

APPENDIX E

SOIL SURVEY REPORT

MANITOBA INFRASTRUCTURE AND TRANSPORTATION
MATERIALS ENGINEERING BRANCH
SOIL SURVEY REPORT



Field Book No.:

Client: Water Management and Structures

From:

Project: Lake St Martin Channel

To:

Control Section:

Survey Location: Access Road

Project No.:

Survey Purpose: Preliminary

Soil Survey No.: 2014SS05

Internal Order No.: 200037101

Sampled By: KGS Group

Contract No.:

Dated Sampled: February 10-17, 2015

**MANITOBA INFRASTRUCTURE AND TRANSPORTATION
MATERIALS ENGINEERING BRANCH - CENTRAL LAB**



SOIL SURVEY PROPERTY SUMMARY SHEET

Field Book No.:		From:		Report To:	Akinbola George, Rick Postlethwaite
Client:	Water Management and Structures	To:		Date Requisitioned:	2015-03-06
Highway:	Lake St Martin Channel Access Road	Contract No.:		Date Reported:	2015-06-04
Control Section:		Survey Location:	Access Road		
Project No.:		Survey Purpose:	Preliminary		
Soil Survey No.:	2014SS05	Sampled By:	KGS		
Internal Order No.:	200037101	Date Sampled:	2015-02-10	Page:	1 of 6

Sample Data							Particle Size Analysis					Soil Properties/Classification												Field Description
Legal Description	Test Hole#	Station	Centerline offset (m)	Lab Sample Number	Depth(ft)	Field Sample No.	Coarse Aggregate (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (-1 = NP)	AASHTO	Group Index	Soil Type	Moisture Content (%)	Frost Susceptibility	Organic Content (%)	Maximum Density (kg/m³)	Optimum Moisture (%)		
	TP15-32			WSS140413	3-4	S1	NT											17					silty clay	
	TP15-32			WSS140414	5-6	S2	NT											24					silty clay	
	TP15-32			WSS140415	7-8	S3	NT											22					silty clay	
	TP15-32			WSS140416	11-12	S4	14	2	17	33	34	27	13	14	A-6	8	Low Plastic Clay	15					silt till	
	TP15-32			WSS140417	13-14	S5	8	1	11	24	56	44	20	24	A-7-6	15	High Plastic Clay	12					silt till	
	TP15-33			WSS140418	5-6	S1	NT											25					silty clay	
	TP15-33			WSS140419	7-8	S2	4	2	9	27	58	43	19	24	A-7-6	14	High Plastic Clay	22					silty clay	
	TP15-33			WSS140420	10-11	S3	12	7	17	35	28	21	13	8	A-4	6	Sandy Silt	13					silt till	
	TP15-34			WSS140421	1-2	S1	5	7	15	25	49	41	21	20	A-7-6	12	High Plastic Clay	24					silty clay	
	TP15-34			WSS140422	4-5	S2	18	1	19	41	21	14	12	2	A-4	5	Sandy Silt	7	FS				silt till	
	TP15-34			WSS140423	8-9	S3	NT											5					silt till	
	TP15-34			WSS140424	11-12	S4	22	2	19	38	20	16	12	4	A-4	5	Gravelly Silt	6					silt till	
	TP15-34			WSS140425	14-15	S5	NT											6					silt till	
	TP15-35			WSS140426	5-6	S1	7	1	10	27	54	41	20	21	A-7-6	13	High Plastic Clay	25					silty clay	
	TP15-35			WSS140427	8-9	S2	NT											20					silty clay	
	TP15-36			WSS140428	3-4	S1	20	23	5	18	34	40	19	21	A-6	7	Sandy Clay	24					silty clay	
	TP15-36			WSS140429	6-7	S2	NT											20					silty clay	
	TP15-36			WSS140430	10-11	S3	17	1	19	35	28	22	13	9	A-4	6	Sandy Silt	10					silt till	
	TP15-36			WSS140431	14-15	S4	NT											10					silt till	
	TP15-37			WSS140432	3-4	S1	NT											33					silty clay	

Field Book information is represented by the shaded area

NS - Not Sampled

NT - Not Tested

FS - Frost Susceptible

**MANITOBA INFRASTRUCTURE AND TRANSPORTATION
MATERIALS ENGINEERING BRANCH - CENTRAL LAB**



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	TP15-37			WSS140433	5-6	S2	6	2	10	19	63	51	20	31	A-7-6	18	High Plastic Clay	22					silty clay	
	TP15-37			WSS140434	8-9	S3	NT											24					silty clay	
	TP15-37			WSS140435	10-11	S4	16	2	18	38	26	19	13	6	A-4	6	Sandy Silt	9					silt till	
	TP15-37			WSS140436	15-16	S5	NT											10					silt till	
	TP15-38			WSS140437	7-8	S1	7	2	11	22	58	43	20	23	A-7-6	14	High Plastic Clay	32					silty clay	
	TP15-38			WSS140438	9.5-10.5	S2	NT											15					silty clay	
	TP15-38			WSS140439	12-13	S3	15	1	19	42	23	39	13	26	A-6	12	Sandy Clay	11					silt till	
	TP15-39			WSS140440	1-2	S1	NT											795					peat	
	TP15-39			WSS140441	6-7	S2	2	1	5	18	74	52	22	30	A-7-6	18	High Plastic Clay	31					silty clay	
	TP15-39			WSS140442	10-11	S3	10	4	14	39	33	23	13	10	A-4	7	Clayey Silt	14					silt till	
	TP15-40			WSS140443	1-2	S1	NT											874					peat	
	TP15-40			WSS140444	6-7	S2	9	3	12	22	54	42	19	23	A-7-6	14	High Plastic Clay	20					silty clay	
	TP15-40			WSS140445	10-11	S3	0	0	4	18	78	63	25	38	A-7-6	20	High Plastic Clay	40					silty clay to silt till	
	TP15-41			WSS140446	1-2	S1	NT											416					peat	
	TP15-41			WSS140447	5-6	S2	11	0	17	32	40	28	14	14	A-6	9	Low Plastic Clay	14					silty clay	
	TP15-41			WSS140448	10-11	S3	20	1	17	40	22	15	12	3	A-4	5	Sandy Silt	9					silt till	
	TP15-42			WSS140449	0.5-1.5	S1	NT											1342					peat	
	TP15-42			WSS140450	1.5-2.5	S2	NT											507					peat	
	TP15-42			WSS140451	3-4	S3	0	0	18	46	36	19	14	5	A-4	8	Clayey Silt	15					silty clay to clayey silt	
	TP15-42			WSS140452	7-8	S4	0	0	21	50	30	18	13	5	A-4	8	Clayey Silt	10					silt till	

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**MANITOBA INFRASTRUCTURE AND TRANSPORTATION
MATERIALS ENGINEERING BRANCH - CENTRAL LAB**



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Sample Data							Particle Size Analysis					Soil Properties/Classification												Field Description
Legal Description	Test Hole#	Station	Centerline offset (m)	Lab Sample Number	Depth(ft)	Field Sample No.	Coarse Aggregate (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (-1 = NP)	AASHTO	Group Index	Soil Type	Moisture Content (%)	Frost Susceptibility	Organic Content (%)	Maximum Density (kg/m ³)	Optimum Moisture (%)		
	TP15-43			WSS140453		S1	NT											831					peat	
	TP15-43			WSS140454		S2	0	0	13	30	57	40	19	21	A-6	12	Low Plastic Clay	24					silty clay	
	TP15-43			WSS140455		S3	0	0	30	43	27	15	12	3	A-4	7	Silt	12					silt till	
	TP15-44			WSS140456		S1	NT											356					peat	
	TP15-44			WSS140457		S2	0	0	21	43	36	20	14	6	A-4	8	Clayey Silt	19					silty clay to clayey silt	
	TP15-44			WSS140458		S3	NT											11					silt till	
	TP15-45			WSS140459		S1	NT											85					peat	
	TP15-45			WSS140460		S2	0	0	19	29	52	40	18	22	A-6	13	Low Plastic Clay	26					silty clay	
	TP15-45			WSS140461		S3	0	0	10	25	65	46	20	26	A-7-6	15	High Plastic Clay	19					silty clay / silt till	
	TP15-45			WSS140462		S4	NT											10					silt till	
	TP15-46			WSS140463		S1	NT											139					peat	
	TP15-46			WSS140464		S2	9	0	28	47	16	14	12	2	A-4	6	Sandy Silt	13					clayey silt and sand	
	TP15-46			WSS140465		S3	0	0	28	48	24	15	12	3	A-4	7	Silt	9	FS				silt till	
	TP15-47			WSS140466		S1	8	3	16	35	39	30	16	14	A-6	9	Low Plastic Clay	13					silty clay	
	TP15-48			WSS140467		S1	NT											555					peat	
	TP15-48			WSS140468		S2	0	0	21	43	36	19	14	5	A-4	8	Clayey Silt	16					silty clay to clayey silt	
	TP15-48			WSS140469		S3	0	0	31	45	24	15	13	2	A-4	7	Silt	8	FS				silt till	
	TP15-49			WSS140470		S1	0	0	19	41	40	27	16	11	A-6	8	Low Plastic Clay	16					silty clay to clayey silt	
	TP15-49			WSS140471		S2	NT											9					silty clay to clayey silt	
	TP15-50			WSS140472		S1	NT											240					peat	

