Geotechnical Investigation

City of Winnipeg Street Investigation
Winnipeg, Manitoba
WX19092
17 June 2020

Environment & Infrastructure Solutions
440 Dovercourt Drive, Winnipeg Manitoba, Canada R3Y 1N4
Phone: (204) 488-2997
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Geotechnical Investigation
City of Winnipeg Street Investigation
Wood Project Number - WX19092

Prepared for:	Stantec 500-311 Portage Avenue Winnipeg, Manitoba R3B 2B9
Contact:	Mark Edgar, P.Eng.
Report Distribution:	
Stantec:	Mark Edgar, P.Eng.
Third Party:	
Report Classification:	Confidential

	Name	Job Title	Signature
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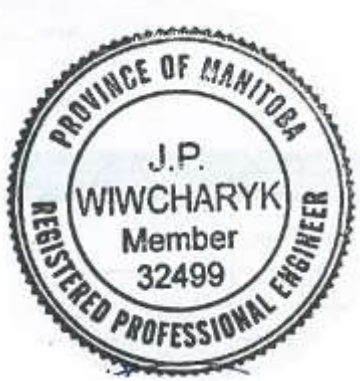
Other Technical Contributors			

Rev.	Date	Revision Notes
0	**17 June 2020**	Issued Final to Client

Permit Stamp	Engineer Seal
	

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1.0 Introduction

At the authorization of Mr. Mark Edgar, P. Eng., of Stantec, Wood Environment & Infrastructure Solutions, a division of Wood Canada Limited (Wood), completed a pavement coring and test hole drilling program related to the pavement evaluation and potential asphalt reconstruction and rehabilitation for thirty (30) locations in the City of Winnipeg, Manitoba. Locations and scope are itemized in Table 1-1. In summary, the Scope of Work included the coring of the pavement surface at a total of twenty street locations, with the advancement of test holes to a minimum depth of 2.5 m at fifteen of those locations. At the remaining five coring-only locations, a total of three cores were obtained, one from mid-slab, one from the transverse joint, and one from the longitudinal joint.

Table 1: Street Location and Investigation Scope

Street Name	Location	Number of Cores	Number of Test Holes	Test Hole Numbers
Salter Street	Slaw Rebchuk Bridge to Cathedral Avenue	18	3	TH20 - SS01 to TH20 - SS03 CH20 – SS04 to CH20 – SS08
Selkirk Avenue	McPhillips Street to Arlington Street	7	7	TH20 - SA01 to TH20 - SA07
William Avenue	McPhillips Street to Arlington Street	5	5	TH20 - WA01 to TH20 – WA05
	Total	**30**	**15**	

The geotechnical investigation was completed in accordance with the Scope of Work and Terms and Conditions outlined in Wood Proposal No. WPG2020.269, dated 6 May 2020.

2.0 Geotechnical Investigation

Prior to initiating drilling, Wood notified public utility providers (i.e. Manitoba Hydro, MTS, Shaw, etc.) of the intent to drill in order to clear public utilities, and where required, met with said representatives on-site.

Between 22 May and 3 June 2020, Wood supervised the drilling and coring a total of thirty core holes and fifteen test holes distributed between Salter Street, Selkirk Avenue and William Avenue as indicated in Table 1-1. The test hole locations are illustrated in Figures A1, B1 and C1. All locations were cored using a 150 mm diameter core barrel, while test hole drilling was conducted using a truck mounted Mobile B40LX or CME85 drill rig equipped with 125 mm solid stem augers, owned and operated by Maple Leaf Drilling of Springfield, Manitoba. Coring and test hole locations were initially selected by Stantec, however underground utilities required some adjustments to the original test hole locations. All final test hole locations were provided to Stantec prior to coring or drilling. At core-only locations (CH20-SS04 to CH20-SS08), a total of three cores were obtained, one at mid-slab (identified as core "A" at each location), one at the transverse joint (identified as core "B" at each location), and one at the longitudinal joint (identified as core "C" at each location).

During coring, Wood field personnel identified pavement types and thicknesses, as well as underlying granular structure, while during drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D3282 and ASTM D2487, as well as noted observed seepage and/or sloughing conditions. Soil sampling consisted of grab samples of the auger cuttings at all

test hole locations. All grab samples were retained in sealed plastic bags and shipped to Wood's Winnipeg laboratory for review and selected testing. All pavement core samples were shipped to Winnipeg laboratory to be photographed. The core photos and underlying pavement structure information are provided in Appendices A, B and C for Salter Street, Selkirk Avenue and William Avenue, respectively.

During drilling, Wood field personnel visually classified the soil stratigraphy within the test holes in accordance with ASTM D2487 – *Standard Practice for Classification of Soils for Engineering Purposes* and recorded observed seepage and/or sloughing conditions. Soil sampling consisted of grab samples of the auger cuttings at all test hole locations at depths of 0.6 m, 0.9 m, 1.2 m, 1.6 m, 2.0 m, and 2.5 m. Additionally, bulk samples were collected of the anticipated subgrade soils on which pavements would be constructed, beginning at a depth of about 0.9 m or deeper where soils expected to require excavation prior to pavement construction were observed at or below this depth. Test holes were advanced to a depth of about 2.6 m, except for TH20-SA05 and TH20-SA06, which were advanced to about 3.7 m as per request from Stantec. The in-situ relative consistency of cohesive soil (i.e. clay) was evaluated during drilling using a pocket penetrometer. All samples were retained in sealed plastic bags or within the Shelby Tubes and shipped to Wood's Winnipeg laboratory for review and selected testing.

Following completion of the field drilling program, a laboratory testing program was conducted on all soil samples obtained from the test holes. The laboratory testing program consisted of moisture content determinations on all samples, as well as Atterberg limits, particle size distributions (hydrometer method), Standard Proctor Testing in conjunction with California Bearing Ratio (CBR) evaluations on the anticipated subgrade soils. Results of the subgrade soil detailed testing are shown on the test hole logs at a nominal depth of 1.1 m, or deeper where soils expected to require excavation prior to construction were found. It should be noted that all the above testing has been completed with the exception of CBR testing. CBR results will be provided upon their completion. Laboratory testing results and detailed test hole logs summarizing the sampling, field testing, laboratory test results, and subsurface conditions encountered at the test hole locations are presented in Appendices A, B and C for Salter Street, Selkirk Avenue and William Avenue, respectively. Actual depths noted on the test hole logs may vary by ± 0.3 m from those recorded due to the method by which the soil cuttings are returned to the surface. Summaries of the terms and symbols used on the test hole logs and of the Modified Unified Soil Classification System are also presented in Appendix A.

3.0 Pavement Summary

The following sections provide summaries of the pavement structure encountered at each test hole and core hole location. Details of the soil structure underlying the pavements observed either at the bottom of each core hole or within the test holes can be found on the test hole logs or core photos found in Appendices A, B and C.

3.1 Salter Street

Table 2 provides a summary of the pavement type and thickness encountered at each of the test locations on Salter Street.

