32.3
0.001	27.4

Percent of: GRAVEL (0.0 %), SAND (1.6 %), SILT (66.9 %), CLAY (31.5 %)
Sample Description:
Comments: Insitu Moisture content is 27.6%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M. Sc., P. Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

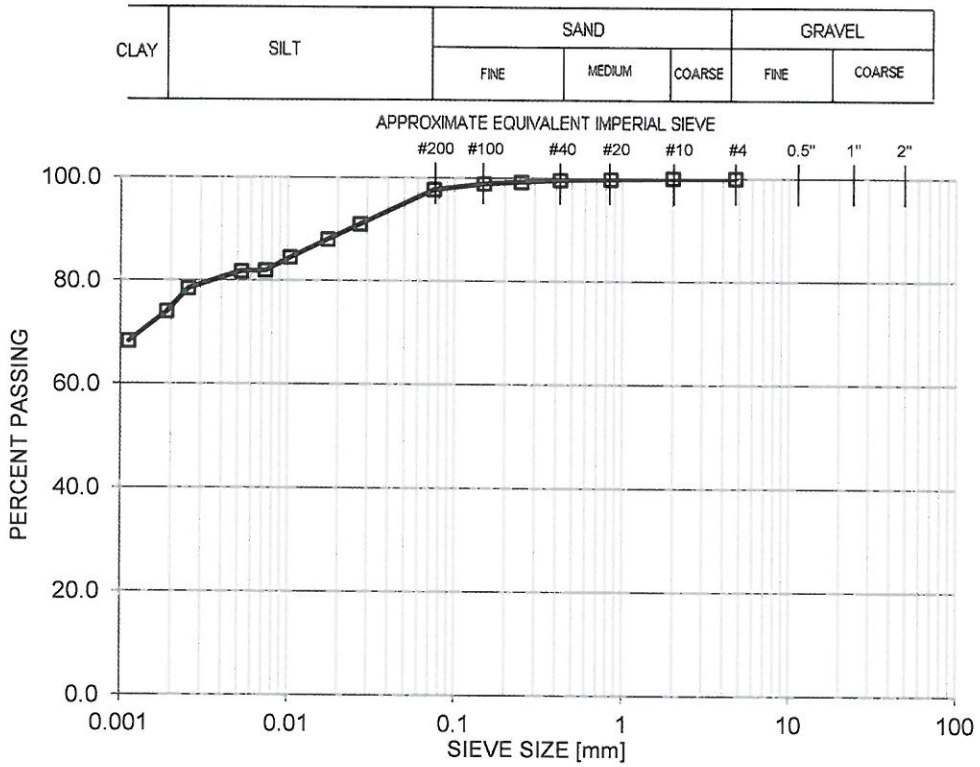
File No.: 17-035-02
Ref. No.: 17-35-2-52

Attention: Joel Piwniuk, E.I.T.

Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH6 **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.8
0.425	99.6
0.250	99.2
0.150	98.9
0.075	97.7
0.027	91.0
0.017	88.0
0.010	84.5
0.007	81.9
0.005	81.8
0.003	78.5
0.002	73.9
0.001	68.2

Percent of: GRAVEL (0.0 %), SAND (2.3 %), SILT (22.9 %), CLAY (74.8 %)
Sample Description:
Comments: Insitu Moisture content is 29.2%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

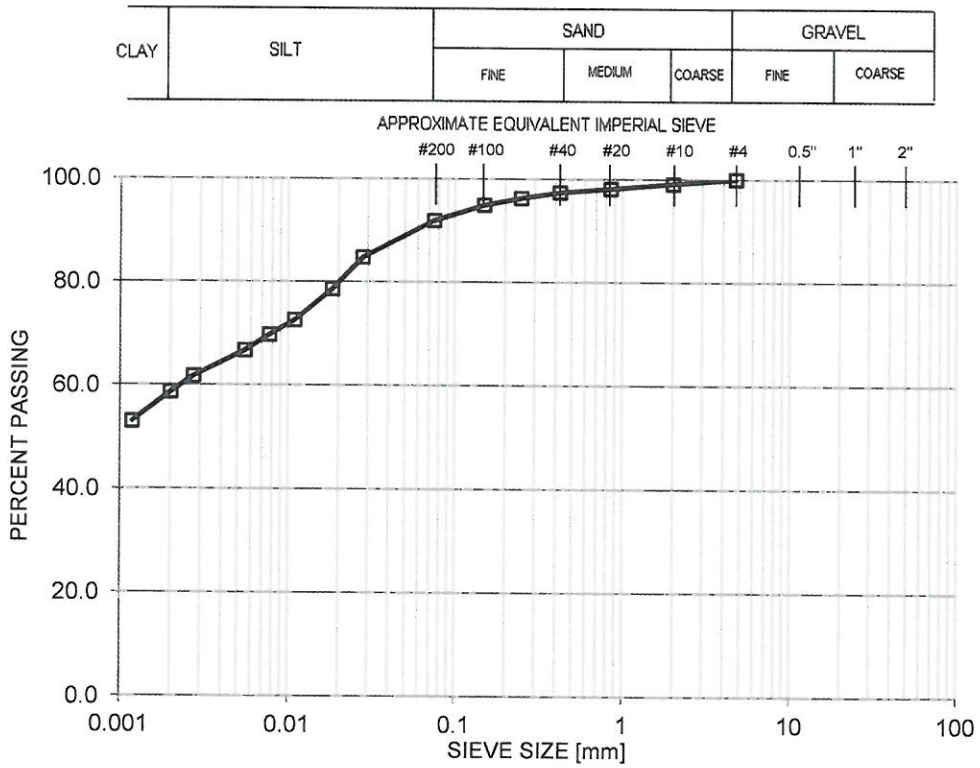
File No.: 17-035-02
Ref. No.: 17-35-2-53

Attention: Joel Piwniuk, E.I.T.

Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH7 **Sample No.** 4 **Depth:** 1.0 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	99.1
0.850	98.2
0.425	97.4
0.250	96.3
0.150	94.9
0.075	91.9
0.028	84.8
0.018	78.6
0.011	72.6
0.008	69.7
0.006	66.7
0.003	61.7
0.002	58.7
0.001	53.0

Percent of: GRAVEL (0.0 %), SAND (8.1 %), SILT (33.2 %), CLAY (58.7 %)
Sample Description:
Comments: Insitu Moisture content is 35.9%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P. Eng.
Ph: (204) 233-1694 Fx: (204) 235-1579

ENG-TECH CONSULTING LIMITED
420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

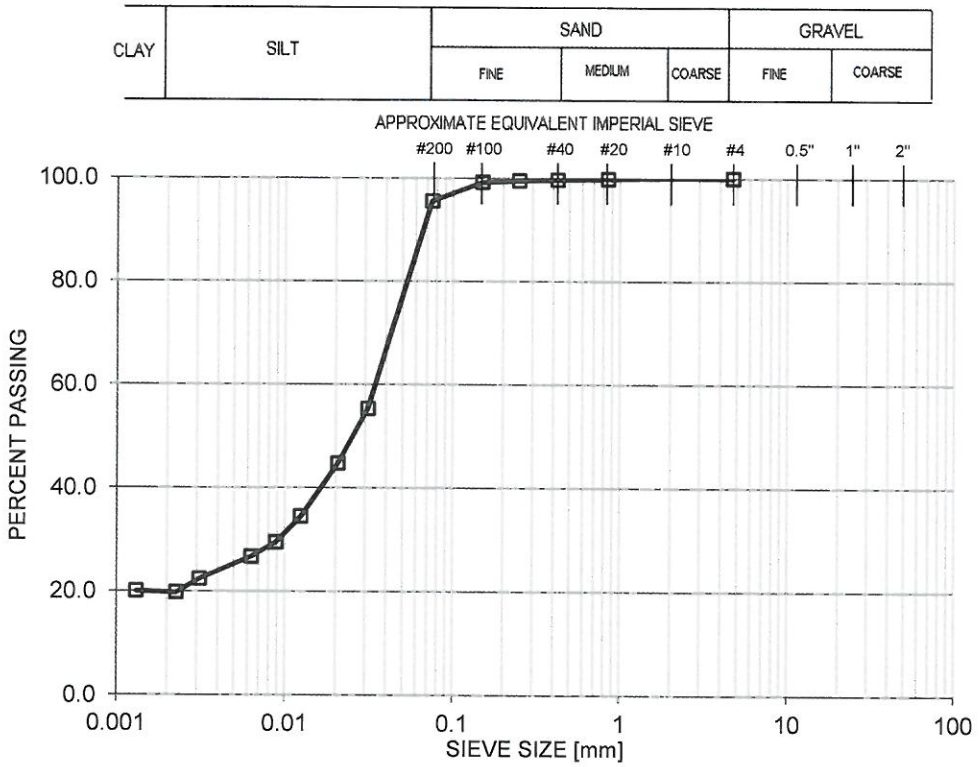
PARTICLE SIZE ANALYSIS

WSP Canada Inc.
111 - 93 Lombard Avenue
Winnipeg, Manitoba
R3B 3B1

File No.: 17-035-02
Ref. No.: 17-35-2-54

Attention: Joel Piwniuk, E.I.T.
Project: GEOTECHNICAL INVESTIGATION - INDUSTRIAL STREETS PACKAGE 18-RL-02

Test Hole No. TH8 **Sample No.** 3 **Depth:** 0.7 m
Sample By: ENG-TECH (Trevor Robertson) **Type of Sample:** Auger cutting **Source:** Higgins Avenue
Date Sampled: Jan 16/18 and Jan 18/18 **Date Received:** Jan 19/18 **Date Tested:** Jan 24/18
Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer **Dispersion Time (min.):** 1



SIEVE SIZE (mm)	PERCENT PASSING
4.75	100.0
2.0	100.0
0.850	99.9
0.425	99.7
0.250	99.5
0.150	99.2
0.075	95.5
0.031	55.3
0.021	44.8
0.012	34.5
0.009	29.5
0.006	26.7
0.003	22.4
0.002	19.8
0.001	20.0

Percent of: GRAVEL (0.0 %), SAND (4.5 %), SILT (75.7 %), CLAY (19.8 %)
Sample Description:
Comments: Insitu Moisture content is 21.5%.

ENG-TECH Consulting Limited

Per _____
Clark Hryhoruk, M.Sc., P.Eng., President
Ph: (204) 233-1694 Fx: (204) 235-1579