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Sample Data							Particle Size Analysis					Soil Properties/Classification											Field Description
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	TP15-50			WSS140473	2-3	S2	0	0	21	49	30	17	13	4	A-4	8	Clayey Silt	11					silty clay to clayey silt
	TP15-51			WSS140474	0.5-1.5	S1	NT											490					peat
	TP15-51			WSS140475	2.5-3.5	S2	0	0	14	31	56	39	20	19	A-6	12	Low Plastic Clay	19					silty clay
	TP15-51	No Sample		WSS140476	12-13	S3	NT																silt till
	TP15-52			WSS140477	2-3	S1	NT											658					peat
	TP15-52			WSS140478	4-5	S2	5	2	8	26	59	47	21	26	A-7-6	16	High Plastic Clay	30					silty clay
	TP15-52			WSS140479	9-10	S3	7	4	19	44	27	15	12	3	A-4	7	Silt	7					silt till
	TP15-53			WSS140480	0.5-1.5	S1	NT											287					peat
	TP15-53			WSS140481	2-3	S2	9	2	14	50	25	16	13	3	A-4	8	Silt	8	FS				clay silt
	TP15-53			WSS140482	10-11	S3	10	1	21	45	23	16	13	3	A-4	7	Silt	5	FS				silt till
	TP15-54			WSS140483	1-2	S1	33	4	37	18	8	NP	NP	NP	A-2-4	0	Silty Sand	9					silty sand and gravel
	TP15-54			WSS140484	4-5	S2	9	3	9	32	47	41	18	23	A-7-6	13	High Plastic Clay	20					silty clay to clayey silt
	TP15-55			WSS140485	0-0.5	S1	NT											136					peat
	TP15-55			WSS140486	3-4	S2	11	2	19	40	28	20	15	5	A-4	7	Clayey Silt	12					silty clay to clayey silt
	TP15-56			WSS140487	4-5	S1	10	3	9	28	50	42	20	22	A-7-6	13	High Plastic Clay	21					silty clay
	TP15-56			WSS140488	5.5-6.5	S2	NT											15					silt till
	TP15-56			WSS140489	9-10	S3	18	2	20	38	22	18	13	5	A-4	5	Sandy Silt	10					silt till
	TP15-57			WSS140490	0-0.5	S1	NT											86					peat
	TP15-57			WSS140491	2-3	S2	0	0	24	48	29	16	13	3	A-4	8	Silt	10					silty clay to clayey silt
	TP15-58			WSS140492	1-2	S1	NT											339					peat

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Control Section:		Survey Location:	Access Road		
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Sample Data							Particle Size Analysis					Soil Properties/Classification												Field Description
Legal Description	Test Hole#	Station	Centerline offset (m)	Lab Sample Number	Depth(ft)	Field Sample No.	Coarse Aggregate (%)	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (-1 = NP)	AASHTO	Group Index	Soil Type	Moisture Content (%)	Frost Susceptibility	Organic Content (%)	Maximum Density (kg/m³)	Optimum Moisture (%)		
	TP15-58			WSS140493	2.5-3.5	S2	8	1	40	16	35	29	15	14	A-6	5	Sandy Clay	27					silty clay	
	TP15-58			WSS140494	6-7	S3	NT											18					silty clay	
	TP15-59			WSS140495	0-0.5	S1	NT											239					peat	
	TP15-59			WSS140496	1-2	S2	NT											16					silty clay	
	TP15-59			WSS140497	5-6	S3	15	1	21	38	25	16	12	4	A-4	6	Sandy Silt	6					silty clay	
	TP15-60			WSS140498	1-1.5	S1	14	10	16	22	38	37	17	20	A-6	9	Sandy Clay	16					silty clay	
	TP15-60			WSS140499	5-6	S2	11	3	27	37	22	15	12	3	A-4	5	Sandy Silt	7	FS				clayey silt	
	TP15-61			WSS140500	2-3	S1	NT											558					peat	
	TP15-61			WSS140501	3-3.5	S2	23	6	59	6	7	NP	NP	NP	A-2-4	0	Fine Sand	14					silty sand	
	TP15-61			WSS140502	5-6	S3	8	3	16	35	38	27	14	13	A-6	9	Low Plastic Clay	22					silty clay	
	TP15-62			WSS140503	2-3	S1	NT											494					peat	
	TP15-62			WSS140504	5-6	S2	10	2	13	27	49	39	16	23	A-6	13	Low Plastic Clay	19					silty clay	
	TP15-62			WSS140505	10-11	S3	12	2	17	44	26	16	12	4	A-4	7	Clayey Silt	7					silt till	
	TP15-63			WSS140506	2-3	S1	NT											28					silty clay	
	TP15-63			WSS140507	4-5	S2	15	1	8	21	54	46	19	27	A-7-6	16	High Plastic Clay	19					silty clay	
	TP15-64			WSS140508	0-0.5	S1	NT											48					peat	
	TP15-64			WSS140509	3-4	S2	13	2	12	20	52	44	18	26	A-7-6	15	High Plastic Clay	20					silty clay	
	TP15-64			WSS140510	9-10	S3	9	3	14	36	38	28	16	12	A-6	9	Low Plastic Clay	16					clay till	
	TP15-65			WSS140511	0.5-1.5	S1	NT											494					peat	
	TP15-65			WSS140512	2-3	S2	1	2	11	15	71	58	28	30	A-7-6	20	High Plastic Clay	42					silty clay	

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	TP15-65	No Sample		WSS140513	4-5	S3	NT																clayey silt	
	TP15-66			WSS140514	2-3	S1	11	1	6	23	59	51	19	32	A-7-6	18	High Plastic Clay	24					silty clay	
	TP15-66			WSS140515	8-9	S2	17	6	16	38	23	17	13	4	A-4	5	Sandy Silt	9					silt till	
	TP15-67			WSS140516	2.5-3.5	S1	3	2	8	23	64	45	23	22	A-7-6	14	High Plastic Clay	28					silty clay	
	TP15-67			WSS140517	6.5-7.5	S2	20	1	15	40	23	16	12	4	A-4	6	Sandy Silt	10					silt till	
	TP15-68			WSS140518	1-2	S1	NT											530					peat	
	TP15-68			WSS140519	3-4	S2	10	3	30	35	22	16	13	3	A-4	4	Sandy Silt	11	FS				clayey silt	
	TP15-68			WSS140520	6-7	S3	13	2	16	43	25	16	12	4	A-4	7	Silt	9	FS				silt till	
	TP15-68			WSS140521	12.5-13.5	S4	NT											8					silt till	
	TP15-69			WSS140522	0-1	S1	NT											488					peat	
	TP15-69			WSS140523	2-3	S2	5	2	8	21	64	46	20	26	A-7-6	16	High Plastic Clay	21					silty clay	
	TP15-69			WSS140524	6.5-7.5	S3	12	2	16	42	29	18	13	5	A-4	7	Clayey Silt	11					silt till	
	TP15-70			WSS140525	2-3	S1	22	0	13	38	27	18	15	3	A-4	6	Gravelly Silt	14					clayey silt	
	TP15-70			WSS140526	4-5	S2	20	0	27	33	21	16	12	4	A-4	4	Sandy Silt	8					silt till	
	TP15-71			WSS140527	2-3	S1	6	4	9	20	61	50	23	27	A-7-6	17	High Plastic Clay	19					silty clay	
	TP15-71			WSS140528	4-5	S2	10	2	16	38	34	21	13	8	A-4	7	Clayey Silt	10					clayey silt to silt till	
	TP15-71			WSS140529	7-8	S3	8	2	8	25	57	49	19	30	A-7-6	18	High Plastic Clay	26					clay till	