Table 2: Salter Street Pavement Summary

Test Hole / Core Hole Number	Street Location	Slab Location	Concrete Thickness (mm)
TH20-SS01	160 Salter Street, NB Curb Lane	Mid-Panel	225
TH20-SS02	20m South of Magnus Avenue, NB Center Lane	Mid-Panel	225
TH20-SS03	200 Salter Street, SB Centre Lane	Mid-Panel	210
CH20-SS04A	25m South of Machray Avenue, SB Center Lane	Mid-Panel	200
CH20-SS04B		South Joint	200
CH20-SS04C		West Joint	250
CH20-SS05A	50m North of St. John's Avenue, SB Center Lane	Mid-Panel	225
CH20-SS05B		North Joint	225
CH20-SS05C		West Joint	225
CH20-SS06A	5m South of Alfred Avenue, NB Curb Lane	Mid-Panel	200
CH20-SS06B		North Joint	225
CH20-SS06C		West Joint	225
CH20-SS07A	25m North of Selkirk Avenue, NB Curb Lane	Mid-Panel	250
CH20-SS07B		North Joint	225
CH20-SSS07C		East Joint	225
CH20-SS08A	25m North of Stella Avenue, SB Curb Lane	Mid-Panel	250
CH20-SS08B		North Joint	250
CH20-SS08C		West Joint	230

3.2 Selkirk Avenue

Table 3 provides a summary of the pavement type and thickness encountered at each of the test hole locations on Selkirk Avenue.

Table 3: Selkirk Avenue Pavement Summary

Test Hole Number	Street Location	Slab Location	Aphalt Thickness (mm)
TH20-SA01	856 Selkirk Avenue, WB Center Lane	Mid-Panel	75
TH20-SA02	887 Selkirk Avenue, WB Center Lane	Mid-Panel	125
TH20-SA03	929 Selkirk Avenue, WB Curb Lane	Mid-Panel	100
TH20-SA04	979 Selkirk Avenue, WB Curb Lane	Mid-Panel	175
TH20-SA05	15m East of Rail Centerline, WB Center Lane	Mid-Panel	200

Test Hole Number	Street Location	Slab Location	Aphalt Thickness (mm)
TH20-SA06	15m West of Rail Centerline, WB Center Lane	Mid-Panel	250
TH20-SA07	1085 Selkirk Avenue, WB Center Lane	Mid-Panel	175

Note to Table: A layer of concrete was present at test holes TH20-SA01, TH20-SA02, TH20-SA06 and TH20-SA07, below a layer of granular fill directly below the asphalt layer. The concrete layer could not be penetrated at test holes TH20-SA01 and TH20-SA02, however was found to be 150 mm and 300 mm thick at test holes TH20-SA06 and TH20-SA07, respectively.

3.3 William Avenue

Table 4 provides a summary of the pavement type and thickness encountered at each of the test locations on William Avenue.

Table 4: William Avenue Pavement Summary

Test Hole Number	Street Location	Slab Location	Aphalt Thickness (mm)	Concrete Thickness (mm)
TH20-WA01	899 William Avenue, WB Center Lane	Mid-Panel	200	--
TH20-WA02	999 William Avenue, WB Center Lane	Mid-Panel	200	200
TH20-WA03	970 William Avenue, EB Curb Lane	Mid-Panel	150	--
TH20-WA04	931 William Avenue, EB Center Lane	Mid-Panel	175	150
TH20-WA05	976 William Avenue, EB Curb Lane	Mid-Panel	100	200

"- -" indicates none found

4.0 Closure

The findings of this report were based on the results of field and laboratory investigations at test hole locations determined based on the requirements provided by Stantec.

The site investigation was conducted for the sole purpose of profiling the pavement and subsurface conditions. Although no environmental issues were identified during the fieldwork, this does not indicate that no such issues exist. If the owner or other parties have any concern regarding the presence of environmental issues, then an appropriate level environmental assessment should be conducted.

Soil conditions, by their nature, can be highly variable across a site. The placement of fill and prior construction activities on a site can contribute to the variability especially near surface soil conditions. A contingency should always be included in any construction budget to allow for the possibility of variation in soil conditions, which may result in modification of any potential design and construction procedures which may arise from this factual investigative report.

This report has been prepared for the exclusive use of Stantec, and their agents, for specific application to the project described in this report. The data provided herein should not be used for any other purpose,

or by any other parties, without review and written advice from Wood. Any use that a third party makes of this report, or any reliance or decisions made based on this report, are the responsibility of those parties. Wood accepts no responsibility for damages suffered by a third party as a result of decisions made or actions based on this report.

This report has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranty, either expressed or implied, is made.

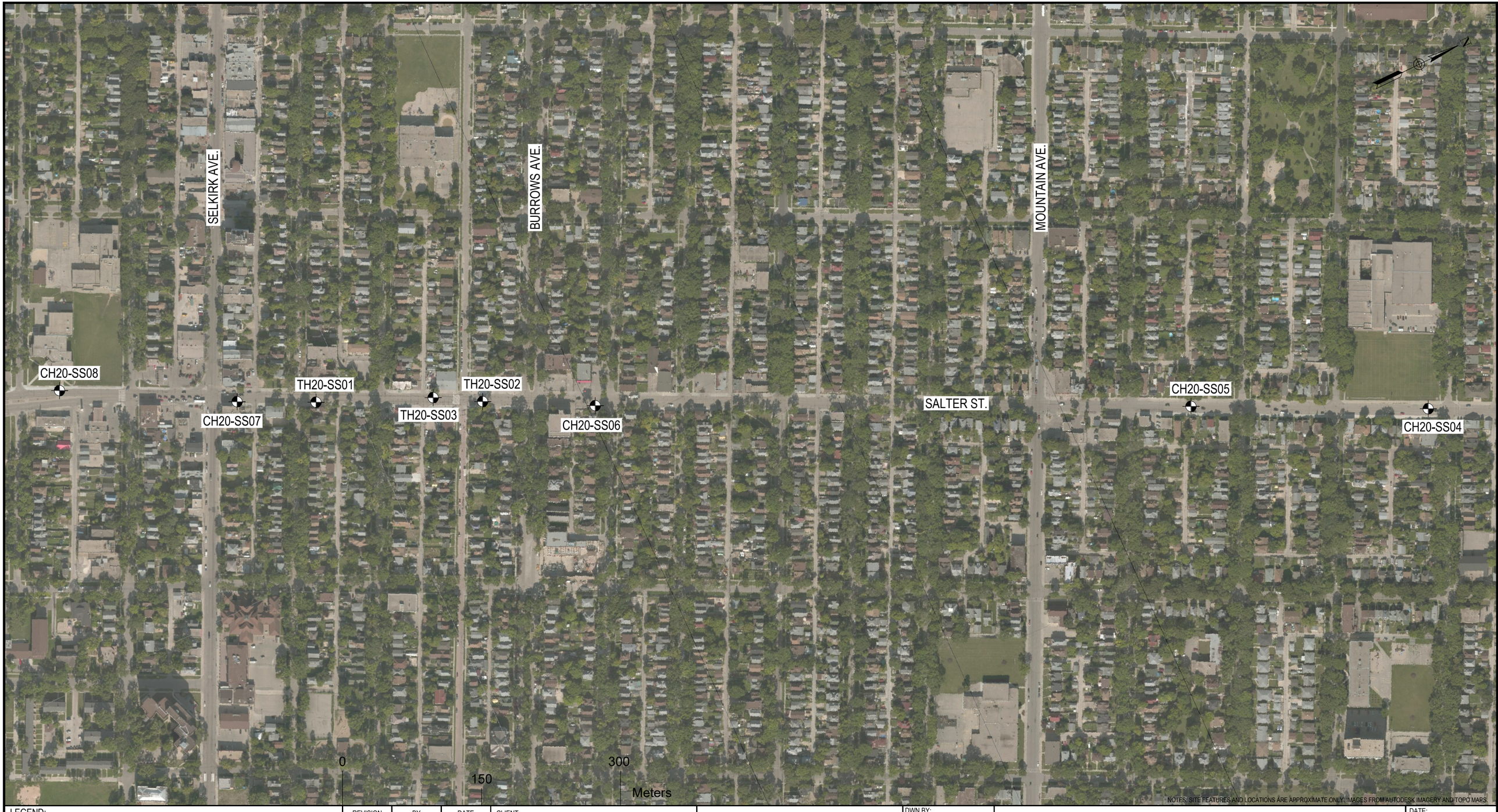
Respectfully submitted,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