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SUMMARY OF LABORATORY TESTS

SOIL CLASSIFICATION CHECK LIST				LEGEND								
COARSE GRAINED		FINE GRAINED		W _N = WATER CONTENT W _L = LIQUID LIMIT W _P = PLASTIC LIMIT I _P = PLASTICITY INDEX C _C = COEFFICIENT OF CURVATURE C _C = (D ₃₀) ² /(D ₁₀ ×D ₆₀)				C _u = COEFFICIENT OF UNIFORMITY C _u = D ₆₀ /D ₁₀ D ₁₀ = 10% SIZE IN mm D ₃₀ = 30% SIZE IN mm D ₆₀ = 60% SIZE IN mm P ₂₀₀ = % PASSING NO.200 SIEVE P.P. = POCKET PENETROMETER q _u = UNCONFINED COMPRESSIVE STRENGTH				
1. SYMBOL or GROUP NAME 2. IF SAND-% GRAVEL, MAX. DIA. 3. IF GRAVEL-% SAND, GRADING 4. % passing 75um Sieve 5. FINES COMPOSITON, ODOUR 6. MOISTURE 7. CEMENTATION 8. COLOUR		1. SYMBOL or GROUP NAME 2. MOISTURE - RELATE TO W _P , W _L (B&S only) 3. SOIL COMPOSITION, ODOUR 4. % SAND and GRADING 5. % GRAVEL and MAX. DIA. 6. SOIL STRENGTH 7. SOIL MOISTURE 8. COLOUR										
FIELD SAMPLE	LAB. NO.	ASTM CLASSIFICATION SYMBOL or GROUP NAME and SAMPLE DESCRIPTION	W _N %	WET DENSITY kg/m ³	ATTERBERG LIMITS GRAIN SIZE CHARACTERISTICS			GRAIN SIZE		STRENGTH		
and HOLE NO.	and DEPTH RANGE (ft)				W _L D ₁₀	W _P C _C	I _P C _u	GRAVEL %	SAND %	SILT or CLAY P ₂₀₀ %	q _u K.S.F. kPa	POCKET PENETROMETER T.S.F.
S1 TP15-39	WSS14 0440 1-2'	PT, Peat, highly organic, roots, moss, clumpy, wet, black, strong odor										
S1 TP15-40	WSS14 0443 1-2'	PT, Peat, highly organic, roots, moss, clumpy, wet, brown, mild odor										
S1 TP15-41	WSS14 0446 1-2'	PT, Peat, highly organic, roots, moss, clumpy, wet, black, strong odor, trace silt, trace sand										
S1 TP15-42	WSS14 0449 0.5-1.5'	PT, Peat, highly organic, roots, moss, clumpy, wet, brown, mild odor										
S2 TP15-42	WSS14 0450 1.5-2.5'	PT, Peat, highly organic, roots, moss, clumpy, wet, black, mild odor										
S1 TP15-43	WSS14 0453 1-2'	PT, Peat, highly organic, roots, moss, clumpy, wet, black, strong odor										
S1 TP15-44	WSS14 0456 0.5-1.5'	PT, Peat, highly organic, roots, moss, loose, moist, black, mild odor										
S1 TP15-45	WSS14 0459 1.0-1.5'	OL/OH, Organic Clay, some silt, roots, moss, clumpy, wet, brown, strong odor, trace sand										
S1 TP15-46	WSS14 0463 0.0-0.5'	PT, Peat, highly organic, roots, moss, loose, dry, black, no odor										
S1 TP15-48	WSS14 0467 0.5-1.5'	PT, Peat, highly organic, roots, moss, clumpy, wet, black, strong odor										
S1 TP15-50	WSS14 0472 0.25-0.5'	PT, Peat, highly organic, roots, moss, clumpy, damp, brown, mild odor										
S1 TP15-51	WSS14 0474 0.5-1.5'	PT, Peat, highly organic, moss, clumpy, wet, black, strong odor, trace roots										
S1 TP15-52	WSS14 0477 2-3'	PT, Peat, highly organic, moss, clumpy, wet, black, no odor, trace roots										
S1 TP15-53	WSS14 0480 0.5-1.0'	PT, Peat, highly organic, roots, moss, loose, damp, black, no odor										
S1 TP15-55	WSS14 0485 0.0-0.5'	PT, Peat, highly organic, roots, moss, loose, moist, black, strong odor										

MANITOBA INFRASTRUCTURE AND TRANSPORTATION MATERIALS ENGINEERING CENTRAL LABS GEOTECHNICAL LABORATORY	PROJECT: Lake St Martin Channel LOCATION: Access Road SITE NO./GEOTECH. NO.: CLASSIFIED BY: MO DATE: 2015-06-03
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[illegible]

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 22.1 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 238.35
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/10/2015
UTM (m) N 5,746,428
 E 565,993

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
238			<u>PEAT</u> - Black to brown, wet, soft.						
237.4	1		<u>SILTY CLAY</u> - Grey, moist, soft, low to intermediate plasticity, with sand, with gravel.	S1					
237	5		- Stiff and with silt seams below 1.52 m.	S2					
236	2			S3					
235.0	3								
235.0	10		<u>SILT TILL</u> - Brown, moist, dense, well graded, with gravel, some cobbles. - Grain size distribution at 3.51 m: Gravel (14%), Sand (19%), Silt (33%), Clay (34%).	S4					
234.1	4		- Grain size distribution at 4.12 m: Gravel (8%), Sand (12%), Silt (24%), Clay (56%).	S5					
234			END OF TEST PIT ON SUSPECTED BOULDERS AT 4.27 m						
233	15		Notes: 1. Significant water infiltration into test pit from peat. 2. Backfilled test pit to grade upon completion.						
232	6								
	20								

SAMPLE TYPE Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTION INSPECTOR J. MACLENNAN

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 20.9 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 240.41
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/10/2015
UTM (m) N 5,745,237
 E 565,848

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
			<u>PEAT</u> - Black to brown, wet, soft.			
240	1					
239.0	5		<u>SILTY CLAY</u> - Brown, moist, firm, intermediate plasticity, with silt seams, trace sand, trace gravel.	S1		
239	2		- Some sand, some gravel below 2.14 m. - Grain size distribution at 2.29 m: Gravel (4%), Sand (11%), Silt (27%), Clay (58%).	S2		
238						
237.4	3		<u>SILT TILL</u> - Brown, moist, compact, well graded, with gravel. - Grain size distribution at 3.20 m: Gravel (12%), Sand (24%), Silt (35%), Clay (28%).	S3		
237	4		- Some cobbles below 3.97 m.			
236	15					
235.2	5					
235			END OF TEST PIT ON SUSPECTED BOULDER AT 5.19 m			
234	6		Notes: 1. Significant water infiltration into test pit from peat. 2. 0.92 m of water ponded base of test pit from infiltration from peat. 3. Sidewall sloughing during excavation. 4. Backfilled test pit to grade upon completion.			
	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTION INSPECTOR J. MACLENNAN

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 20.7 From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 241.40
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/11/2015
UTM (m) N 5,744,699
E 565,642

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
241.2			PEAT - Black to brown, damp, soft, some rootlets.			
241			SILTY CLAY - Brown, moist, firm, low plasticity, trace coarse grained sand, trace gravel, some silt seams. - Grain size distribution at 0.46 m: Gravel (5%), Sand (22%), Silt (25%), Clay (49%).	S1		
240.5	1		SILT TILL - Brown, moist, loose to compact, well graded, with gravel, trace cobbles. -Increasing density with depth.			
240	5		- Grain size distribution at 1.37 m: Gravel (18%), Sand (20%), Silt (41%), Clay (21%).	S2		
239	2			S3		
238	3-10		- Grain size distribution at 3.51 m: Gravel (22%), Sand (21%), Silt (38%), Clay (12%).	S4		
237	4			S5		
236.8	15		END OF TEST PIT ON DENSE SILT TILL AT 4.58 m			
236	5		Notes: 1. Backfilled test pit to grade upon completion.			
235	6-20					
SAMPLE TYPE  Grab from Bucket						
CONTRACTOR TERRY LAVALLEE CONSTRUCTION			INSPECTOR J. MACLENNAN		APPROVED DRAFT	DATE 7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 20.4 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 240.52
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/11/2015
UTM (m) N 5,744,989
 E 565,740

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
240	1		<u>PEAT</u> Black to brown, wet, soft.			
239.3	5		<u>SILTY CLAY</u> - Grey, moist, firm, intermediate plasticity, trace coarse grained sand, trace fine grained gravel. - Grain size distribution at 1.67 m: Gravel (7%), Sand (11%), Silt (27%), Clay (54%).	S1		
238	2			S2		
237.5	3		<u>SILT TILL</u> - Brown, moist, compact to dense, well graded, with gravel, some cobbles, trace boulders.			
237	4					
236.5	15		END OF TEST PIT ON DENSE SILT TILL AT 4.58 m			
235	5		Notes: 1. Water infiltration into test pit from silt till. 2. Backfilled test pit to grade upon completion.			
234	6					
SAMPLE TYPE Grab from Bucket						
CONTRACTOR			INSPECTOR		APPROVED	
TERRY LAVALLEE CONSTRUCTION			J. MACLENNAN		DRAFT	
					DATE	
					7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 19.7 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 243.04
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/11/2015
UTM (m) N 5,743,977
 E 565,435

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
243			PEAT - Black to brown, wet, soft.			
242.4			SILTY CLAY - Grey, moist, firm, intermediate plasticity, trace coarse grained sand. - Increasing sand with depth. - Grain size distribution at 1.07 m: Gravel (20%), Sand (28%), Silt (18%), Clay (34%).	S1		
242	1					
241	5			S2		
240.3			SILT TILL - Brown, moist, compact to dense, well graded, with gravel, some cobbles, trace boulders. - Grain size distribution at 3.20 m: Gravel (17%), Sand (20%), Silt (35%), Clay (28%).	S3		
240	3					
239	4			S4		
238.5	15		END OF TEST PIT ON SUSPECTED BOULDERS AT 4.58 m			
238	5		Notes: 1. Water infiltration into test pit from peat. 2. Backfilled test pit to grade upon completion.			
237	6					
	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTION** INSPECTOR **J. MACLENNAN**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 18.9 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 242.78
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/11/2015
UTM (m) N 5,743,136
 E 565,431

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
242.0 242	1		PEAT - Black to brown, wet soft.	S1		
241	5		SILTY CLAY - Grey, moist, soft, high plasticity, some fine to coarse grained sand, trace gravel. - Stiff below 1.52 m. - Grain size distribution at 1.68 m: Gravel (6%), Sand (12%), Silt (19%), Clay (63%).	S2		
240.0 240	10		SILT TILL - Brown, moist, dense, well graded, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles. - Some sand, some gravel, trace cobbles below 2.44 m. - Grain size distribution at 3.20 m: Gravel (16%), Sand (20%), Silt (38%), Clay (26%).	S3		
239	15			S4		
238	20			S5		
237.6			END OF TEST PIT ON DENSE SILT TILL AT 5.19 m.			
237			Notes: 1. Water infiltration into test pit from peat. 2. Backfilled test pit to grade upon completion.			
236						

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTION** INSPECTOR **J. MACLENNAN**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 18.4 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 243.48
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/11/2015
UTM (m) N 5,742,551
 E 565,102

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL % 20 40 60 80
243	1		<u>PEAT</u> - Black to brown, damp, soft.						
242	5								
241.7	2		<u>SILTY CLAY</u> - Grey, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace coarse grained gravel.						
241			- Grain size distribution at 2.29 m: Gravel (7%), Sand (13%), Silt (22%), Clay (58%).	S1					
240.3	3		- Some sand, trace gravel below 3.05 m.	S2					
240			<u>SILT TILL</u> - Brown, moist, dense, well graded, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles.						
239	15		- Grain size distribution at 3.81 m: Gravel (15%), Sand (20%), Silt (42%), Clay (23%).	S3					
238.6	5		END OF TEST PIT ON DENSE SILT TILL AT 4.88 m						
238			Notes: 1. Backfilled test pit to grade upon completion.						
237	6								
	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS				INSPECTOR S. REPA		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 16.9 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 243.53
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/12/2015
UTM (m) N 5,741,216
 E 564,107

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
243	1		PEAT - Dark brown, wet to saturated, some roots (2 to 5 mm), with rootlets, trace roots (5 to 10 mm), fibrous to hemic.	S1		795
242 241.9	5		SILTY CLAY - Grey, moist, high plasticity, firm, laminated with silt lenses, trace fine to coarse grained sand, trace fine to coarse grained gravel. - Grain size distribution at 1.98 m: Gravel (2%), Sand (6%), Silt (18%), Clay (74%). - Increasing silt, fine to coarse grained sand, fine to coarse grained gravel with depth.	S2		
241 240.5	3 10		SILT TILL - Brown, moist, compact to dense, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles. - Grain size distribution at 3.20 m: Gravel (10%), Sand (18%), Silt (39%), Clay (33%).	S3		
240 239.9	4 15		END OF TEST PIT DUE TO SLOUGHING AT 4.58 m			
239 238	5 20		Notes: 1. Significant water infiltration into test pit from peat. 2. Water ponded at bottom of test pit from above noted infiltration. 3. Backfilled test pit to grade upon completion.			
237						

SAMPLE TYPE Grab from Bucket

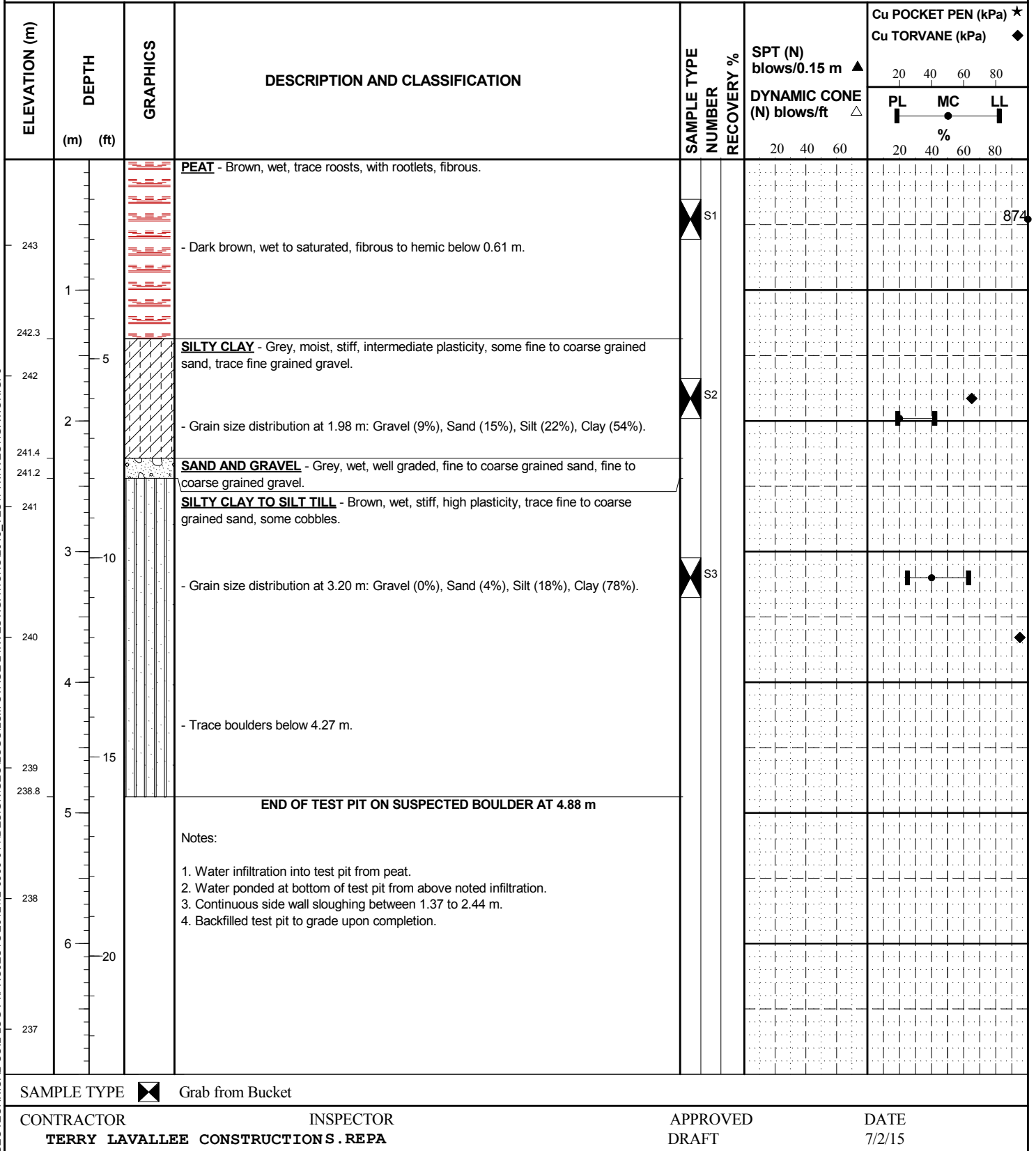
CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 16.4 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 243.66
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/12/2015
UTM (m) N 5,740,771
 E 563,752



CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 15.5 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.03
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/12/2015
UTM (m) N 5,740,101
E 563,410

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
245			PEAT - Brown, wet, with rootlets, some roots (2 to 10 mm), trace roots (10 to 25 mm), fibrous. - Dark brown, decreased fibres below 0.15 m.	S1		416
244.4	1		SILTY CLAY - Grey, moist, firm, low plasticity, silt pockets.			
244	5		- Transition to silt till - Brown mottled with tan, stiff, some fine to coarse grained sand, some fine to coarse grained gravel, trace cobbles, blocky structure below 1.53. - Grain size distribution at 1.68 m: Gravel (11%), Sand (17%), Silt (32%), Clay (40%).	S2		
243	2					
242.6			SILT TILL - Tan, moist, dense, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders. - Increasing cobbles and boulders with depth.			
242	3			S3		
241	4					
240.5	15		END OF TEST PIT ON SUSPECTED BOULDER AT 4.56 m			
240	5		Notes: 1. Minor water infiltration into test pit from peat. 2. Backfilled test pit to grade upon completion.			
239	6					
	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA** APPROVED DRAFT DATE 7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 15.1 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 246.08
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/12/2015
UTM (m) N 5,739,678
 E 563,185

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
246			PEAT - Brown, wet, with rootlets, some roots (2 to 10 mm), trace roots (10 to 25 mm), fibrous.	S1					1342
245.3	1		SILTY CLAY TO CLAYEY SILT - Grey, moist, soft to firm, low plasticity, some fine to coarse grained sand. - Grain size distribution at 1.07 m: Gravel (0%), Sand (18%), Silt (46%), Clay (36%).	S2					507
245	5			S3					
244.1	2		SILT TILL - Tan, moist, friable, with fine to coarse grained sand, some cobbles. - Trace boulders below 2.14 m. - Grain size distribution at 2.29 m: Gravel (0%), Sand (21%), Silt (50%), Clay (30%).	S4					
244									
243	3								
242	4								
241.8									
241	5								
240	6								
			END OF TEST PIT ON DENSE SILT TILL AT 4.27 m						
			Notes: 1. Minor water infiltration into test pit from peat and silty clay to clayey silt interface. 2. Backfilled test pit to grade upon completion.						