Appendix A

Salter Street

- Test and Core Hole Location Plan
- Core Photos
- Test Hole Logs
- Laboratory Testing Results



NOTES: SITE FEATURES AND LOCATIONS ARE APPROXIMATE ONLY. IMAGES FROM AUTODESK IMAGERY AND TOPO MAPS.

LEGEND:

TEST HOLE

REVISION	BY	DATE
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CLIENT: Stantec

wood.
440 DOVERCOURT DRIVE
WINNIPEG, MANITOBA R3Y 1N4
PHONE: 204.488.2997 FAX:204.489.8261

DWN BY: MD
CHK'D BY: JW
DATUM: NAD83
PROJECTION: UTM Zone 14 U
SCALE: AS SHOWN

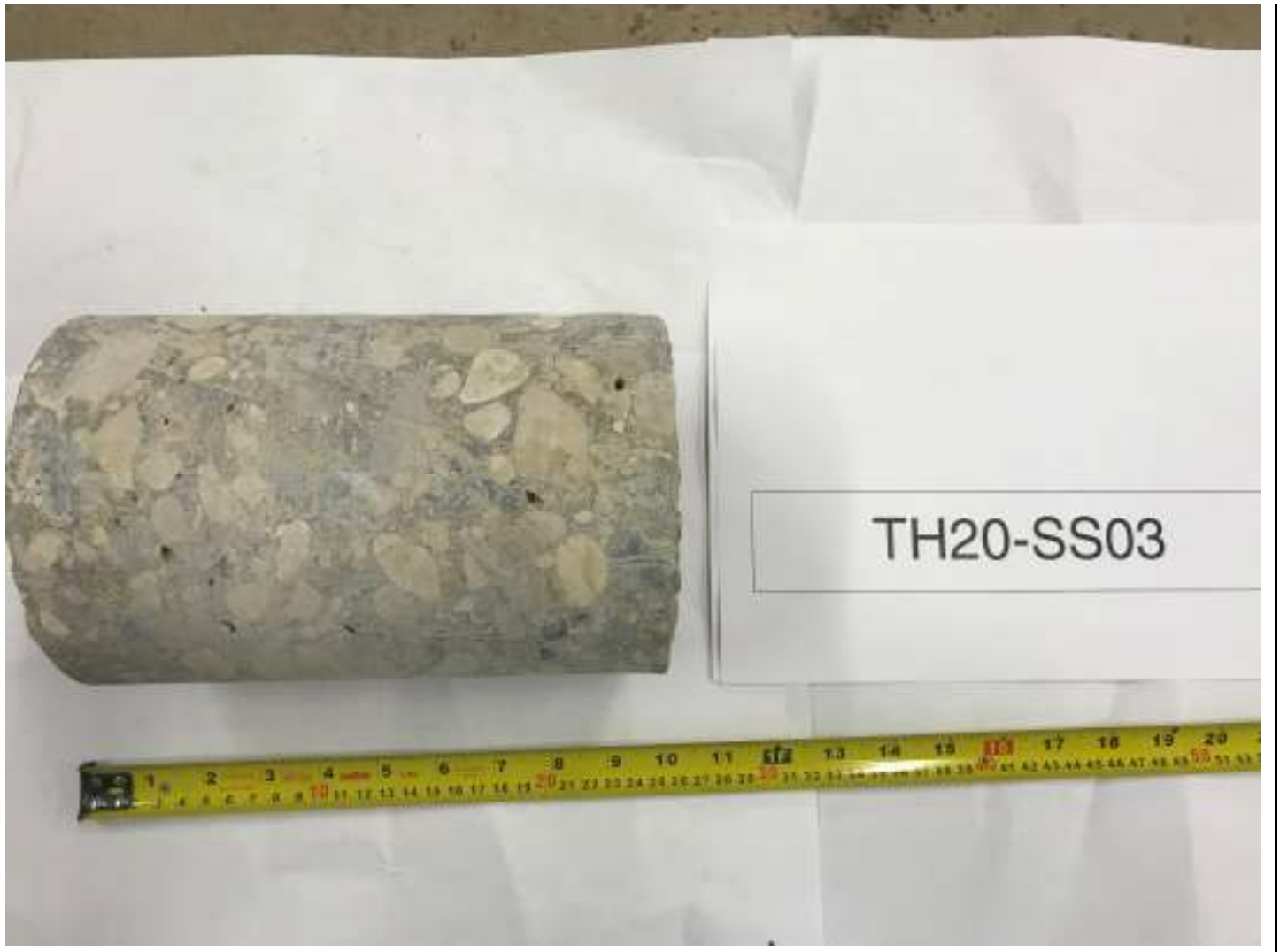
GEOTECHNICAL INVESTIGATION
SALTER STREET
WINNIPEG, MANITOBA

TEST HOLE LOCATION PLAN

DATE: JUNE 2020
PROJECT NO: WX19092
REV. NO.: A
FIGURE NO: FIGURE A1

wood. Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS PAVEMENT CORE SAMPLE TH20-SS01 NORTHBOUND CURB LANE, 160 SALTER STREET WINNIPEG, MANITOBA**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

wood. Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS PAVEMENT CORE SAMPLE TH20-SS02 NORTHBOUND CENTER LANE, SALTER STREET 20M SOUTH OF MAGNUS AVENUE WINNIPEG, MANITOBA**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	



wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE TH20-SS03** **SOUTHBOUND CENTER LANE, 200 SALTER STREET** **WINNIPEG, MANITOBA**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – poorly graded, medium grained, damp to moist, compact (inferred), light brown

wood.		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS04A** **SOUTHBOUND CENTER LANE, 25M SOUTH OF MACHRAY AVENUE** **WINNIPEG, MANITOBA**		
Wood Environment and Infrastructure Solutions		**MID-PANEL**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – poorly graded, medium grained, damp to moist, compact (inferred), light brown

Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS PAVEMENT CORE SAMPLE CH20-SS04B SOUTHBOUND CENTER LANE, 25M SOUTH OF MACRAY AVENUE WINNIPEG, MANITOBA SOUTH JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – poorly graded, medium grained, damp to moist, compact (inferred), light brown

wood.		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS04C** **SOUTHBOUND CENTER LANE, 25M SOUTH OF MACRAY AVENUE** **WINNIPEG, MANITOBA**		
Wood Environment and Infrastructure Solutions		**WEST JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS05A** **SOUTHBOUND CENTER LANE, 50M NORTH OF ST. JOHNS AVENUE** **WINNIPEG, MANITOBA** **MID-PANEL**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS05B** **SOUTHBOUND CENTER LANE, 50M NORTH OF ST. JOHNS AVENUE** **WINNIPEG, MANITOBA** **NORTH JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS PAVEMENT CORE SAMPLE CH20-SS05C SOUTHBOUND CENTER LANE, 50M NORTH OF ST. JOHNS AVENUE WINNIPEG, MANITOBA WEST JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS06A** **NORTHBOUND CURB LANE, 5M SOUTH OF ALFRED AVENUE** **WINNIPEG, MANITOBA** **MID-PANEL**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS06B** **NORTHBOUND CURB LANE, 5M SOUTH OF ALFRED AVENUE** **WINNIPEG, MANITOBA** **NORTH JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS06C** **NORTHBOUND CURB LANE, 5M SOUTH OF ALFRED AVENUE** **WINNIPEG, MANITOBA** **WEST JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

Wood Environment and Infrastructure Solutions		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS07A** **NORTHBOUND CURB LANE, 25M NORTH OF SELKIRK AVENUE** **WINNIPEG, MANITOBA** **MID-PANEL**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS07B** **NORTHBOUND CURB LANE, 25M NORTH OF SELKIRK AVENUE** **WINNIPEG, MANITOBA** **NORTH JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS07C** **NORTHBOUND CURB LANE, 25M NORTH OF SELKIRK AVENUE** **WINNIPEG, MANITOBA** **EAST JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS08A** **SOUTHBOUND CURB LANE, 25M NORTH OF STELLA AVENUE** **WINNIPEG, MANITOBA** **MID-PANEL**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood. **Wood Environment and Infrastructure Solutions**		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS08B** **SOUTHBOUND CURB LANE, 25M NORTH OF STELLA AVENUE** **WINNIPEG, MANITOBA** **NORTH JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

Granular Structure Below Pavement: Gravel fill – sandy, poorly graded, fine grained, damp to moist, compact (inferred), light brown

wood.		**CORE PHOTOGRAPHS** **PAVEMENT CORE SAMPLE CH20-SS08C** **SOUTHBOUND CURB LANE, 25M NORTH OF STELLA AVENUE** **WINNIPEG, MANITOBA**		
Wood Environment and Infrastructure Solutions		**WEST JOINT**		
Drawn: JW	Scale: N/A	Date: 5 June 2020	Project No.: WX19092	

PROJECT: City of Winnipeg Street Investigation	DRILLER: Maple Leaf Drilling Ltd.	TEST HOLE ID: **TH20-SS01**
CLIENT: Stantec	DRILL RIG: Truck Mounted B40	PROJECT No: WX19092
LOCATION: 160 Salter Street, NB Curb Lane	DRILL METHOD: 125mm SSA	ELEVATION: 231.58 m

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

▲ UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

☒ POCKET PENETROMETER (kPa) ☒ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	ELEVATION (m)
0		CONC	CONCRETE - 225mm thick					231
		GP	GRAVEL (FILL) - poorly graded, medium grained, damp to moist, compact (inferred), brown		1			
1			CLAY - some silt, trace sand, high plastic, moist, stiff, brown (Group A-7-6(61))		2			230
					3		Bulk Sample Collected From Below 0.9m	
			- below 1.2m, firm					
2		CH			4		Particle Size Analysis - Sample 3 @ 1.1m: Gravel= 0.0% Sand= 3.0% Silt= 15.8% Clay= 81.2%	229
					5			
3					6			228
			TEST HOLE TERMINATED AT 2.6m BELOW PAVEMENT Notes: - No sloughing was observed during drilling. - No seepage was observed during drilling. - Test hole remained open to 2.6m below grade with no accumulation of water prior to backfilling. - Test hole was backfilled with auger cuttings, bentonite, and pavement surface repaired with asphalt.					
4								227
5								226
6								225
7								224
8								223
9								222
10								

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LOGGED BY: JW	COMPLETION DEPTH: 2.6 m
REVIEWED BY: TG	COMPLETION DATE: June 1, 2020
Figure No. A1	Sheet 1 of 1

WX19092 - STANTEC - CITY OF WINNIPEG STREET INVESTIGATION.GPJ 20/06/17 09:30 PM (WPG - GEOTECH LOG 1)

PROJECT: City of Winnipeg Street Investigation	DRILLER: Maple Leaf Drilling Ltd.	TEST HOLE ID: **TH20-SS02**
CLIENT: Stantec	DRILL RIG: Truck Mounted B40	PROJECT No: WX19092
LOCATION: Salter, 20m S. of Magnus, NB Center Lane	DRILL METHOD: 125mm SSA	ELEVATION: 231.31 m

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

▲ UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400

☒ POCKET PENETROMETER (kPa) ☒ 100 200 300 400

PLASTIC M.C. LIQUID 20 40 60 80

DEPTH (m)	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	ELEVATION (m)
0		CONC	CONCRETE - 225mm thick					231
		GP	GRAVEL (FILL) - poorly graded, medium grained, damp, compact (inferred), brown		1			
1					2			
			CLAY - trace silt and sand, high plastic, moist, stiff, dark brown (Group A-7-6(71))		3		Bulk Sample Collected From Below 1.0m	230
			- at 1.6m, low plastic silt layer (150mm thick)		4		Particle Size Analysis - Sample 3 @ 1.1m: Gravel= 0.0% Sand= 1.9% Silt= 8.8% Clay= 89.3%	
2		CH	- below 1.8m, brown		5			229
					6			
			TEST HOLE TERMINATED AT 2.6m BELOW PAVEMENT Notes: - No sloughing was observed during drilling. - No seepage was observed during drilling. - Test hole remained open to 2.6m below grade with no accumulation of water prior to backfilling. - Test hole was backfilled with auger cuttings, bentonite, and pavement surface repaired with asphalt.					228
3								
4								227
5								
6								226
7								225
8								224
9								223
10								222

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LOGGED BY: JW	COMPLETION DEPTH: 2.6 m
REVIEWED BY: TG	COMPLETION DATE: June 1, 2020
Figure No. A2	Sheet 1 of 1

PROJECT: City of Winnipeg Street Investigation	DRILLER: Maple Leaf Drilling Ltd.	TEST HOLE ID: **TH20-SS03**
CLIENT: Stantec	DRILL RIG: Truck Mounted B40	PROJECT No: WX19092
LOCATION: 200 Salter Street, SB Center Lane	DRILL METHOD: 125mm SSA	ELEVATION: 231.59 m

SAMPLE TYPE: Shelby Tube | No Recovery | SPT (N) | Grab Sample | Split-Pen | Core