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 14.4 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 246.65
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/13/2015
UTM (m) N 5,739,037
 E 562,884

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
246.0 246	1		PEAT - Dark brown to black, wet, some roots (2 -10 mm), trace roots (10-50 mm), some rootlets, hemic.	S1		83
245.1 245	5		SILTY CLAY - Grey, moist, intermediate plasticity, some fine to coarse grained sand, trace silt pockets (up to 50 mm). - Grain size distribution at 1.07 m: Gravel (0%), Sand (13%), Silt (30%), Clay (57%). - Increasing fine to coarse grained sand, fine to coarse grained gravel and silt below 1.22 m.	S2		
244 243	10		SILT TILL - Tan, damp to moist, friable, with fine to coarse grained sand, some cobbles. - Increasing density with depth. - Trace boulders below 2.14 m. - Grain size distribution at 2.29 m: Gravel (0%), Sand (30%), Silt (43%), Clay (27%).	S3		
242.1 242	15		END OF TEST PIT ON DENSE SILT TILL AT 4.58 m			
241 240	20		Notes: 1. Water infiltration into test pit from peat and silty clay interface. 2. 0.61 m of water ponded at bottom of test pit from above noted infiltration. 3. Backfilled test pit to grade upon completion.			

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

JOB NO. **12-0300-011**
GROUND ELEV. **246.35**
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED **2/13/2015**
UTM (m) N **5,738,375**
E **562,548**

GEOTECHNICAL-SOIL LOG LOG P:\PROJECTS\2012\12-0300-01\1\DESIGN\GEOLOG\SM STAGE 2 INVESTIGATIONS\2015 TESTPIT\INVESTIGATION.GPJ

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 12.8 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 247.29
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/13/2015
UTM (m) N 5,737,451
 E 562,048

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
247			PEAT - Black, wet, with rootlets, some roots (up to 50 mm), hemic.			
246.8			SILTY CLAY - Grey, moist, firm, intermediate plasticity some fine to coarse grained sand.	S1		
	1		- Grain size distribution at 0.76 m: Gravel (0%), Sand (19%), Silt (29%), Clay (52%).	S2		
246			- Brown, mottled with tan, increased silt content, low to intermediate plasticity, friable below 1.07 m.			
245.6	5		- Grain size distribution at 1.68 m: Gravel (0%), Sand (10%), Silt (25%), Clay (65%).	S3		
	2		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders.			
245			- Increasing density with depth.			
	3					
244	10					
	4			S4		
243.0			END OF TEST PIT ON SUSPECTED BOULDER AT 4.27 m			
243			Notes:			
	5		1. Minor water infiltration into test pit from peat and silty clay interface and clay and till interface.			
242			2. Backfilled test pit to grade upon completion.			
	6					
241	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 11.9 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 250.05
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/13/2015
UTM (m) N 5,736,617
 E 561,603

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
250.0								20 40 60 80	PL MC LL %
249.9			PEAT - Black to dark brown, dry to damp, with rootlets, hemic.	S1					
			CLAYEY SILT AND SAND - Brown to tan, moist, soft, low plasticity, fine to medium grained sand, some coarse grained sand, trace fine grained gravel.	S2					
249.0	1		- Grain size distribution at 0.76 m: Gravel (9%), Sand (28%), Silt (47%), Clay (16%).						
248.2	5		- Some cobbles, some flat and angular to subrounded boulders up to 500 mm, some fine to medium grained sand below 1.07 m.						
248.0	2		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some cobbles, trace subrounded to subangular boulders.	S3					
247.0	10		- Grain size distribution at 2.59 m: Gravel (0%), Sand (28%), Silt (48%), Clay (24%).						
246.0	4								
245.8	15		END OF TEST PIT ON SUSPECTED BOULDER AT 4.58 m						
245.0	5		Notes: 1. Water infiltration into test pit. 2. Backfilled test pit to grade upon completion.						
244.0	20								

SAMPLE TYPE  Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA
 INSPECTOR

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 DRAFT

DATE
 7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 11.1 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.75
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/13/2015
UTM (m) N 5,735,860
 E 561,118

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
248.7			TOPSOIL/PEAT - Black to dark brown, moist (frozen), with rootlets, some roots (up to 50 mm). SILTY CLAY - Brown mottled with tan, moist, stiff, low to intermediate plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel. - Grain size distribution at 1.07 m: Gravel (8%), Sand (19%), Silt (35%), Clay (39%). - Increased silt content below 1.22 m.						
248	1								
247	5								
246.6	2		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders. - Density increasing with depth.						
246	3								
244.9	4		END OF TEST PIT ON DENSE SILT TILL AT 3.81 m						
244	15		Notes: 1. Water infiltration into test pit from silt till. 2. Backfilled test pit to grade upon completion.						
243	6								
242	20								

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 10.5 km From Camp to Reach 2/3
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.15
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,735,317
 E 560,746

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
248			PEAT - Dark brown, wet, with rootlets, some roots (up to 50 mm), hemic.						
247.7			SILTY CLAY TO CLAYEY SILT - Grey to tan, moist, low plasticity, soft to firm, with fine to coarse grained sand, trace cobbles.	S1					555
247	1		- Increased silt, fine to coarse grained sand and fine to coarse grained gravel below 0.915 m. - Grain size distribution at 1.07 m: Gravel (0%), Sand (21%), Silt (43%), Clay (36%).	S2					
246.3	5		SILT TILL - Tan, damp to moist, loose to compact, with fine to coarse grained sand, some cobbles, trace boulders.	S3					
246	2		- Grain size distribution at 1.83 m: Gravel (0%), Sand (31%), Silt (45%), Clay (24%). - Increasing density with depth.						
245	3	10							
244	4								
243.6	15		END OF TEST PIT ON DENSE SILT TILL AT 4.58 m						
243	5		Notes: 1. Backfilled test pit to grade upon completion.						
242	6	20							
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA				INSPECTOR		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 10.2 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.52
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,735,062
 E 560,594

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★		Cu TORVANE (kPa) ◆	
									20	40	60	80
248.4			TOPSOIL/PEAT - Black to dark brown, hemic.									
			SILTY CLAY TO CLAYEY SILT - Grey mottled with brown, moist, soft, intermediate plasticity, some fine to coarse grained sand, trace cobbles.									
248	1		- Grain size distribution at 0.76 m: Gravel (0%), Sand (19%), Silt (41%), Clay (40%).		S1							
			- Increased silt, fine to coarse grained sand below 1.22 m.									
247	5				S2							
246.7	2		SILT TILL - Tan, damp to moist, loose to compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders, trace clay.									
			- Decreasing clay content with depth.									
			- Increasing density with depth.									
246	3											
245	10											
244.9			END OF TEST PIT ON DENSE SILT TILL AT 3.66 m									
	4		Notes:									
			1. Backfilled test pit to grade upon completion.									
244	15											
	5											
243												
	6											
242	20											
SAMPLE TYPE Grab from Bucket												
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS				INSPECTOR S. REPA				APPROVED DRAFT		DATE 7/2/15		

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 9.5 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.62
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,734,429
 E 560,593

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
248.5			PEAT - Black, damp to moist, with rootlets, trace roots (up to 25 mm), hemic.	S1				240	
248	1		SILTY CLAY TO CLAYEY SILT - Grey to tan, moist firm, low plasticity, with fine to coarse grained sand.	S2					
			- Grain size distribution at 0.76 m: Gravel (0%), Sand (21%), Silt (49%), Clay (30%).						
	5		- Increased silt, fine to coarse grained sand, fine to coarse grained gravel below 1.22 m.						
247									
246.5	2		SILT TILL - Tan, damp to moist, loose to compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, some boulders, trace clay.						
246			- Decreasing clay with depth						
	3		- Increasing density with depth.						
245.1	10								
245			END OF TEST PIT ON SUSPECTED BOULDER AT 3.51 m						
	4		Notes:						
			1. Backfilled test pit to grade upon completion.						
244	15								
	5								
243									
	6								
242	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR		INSPECTOR		APPROVED		DATE			
TERRY LAVALLEE CONSTRUCTIONS		S. REPA		DRAFT		7/2/15			

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 8.9 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.53
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,733,800
E 560,599

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
248.1			PEAT - Black, saturated to wet, some rootlets, trace roots (up to 25 mm), hemic.	S1		
248	1		SILT CLAY - Grey, moist, soft, intermediate plasticity, some silt pockets (up to 50 mm), some fine to coarse grained sand. - Grain size distribution at 0.92 m: Gravel (0%), Sand (14%), Silt (31%), Clay (56%).	S2		
247	5		- Increased silt, fine to coarse grained sand, fine to coarse grained gravel below 1.53 m - Some cobbles below 1.53 m.			
246.4	2		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders. - Increasing density with depth.			
246						
245	3					
244.3	4			S3		
244	15		END OF TEST PIT ON DENSE SILT TILL AT 4.27 m			
243	5		Notes: 1. Minor water infiltration into test pit from silty clay. 2. Backfilled test pit to grade upon completion.			
242	6					