BACKFILL TYPE: Bentonite | Pea Gravel | Drill Cuttings | Grout | Slough | Sand

DEPTH (m)	▲ UNCONFINED COMPRESSION (kPa) ▲ 100 200 300 400 ☒ POCKET PENETROMETER (kPa) ☒ 100 200 300 400 PLASTIC M.C. LIQUID 20 40 60 80	SOIL SYMBOL	MUSCS	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT (N)	COMMENTS	ELEVATION (m)
0			CONC	CONCRETE - 210mm thick					231
			GP	GRAVEL (FILL) - poorly graded, medium grained, damp, compact (inferred), brown		1			
						2			
1				CLAY - silty, some sand, medium to high plastic, moist, stiff, dark brown (Group A-7-6(24))		3		Bulk Sample Collected From Below 1.0m	
						4		Particle Size Analysis - Sample 3 @ 1.1m: Gravel= 0.1% Sand= 17.9% Silt= 29.9% Clay= 52.0%	230
2			CH	- below 1.8m, brown		5			
						6			229
				TEST HOLE TERMINATED AT 2.6m BELOW PAVEMENT Notes: - No sloughing was observed during drilling. - No seepage was observed during drilling. - Test hole remained open to 2.6m below grade with no accumulation of water prior to backfilling. - Test hole was backfilled with auger cuttings, bentonite, and pavement surface repaired with asphalt.					
3									228
4									227
5									226
6									225
7									224
8									223
9									222
10									

wood.

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a division of Wood Canada Limited

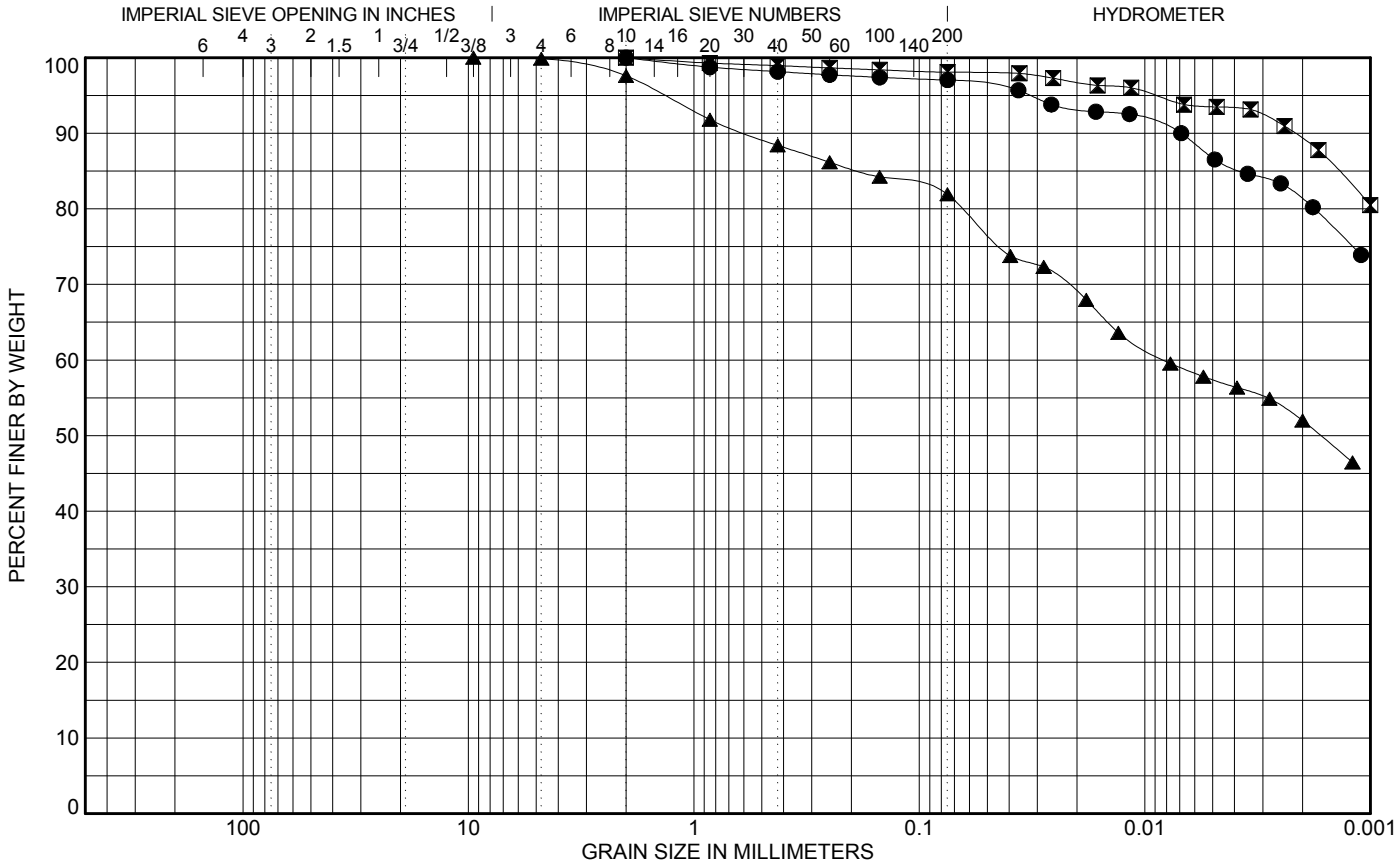
LOGGED BY: JW	COMPLETION DEPTH: 2.6 m
REVIEWED BY: TG	COMPLETION DATE: June 1, 2020
Figure No. A3	Sheet 1 of 1

PARTICLE SIZE ANALYSIS

Report Date: 17 June 2020

Client		**Project**	
Name:	Stantec	**Name:**	City of Winnipeg Street Investigation
Address:	500-311 Portage Avenue, WPG, MB	**Address:**	Salter St, William Ave, and Selkirk Ave, WPG, MB
Attention:	Mark Edgar	**Project No.:**	WX19092
PO Number:		**Manager:**	JW

Gradation Specification:



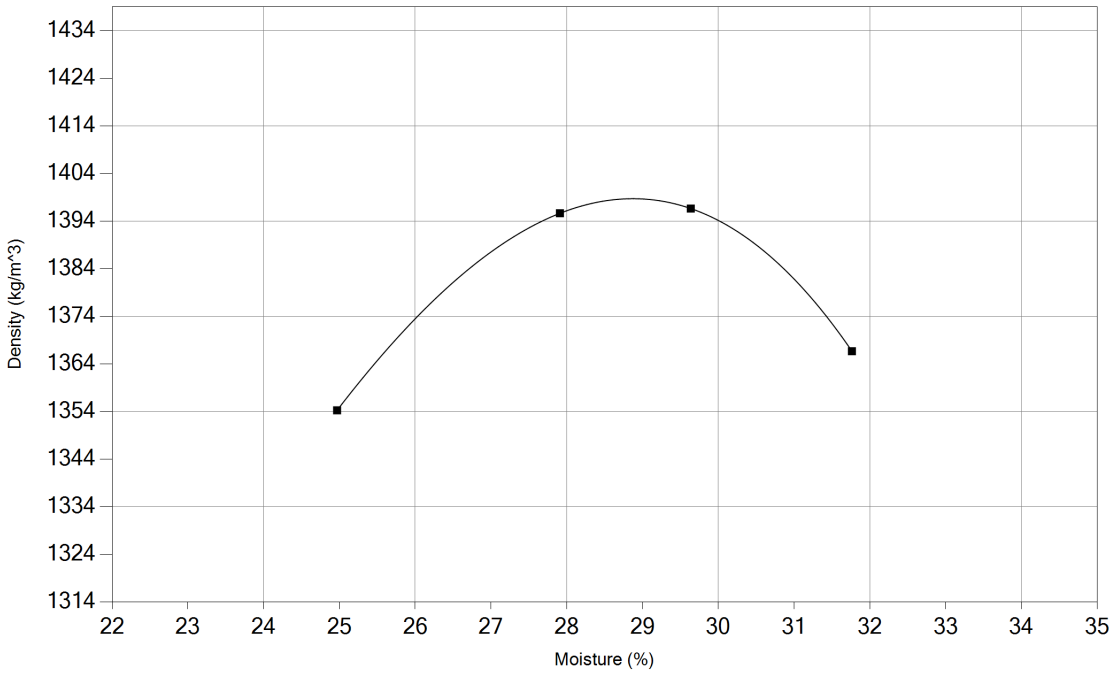
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Sample ID	mUSCS	MC	D100	D60	D30	D10	LL	PL	% Gravel	% Sand	% Fines
●	TH20-SS01, 1.1 m	CI	36.5	2				76	20	0	3	16 (Silt) : 81 (Clay)
⊠	TH20-SS02, 1.1 m	CI	33.4	2				85	21	0	2	9 (Silt) : 89 (Clay)
▲	TH20-SS03, 1.1 m	CI	31.4	9.5	0			45	14	0	18	30 (Silt) : 52 (Clay)

Moisture / Density Relationship

Report Date: June 05, 2020

Client		Project	
Name:	Stantec	**Name:**	(WX19092) City of Winnipeg Street Investigation
Address:	311 Portage Ave, Suite 500 Winnipeg, Mantioba	**Address:**	Winnipeg, Manitoba
Attention:	Scott Suderman	**Phase:**	N/A **Task:** N/A
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	6/1/2020 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19092-SS01
Source:	TH20-SS01 Bulk Sample	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1399

Optimum Moisture (%): 28.9

Received Moisture Content (%):

Remarks:

Distribution: Jorden Wiwcharyk

Reviewed By: Randell Johnson

R. Johnson

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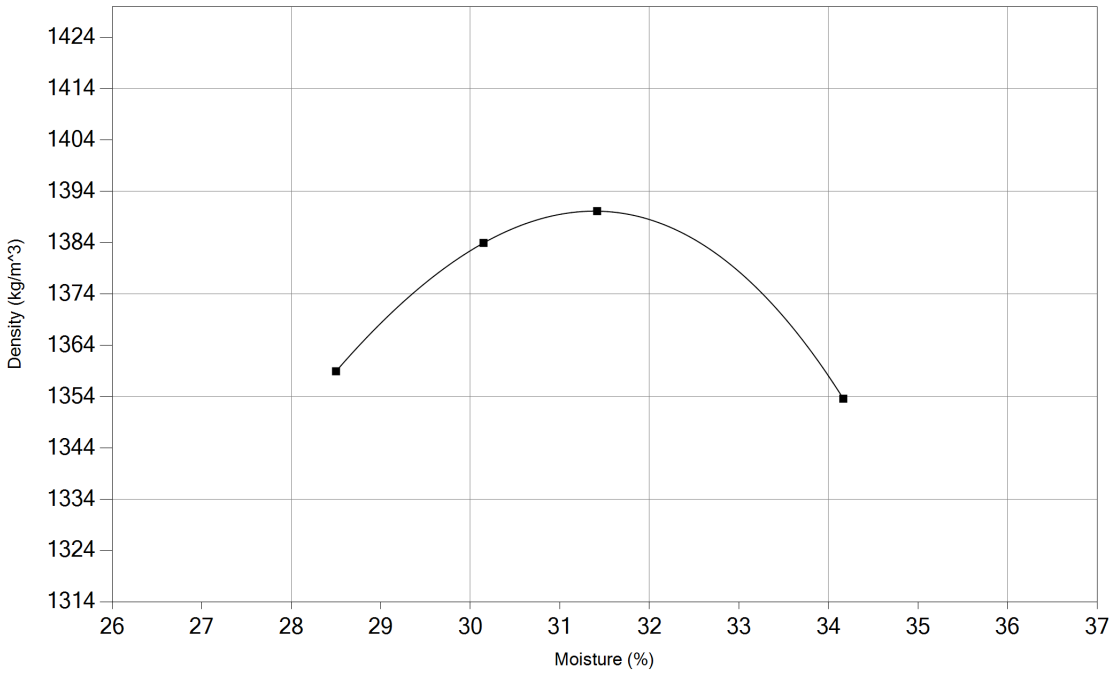
CCIL Certified Aggregate Type C & Type D

Moisture / Density Relationship

Report Date: June 05, 2020

Client		Project	
Name:	Stantec	**Name:**	(WX19092) City of Winnipeg Street Investigation
Address:	311 Portage Ave, Suite 500 Winnipeg, Mantioba	**Address:**	Winnipeg, Manitoba
Attention:	Scott Suderman	**Phase:**	N/A **Task:** N/A
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	6/1/2020 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19092-SS02
Source:	TH20-SS02 Bulk Sample	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1390

Optimum Moisture (%): 31.4

Remarks:

Distribution: Jorden Wiwcharyk

Reviewed By: Randell Johnson

R. Johnson

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

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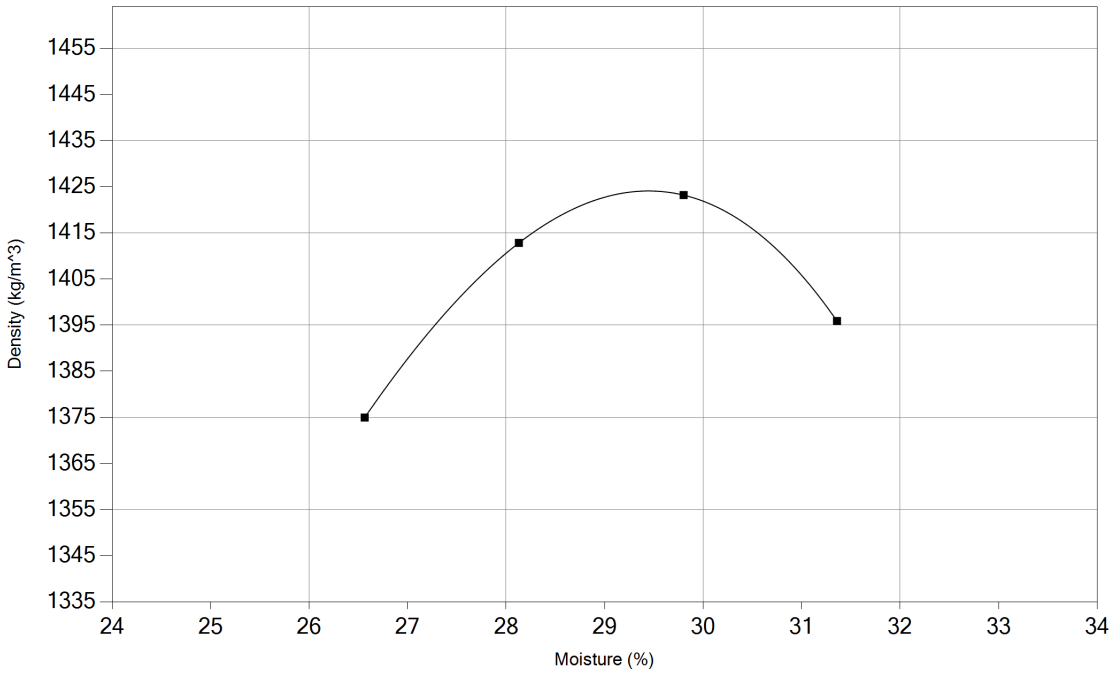
CCIL Certified Aggregate Type C & Type D