SAMPLE TYPE Grab from Bucket

CONTRACTOR INSPECTOR
TERRY LAVALLEE CONSTRUCTIONS. REPA

APPROVED
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DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 8.4 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 248.46
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,733,204
 E 560,622

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
248	1		PEAT - Black, wet, with rootlets, trace roots (up to 25 mm), hemic.	S1		
247.4	5		SILTY CLAY - Grey, moist, intermediate plasticity, soft, trace fine to medium grained sand, trace fine grained gravel, some silt pockets (up to 50 mm). - Grain size distribution at 1.37 m: Gravel (5%), Sand (10%), Silt (26%), Clay (59%). - Increased silt, fine to coarse grained sand, fine to coarse grained gravel below 1.53 m. - Some cobbles below 1.53 m.	S2		
246.3	2		SILT TILL - Tan, damp to moist, compact, some fine to coarse grained sand, trace fine to coarse grained gravel, some cobbles, trace boulders. - Grain size distribution at 2.90 m: Gravel (7%), Sand (23%), Silt (44%), Clay (27%). - Increased density with depth.	S3		
244.5	4		END OF TEST PIT ON SUSPECTED BOULDER AT 3.97 m			
244	15		Notes: 1. Water infiltration into test pit from peat clay interface. 2. Backfilled test pit to grade upon completion.			
243	5					
242	20					

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 8.1 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 250.23
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,732,606
 E 560,616

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
249.9			PEAT - Black, damp to moist, with rootlets, trace roots (up to 25 mm), hemic.	S1		
	1		CLAY SILT - Tan, moist, low plasticity, with fine to coarse grained sand, some fine to coarse grained gravel, friable. - Grain size distribution at 0.76 m: Gravel (9%), Sand (16%), Silt (50%), Clay (25%). - Increased silt, sand below 1.22 m. - Increasing density with depth.	S2		287
249	5					
248.4	2		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, trace fine to coarse grained gravel, some cobbles, trace boulders. - Increasing density with depth.			
248						
	3			S3		
247	10		- Grain size distribution at 3.20 m: Gravel (10%), Sand (22%), Silt (45%), Clay (23%).			
	4					
246.1			END OF TEST PIT ON DENSE SILT TILL AT 4.12 m			
246			Notes: 1. Backfilled test pit to grade upon completion.			
	15					
	5					
245						
	6					
244	20					

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 7.2 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 250.23
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/14/2015
UTM (m) N 5,731,872
 E 560,601

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL % 20 40 60 80
250.1			TOPSOIL/PEAT - Black, damp to moist, with rootlets, trace roots (up to 25 mm), hemic.						
250			SILTY SAND AND GRAVEL - Brown, moist to wet, loose, fine to coarse grained sand, fine to coarse grained gravel, trace cobbles. - Grain size distribution at 0.46 m: Gravel (33%), Sand (41%), Silt (18%), Clay (8%).	S1					
249.2	1		SILTY CLAY - Brown mottled with tan, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel, trace cobbles. - Grain size distribution at 1.37 m: Gravel (9%), Sand (12%), Silt (32%), Clay (47%). - Increased silt, fine to coarse grained sand, fine to coarse grained gravel below 1.53 m.	S2					
249	5								
248	2								
247.8			SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, trace boulders. - Increasing density with depth. - Some boulders (up to 750 mm) below 3.66 m.						
247	3								
246	4								
245	5								
244	6								
			END OF TEST PIT ON DENSE SILT TILL AT 4.27 m						
			Notes: 1. Minor water infiltration into test pit at bottom of pit. 2. Backfilled test pit to grade upon completion.						

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 6.2 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,731,039
E 561,064

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
						20 40 60	20 40 60 80		
			PEAT - Black, damp, with rootlets, some roots (up to 50 mm), hemic.	S1					136
			SILTY CLAY TO CLAYEY SILT - Brown to tan, damp to moist, friable, low plasticity, with fine to coarse grained sand, some fine to coarse grained gravel.						
	1		- Grain size distribution at 1.07 m: Gravel (11%), Sand (21%), Silt (40%), Clay (28%).						
	5		- Grain size distribution at 1.37 m: Gravel (10%), Sand (12%), Silt (28%), Clay (50%).	S2					
	2		- Some cobbles below 1.53 m.						
			SILT TILL - Tan, damp to moist, non plastic, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders.						
	3								
	10								
	4								
			END OF TEST PIT ON DENSE SILT TILL AT 4.12 m						
	15		Notes:						
	5		1. Backfilled test pit to grade upon completion.						
	6								
	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS.REPA				INSPECTOR		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 5.5 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,730,260
 E 561,341

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
			PEAT - Black, damp, with rootlets, some roots (up to 50 mm), hemic. SILTY CLAY - Brown, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel. - Increased fine to coarse grained sand, fine to coarse grained gravel with depth.			
	1					
	5			S1		
	2		SILT TILL - Tan, damp to moist, compact to dense, non plastic, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, some boulders (up to 750 mm). - Increasing density with depth.	S2		
	3		- Grain size distribution at 2.90 m: Gravel (18%), Sand (22%), Silt (38%), Clay (22%).	S3		
	4		END OF TEST PIT ON SUSPECTED BOULDER AT 3.81 m			
	15		Notes:			
	5		1. Backfilled test pit to grade upon completion.			
	6					
	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA
 INSPECTOR

APPROVED
 DRAFT

DATE
 7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 4.8 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,729,577
 E 561,382

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
			PEAT - Black, damp, with rootlets, some roots (up to 50 mm)	S1					
			SILTY CLAY TO CLAYEY SILT - Brown to tan, damp to moist, soft, low plasticity, with fine to coarse grained sand, friable.	S2					
	1		- Grain size distribution at 0.76 m: Gravel (0%), Sand (24%), Silt (48%), Clay (29%).						
	5		- Increased silt, fine to coarse grained sand below 1.53 m.						
			- Some cobbles below 1.53 m.						
	2		SILT TILL - Tan, damp to moist, compact, non plastic, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, some boulders (up to 1000 mm).						
			- Increasing density with depth.						
	3								
	10								
	4		END OF TEST PIT ON DENSE SILT TILL AT 3.81 m						
			Notes:						
			1. Backfilled test pit to grade upon completion.						
	15								
	5								
	6								
	20								

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 4.1 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,728,999
 E 561,423

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
								20 40 60 80	
			PEAT - Black, wet to saturated, with roots.						
	1		SILTY CLAY - Grey, moist, firm, low plasticity, trace fine to coarse grained sand, trace fine to coarse grained gravel.	S1					339
	5		- Grain size distribution at 0.92 m: Gravel (8%), Sand (41%), Silt (16%), Clay (35%).	S2					
	2		- Increased fine to coarse grained sand, fine to coarse grained gravel below 1.53 m.						
			- Trace cobbles below 1.53 m.	S3					
	3		SILT TILL - Tan, damp to moist, compact to dense, non plastic, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders.						
	4		END OF TEST PIT ON DENSE SILT TILL AT 4.12 m						
	15		Notes:						
	5		1. Minor water infiltration into test pit from peat and silty clay.						
			2. Minor sloughing from 0 to 1.53 m below grade.						
			3. Backfilled test pit to grade upon completion.						
	6								
	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS.REPA				INSPECTOR		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 3.4 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,728,339
E 561,389

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
						20 40 60	20 40 60 80		
			PEAT (hemic) - Black, moist, with rootlets, some roots (up to 50 mm).	S1					238
			SILTY CLAY - Brown, moist, firm, friable, low plasticity, with fine to coarse grained sand, some fine to coarse grained gravel.	S2					
	1		- Increased silt, sand below 0.92 m. - Trace cobbles below 0.92 m.						
	5		- Grain size distribution at 1.68 m: Gravel (15%), Sand (22%), Silt (38%), Clay (25%).	S3					
	2		SILT TILL - Tan, damp to moist, non plastic, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders.						
	3								
	10								
	4								
	15		END OF TEST PIT ON DENSE SILT TILL AT 4.12 m						
	5		Notes: 1. Backfilled test pit to grade upon completion.						
	6								
	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS				INSPECTOR S. REPA		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 3.0 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/15/2015
UTM (m) N 5,727,987
 E 561,012

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆	
						20 40 60 80	PL MC LL %
			PEAT (hemic) - Black, damp, with rootlets, some roots (up to 50 mm).				
			SILTY CLAY - Brown, moist, firm, intermediate plasticity, with fine to coarse grained sand, some fine grained gravel, friable. - Grain size distribution at 0.38 m: Gravel (14%), Sand (26%), Silt (22%), Clay (38%).	S1			
			CLAYEY SILT - Tan, damp to moist, low plasticity, firm, some fine to coarse grained sand, trace fine to coarse grained gravel. - Increased silt, sand, gravel content with depth.	S2			
			SILT TILL - Tan, damp to moist, compact to dense, non plastic, with fine to coarse grained sand, some fine to coarse grained gravel. - Density increasing with depth. - Grain size distribution at 1.68 m: Gravel (11%), Sand (30%), Silt (37%), Clay (22%).				
			END OF TEST PIT ON DENSE SILT TILL AT 3.97 m				
			Notes: 1. Backfilled test pit to grade upon completion.				