Moisture / Density Relationship

Report Date: June 05, 2020

Client		Project	
Name:	Stantec	**Name:**	(WX19092) City of Winnipeg Street Investigation
Address:	311 Portage Ave, Suite 500 Winnipeg, Mantioba	**Address:**	Winnipeg, Manitoba
Attention:	Scott Suderman	**Phase:**	N/A **Task:** N/A
PO Number:		**Manager:**	Jorden Wiwcharyk
Sample Date:	6/1/2020 by Jorden Wiwcharyk	**Lab/Ref. #:**	WX19092-SS03
Source:	TH20-SS03 Bulk Sample	**Description:**	Clay



Moisture Density Relationship: (ASTM D698-12) Method: A

Preparation Method: Dry **Rammer Type:**Mechanical

Maximum Density (kg/m^3): 1424

Optimum Moisture (%): 29.4

Remarks:

Distribution: Jorden Wiwcharyk

Reviewed By: Randell Johnson

R. Johnson

Reporting of these results constitutes a testing service only. Engineering interpretation or evaluation of the test results is provided only on written request.

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CCIL Certified Aggregate Type C & Type D

California Bearing Ratio

ASTM D1883-16, Soaking Method

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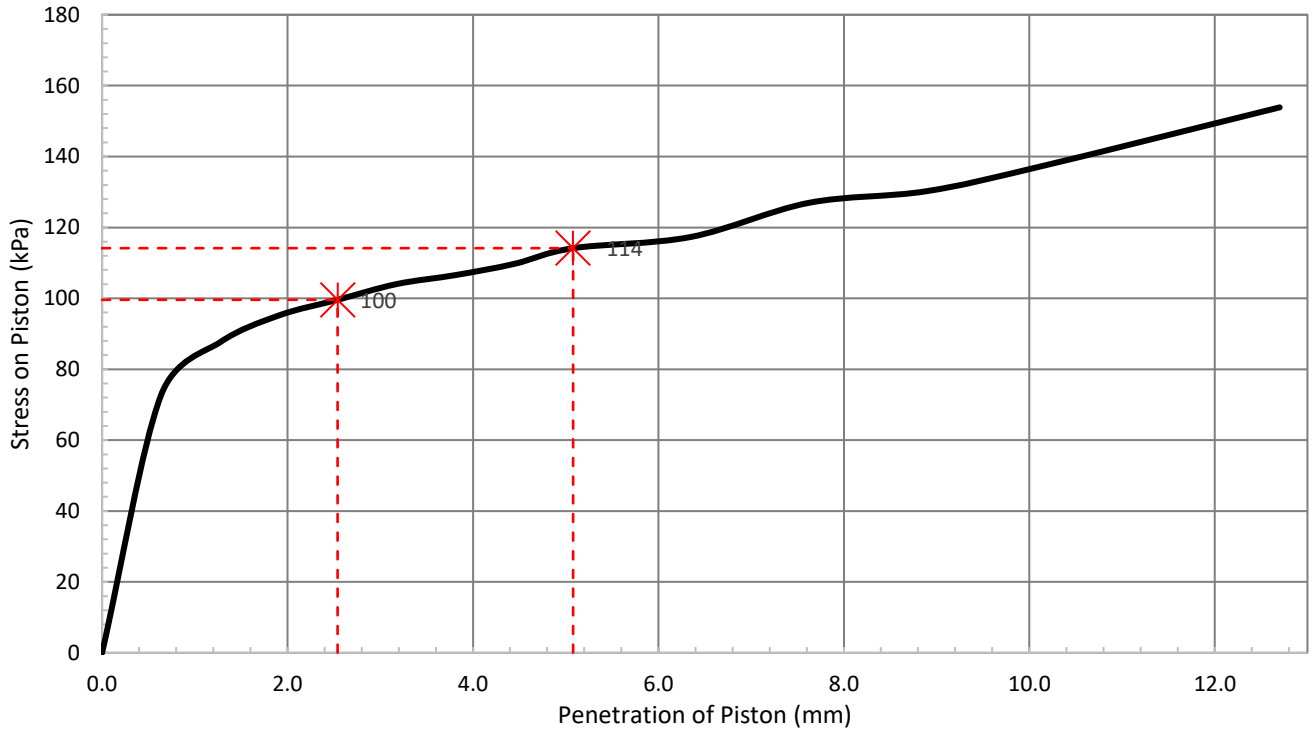
Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1399 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	28.9 %	Top 1 Inch Soaked Moisture	41.1 %
Compacted Dry Density	1426 kg/m^3	Bottom 1 Inch Soaked Moisture	31.3 %
Compacted Moisture Content	27.9 %	Average Soaked Moisture	35.0 %
Percent Compaction	102% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	100	**1.4**
5.080	10300	114	**1.1**



Client:	Stantec	Project:	City of Winnipeg Street Investigation
Project No:	WX19092	Site Location:	SS01
Date:	June 17, 2020	Request No:	N/A
Technologist:	Mdnazri Mohidin	Reviewed By:	Caolan McEvoy