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

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DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 1.9 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/16/2015
UTM (m) N 5,727,274
 E 560,081

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL % 20 40 60 80
			PEAT (hemic) - Dark brown to black, wet with rootlets, some roots (up to 50 mm).						
	1			S1					558
	5		SAND - Grey, wet, loose, fine to coarse grained sand, with fine to coarse grained gravel, trace silt, trace clay. - Grain size distribution at 1.00 m: Gravel (23%), Sand (65%), Silt (6%), Clay (7%).	S2					
	2		SILTY CLAY - Brown mottled with tan, firm, low plasticity, some silt pockets (up to 50 mm), some fine to coarse grained sand, trace fine to coarse grained gravel. - Increased silt content with depth. - Grain size distribution at 1.68 m: Gravel (8%), Sand (19%), Silt (35%), Clay (38%). - Some boulders, trace boulders (up to 750 mm) below 1.83 m.	S3					
	3		SILT TILL - Tan, damp to moist, non plastic, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders (up to 750 mm).						
	10								
	4								
	15								
	5		END OF TEST PIT DUE TO CONTINUOUS SLOUGHING AT 4.58 m						
	6		Notes: 1. Water infiltration into test pit from 0 to 2.44 m below grade. 2. Backfilled test pit to grade upon completion.						
	20								
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS				INSPECTOR S. REPA		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 0.7 km From Camp
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV.
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/16/2015
UTM (m) N 5,726,478
E 559,077

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
	1		PEAT (fibrous) - wet to saturated, with rootlets, some roots (up to 50 mm). - Hemic, brown below 0.46 m.	S1		
	5		SILTY CLAY - Grey, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace fine grained gravel, some silt pockets, friable. - Grain size distribution at 1.68 m: Gravel (10%), Sand (15%), Silt (27%), Clay (49%).	S2		
	2		SILTY SAND - Grey, saturated, loose, fine to coarse grained sand, with fine to coarse grained gravel.			
	3		SILT TILL - Tan, damp to moist, compact, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel, trace cobbles, trace boulders. - Increasing density with depth.	S3		
	10		- Grain size distribution at 3.20 m: Gravel (12%), Sand (19%), Silt (44%), Clay (26%).			
	4		END OF TEST PIT ON DENSE SILT TILL AT 4.12 m			
	15		Notes: 1. Water infiltration into test pit. 2. 0.48 m of water ponded at bottom of test pit from above noted infiltration. 3. Continuous side wall sloughing between 0 to 2.44 m. 4. Backfilled test pit to grade upon completion.			
	5					
	6					
	20					

SAMPLE TYPE Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS
INSPECTOR S. REPA

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 10.8 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 247.36
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/16/2015
UTM (m) N 5,735,514
E 560,187

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
247.3			PEAT (hemic) - Black, damp, with rootlets, some roots (up to 50 mm).			
247			SILTY CLAY - Brown, moist, soft to firm, intermediate plasticity, some fine grained gravel, trace fine to coarse grained sand, some silt pockets (up to 50 mm), friable. - Increased fine to coarse grained sand, with depth.	S1		
246	1					
246	5		- Grain size distribution at 1.37 m: Gravel (15%), Sand (9%), Silt (21%), Clay (54%).	S2		
245.2	2					
245			SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders (up to 750 mm). - Increasing density with depth.			
244	3					
244	10					
243.2	4					
243			END OF TEST PIT ON DENSE SILT TILL AT 4.12 m			
243	15		Notes: 1. Backfilled test pit to grade upon completion.			
242	5					
242						
241	6					
241	20					

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA** APPROVED DRAFT DATE 7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 11.4 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 246.67
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,735,473
 E 59,690

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL % 20 40 60 80
246.6			ORGANIC CLAY - Black, moist to wet, with rootlets, trace roots (up to 25 mm).	S1					
246.4			SANDY CLAY - Brown, moist to wet, soft, fine to coarse grained sand, fine to coarse grained gravel.						
246			SILTY CLAY - Brown, moist, stiff, intermediate plasticity, some fine to coarse grained sand, some fine to coarse grained gravel, some silt pockets (up to 50 mm), trace silt lens (up to 200 mm), friable.						
1			- Grain size distribution at 1.07 m: Gravel (13%), Sand (14%), Silt (20%), Clay (52%).	S2					
245	5								
244.2	2								
244			CLAY TILL - Brown mottled with tan, damp to moist, stiff, low plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel, trace cobbles, trace boulders.						
243	3		- Increasing density with depth.						
	10		- Grain size distribution at 2.90 m: Gravel (9%), Sand (17%), Silt (36%), Clay (38%).	S3					
242.2	4								
242	15		END OF TEST PIT ON DENSE CLAY TILL AT 4.42 m						
241	5		Notes: 1. Backfilled test pit to grade upon completion.						
240	6								
	20								

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 12.2 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.73
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,736,541
E 558,985

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
245.1	1		<u>PEAT</u> - Black, wet, with roots.	S1		494
245			<u>SILTY CLAY</u> - Grey, moist, firm, high plasticity, some fine to coarse grained sand, trace fine grained gravel. - Grain size distribution at 0.76 m: Gravel (1%), Sand (13%), Silt (15%), Clay (71%).	S2		
244.7			<u>CLAYEY SILT</u> - Tan, moist to wet, non plastic to low plasticity, with fine to coarse grained sand, with fine to coarse grained gravel. - Increased silt below 1.53. - Some cobbles, trace boulders below 1.53 m.	S3		
244.5	5					
243.9	2		<u>SILT TILL</u> - Tan, moist, loose, wet, with fine to coarse grained sand, with fine to coarse grained gravel, with cobbles, some boulders.			
243	3					
242	10					
241.8	4		END OF TEST PIT DUE TO CONTINUOUS SIDEWALL SLOUGHING AT 3.97 m			
241	15		Notes: 1. Minor water infiltration into test pit from peat and silty clay interface. 2. 0.31 m of water ponded at bottom of test pit from above noted infiltration. 3. Backfilled test pit to grade upon completion.			
240	5					
239	6					
	20					

SAMPLE TYPE Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA INSPECTOR DATE 7/2/15
APPROVED DRAFT

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 12.9 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.80
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,737,051
 E 558,362

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
245.8			PEAT - Black, moist, with roots.						
			SILTY CLAY - Brown, moist, firm, high plasticity, trace fine to coarse grained sand, some fine to coarse grained gravel, some silt pockets (up to 50mm), trace silt lenses (up to 200 mm), friable.						
245	1		- Grain size distribution at 0.76 m: Gravel (11%), Sand (7%), Silt (23%), Clay (59%).	S1					
244.6	5		CLAYEY SILT - Tan, moist, some fine to coarse sand, some fine to coarse grained gravel, trace cobbles.						
244.0	2		SILT TILL - Tan, damp to moist, compact, low plasticity, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders.						
243	3		- Increasing density with depth. - Grain size distribution at 2.59 m: Gravel (17%), Sand (22%), Silt (38%), Clay (23%).	S2					
242.0	4		END OF TEST PIT ON SUSPECTED BOULDER AT 3.81 m						
241	5		Notes: 1. Backfilled test pit to grade upon completion.						
240	6								
239									

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 13.7 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.63
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,737,895
 E 557,922

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
245.2			PEAT - Black to dark brown, wet, with rootlets, trace traces (up to 50 mm).						
245	1		SILTY CLAY - Brown, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel, some silt pockets, trace silt lenses (up to 200 mm), friable. - Grain size distribution at 0.92 m: Gravel (3%), Sand (10%), Silt (23%), Clay (64%).	S1					
244	5								
243.6	2		SILT TILL - Tan, damp to moist, compact, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders. - Grain size distribution at 2.14 m: Gravel (20%), Sand (16%), Silt (40%), Clay (23%). - Density increasing with depth.	S2					
243	3								
242	10								
241.5	4								
241	15		END OF TEST PIT ON DENSE SILT TILL AT 4.12 m						
240	5		Notes: 1. Minor water infiltration into test pit from peat. 2. Backfilled test pit to grade upon completion.						
239	20								

SAMPLE TYPE  Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 15.1 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.85
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,738,780
 E 557,397