Soil Description: Clay

Liquid Limit 76 Plastic Limit 20 Plasticity Index 56 Swell 0.54%

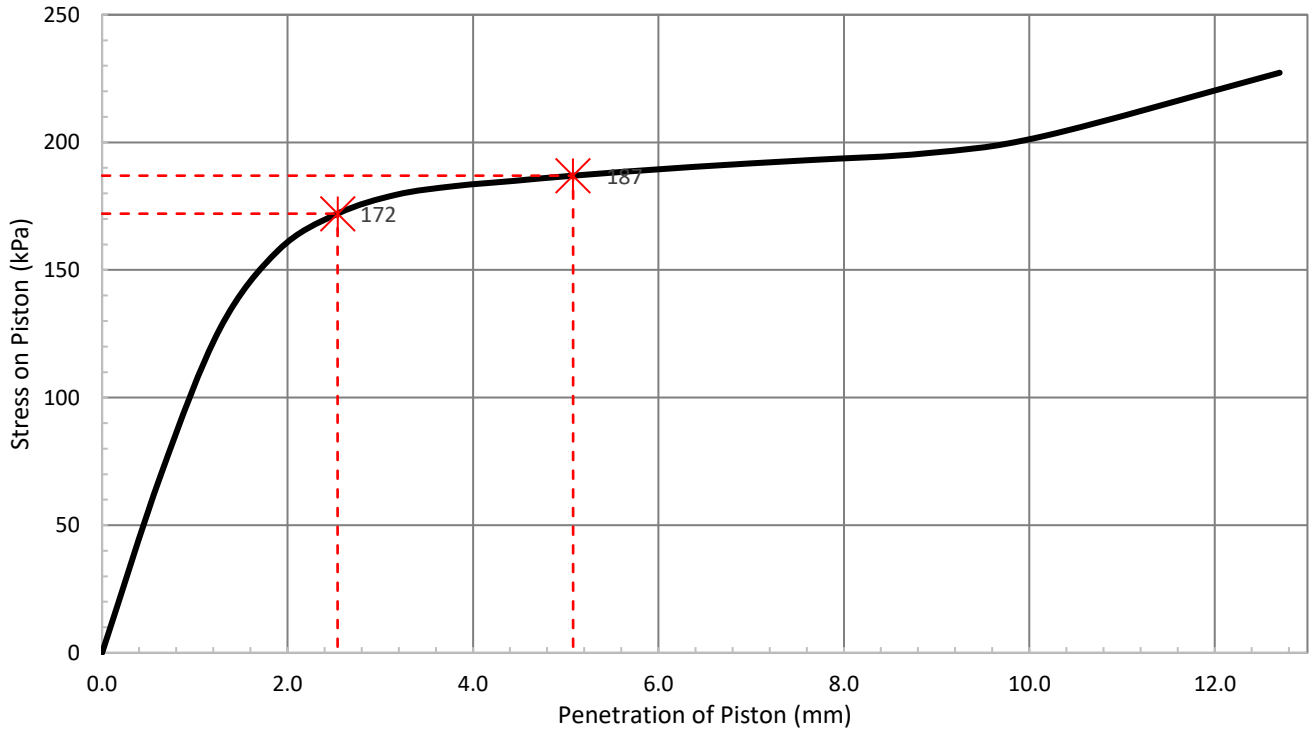
California Bearing Ratio

ASTM D1883-16, Soaking Method

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1390 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	31.4 %	Top 1 Inch Soaked Moisture	35.7 %
Compacted Dry Density	1422 kg/m^3	Bottom 1 Inch Soaked Moisture	34.6 %
Compacted Moisture Content	31.5 %	Average Soaked Moisture	35.3 %
Percent Compaction	102% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	172	**2.5**
5.080	10300	187	**1.8**



Client:	Stantec	Project:	C.O.W. Street Investigation
Project No:	WX19092	Site Location:	TH20-SS02 Bulk Sample
Date:	June 17, 2020	Request No:	N/A
Technologist:	Mdnazri Mohidin	Reviewed By:	Caolan McEvoy

Soil Description: Clay

Liquid Limit 85 Plastic Limit 21 Plasticity Index 64 Swell 0.69%

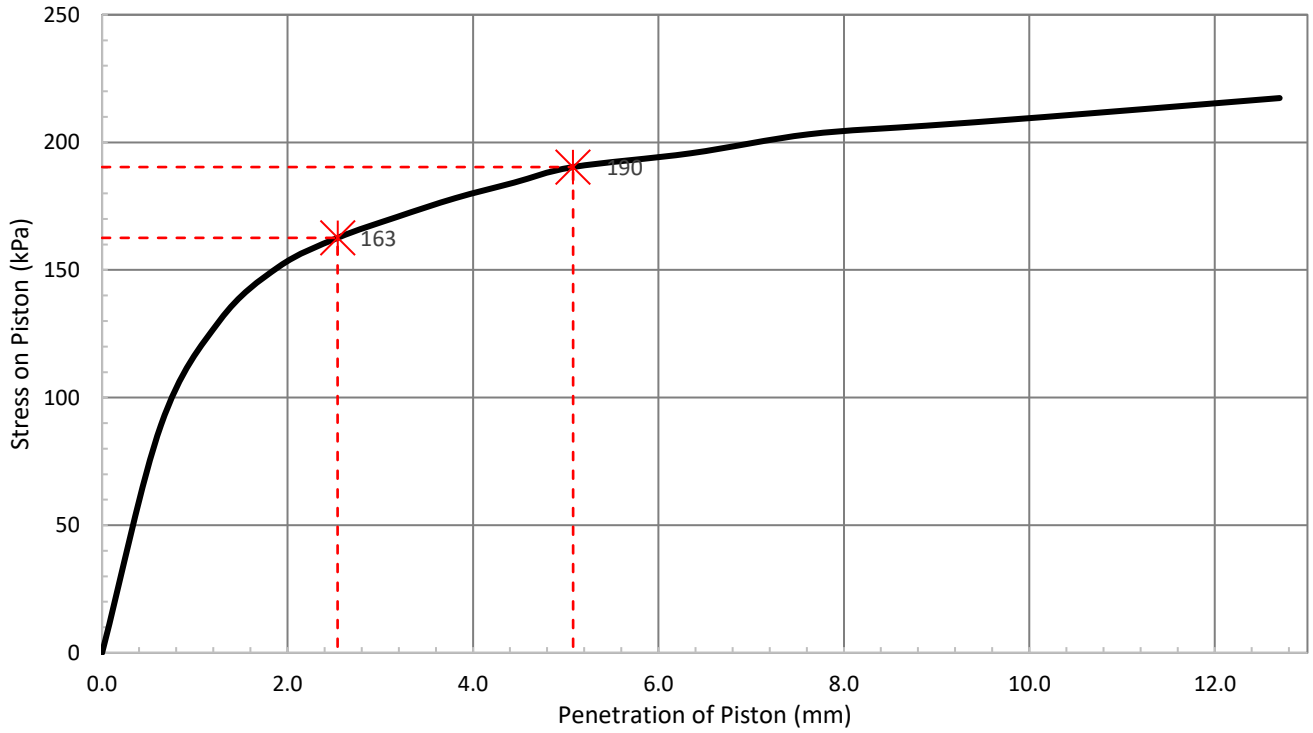
California Bearing Ratio

ASTM D1883-16, Soaking Method

Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

Type of Preparation	Standard ASTM D698	Sample Preparation	Soaked
Maximum Dry Density	1424 kg/m^3	Soaking time	96 hrs
Optimum Moisture Content	29.4 %	Top 1 Inch Soaked Moisture	41.0 %
Compacted Dry Density	1425 kg/m^3	Bottom 1 Inch Soaked Moisture	32.9 %
Compacted Moisture Content	30.4 %	Average Soaked Moisture	35.5 %
Percent Compaction	100% %	Mass of Surcharge	4.54 kg

Corrected Penetration (mm)	Standard Load of Crushed Stone (kPa)	Corrected Load (kPa)	CBR (%)
2.540	6900	163	**2.4**
5.080	10300	190	**1.8**



Client:	Stantec	Project:	C.O.W. Street Investigation
Project No:	WX19092	Site Location:	TH20-SS03
Date:	June 17, 2020	Request No:	N/A
Technologist:	Mdnazri Mohidin	Reviewed By:	Caolan McEvoy

Soil Description: Clay

Liquid Limit 45 Plastic Limit 14 Plasticity Index 31 Swell 0.29%