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ PL MC LL %
245.2	1		PEAT	S1		530
245	5		CLAYEY SILT - Tan, moist, firm, low plasticity, with fine to coarse grained sand, trace fine to coarse grained gravel. - Grain size distribution at 1.07 m: Gravel (10%), Sand (33%), Silt (35%), Clay (22%).	S2		
244.0 244	2		SILT TILL - Tan, damp to moist, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel. - Grain size distribution at 1.98 m: Gravel (13%), Sand (18%), Silt (43%), Clay (25%). - Increasing density with depth.	S3		
243	3					
242	4			S4		
241.7	4		END OF TEST PIT ON DENSE SILT TILL AT 4.12 m			
241	5		Notes: 1. Water infiltration into test pit from peat. 2. Minor sidewall sloughing. 3. Backfilled test pit to grade upon completion.			
240	6					
239						

SAMPLE TYPE Grab from Bucket

CONTRACTOR **TERRY LAVALLEE CONSTRUCTIONS** INSPECTOR **S. REPA**

APPROVED
DRAFT

DATE
7/2/15

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 16.1 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.72
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,739,893
E 556,584

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER RECOVERY %	SPT (N) blows/0.15 m ▲ DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★ Cu TORVANE (kPa) ◆ 20 40 60 80 PL MC LL % 20 40 60 80
245.4			PEAT - Hemic.	S1		488
245	1		SILTY CLAY - Brown, moist, intermediate plasticity, some fine to coarse grained sand, trace fine grained gravel, some silt pockets (up to 50 mm), friable. - Grain size distribution at 0.76 m: Gravel (5%), Sand (10%), Silt (21%), Clay (64%). - Increased silt, fine to coarse grained sand, fine to coarse grained gravel below 1.37 m. - Some cobbles below 1.37 m.	S2		
244	5					
243.7	2		SILT TILL - Tan, damp to moist, compact, some fine to coarse grained sand, some fine to coarse grained gravel, some cobbles, trace boulders. - Grain size distribution at 2.14 m: Gravel (12%), Sand (18%), Silt (42%), Clay (29%). - Increasing density with depth.	S3		
243	3					
242.9	4		END OF TEST PIT ON SUSPECTED BOULDER AT 3.81 m			
241	15		Notes: 1. Backfilled test pit to grade upon completion.			
240	5					
239	6					
	20					

SAMPLE TYPE Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA INSPECTOR DATE 7/2/15
APPROVED DRAFT

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 17.2 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.72
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,740,552
 E 555,624

ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL %
245.6			PEAT						
			CLAYEY SILT - Tan, moist, soft, some fine to coarse grained sand, with fine to coarse grained gravel, friable.						
245			- Grain size distribution at 0.76 m: Gravel (22%), Sand (13%), Silt (38%), Clay (27%).	S1					
244.7	1		SILT TILL - Tan, damp to moist, compact, with fine to coarse grained sand, some fine to coarse grained gravel, some cobbles.	S2					
			- Grain size distribution at 1.37 m: Gravel (20%), Sand (27%), Silt (33%), Clay (21%).						
	5		- Trace boulders below 1.53 m.						
244			- Increasing density with depth.						
	2								
243									
242.7	3		END OF TEST PIT ON DENSE SILT TILL AT 3.05 m						
	10		Notes:						
242			1. Backfilled test pit to grade upon completion.						
	4								
	15								
241									
	5								
240									
	6								
	20								
239									
SAMPLE TYPE Grab from Bucket									
CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS				INSPECTOR S. REPA		APPROVED DRAFT		DATE 7/2/15	

CLIENT MANITOBA INFRASTRUCTURE AND TRANSPORTATION
PROJECT ASSINIBOINE RIVER & LAKE MB FLOOD STUDY
SITE LAKE ST. MARTIN EMERGENCY CHANNELS
LOCATION 18.2 km From Camp to Reach 1
DRILLING METHOD HITACHI 270 EXCAVATOR

JOB NO. 12-0300-011
GROUND ELEV. 245.68
TOP OF PVC ELEV.
WATER ELEV.
DATE DRILLED 2/17/2015
UTM (m) N 5,740,917
E 554,705

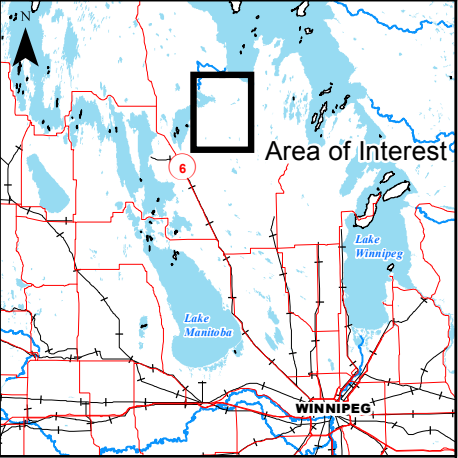
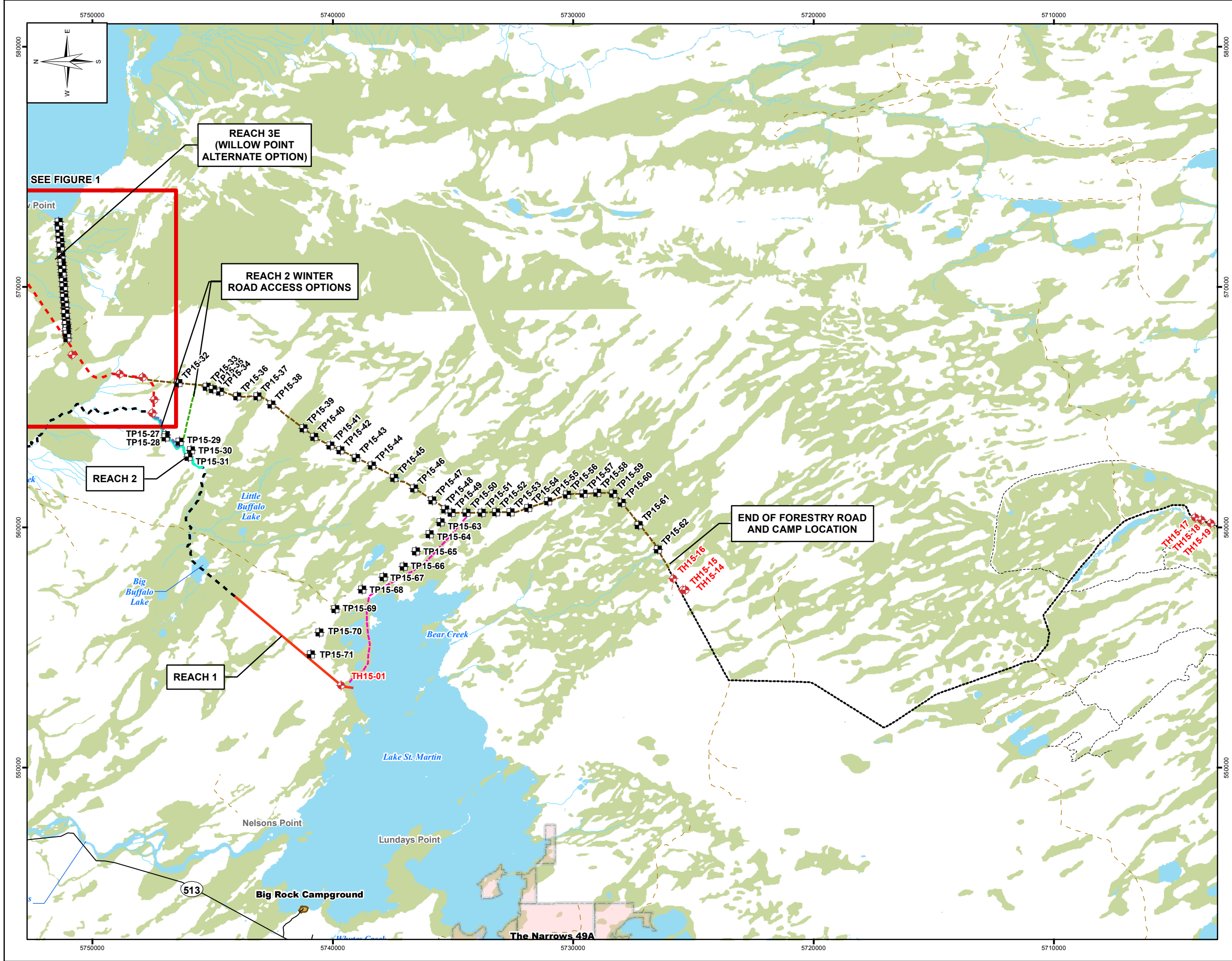
ELEVATION (m)	DEPTH (m) (ft)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE NUMBER	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★	Cu TORVANE (kPa) ◆
								20 40 60 80	PL MC LL % 20 40 60 80
245	1		SILTY CLAY - Brown, moist, firm, intermediate plasticity, some fine to coarse grained sand, trace fine grained gravel, some silt pockets (up to 50 mm), friable. - Grain size distribution at 0.76 m: Gravel (6%), Sand (13%), Silt (20%), Clay (61%).	S1					
244.6	5		CLAYEY SILT TO SILT TILL - Tan, moist, loose to compact, low plasticity, some fine to coarse grained sand, some fine to coarse grained gravel. - Grain size distribution at 1.37 m: Gravel (10%), Sand (18%), Silt (38%), Clay (34%).	S2					
244	2		CLAY TILL - Brown, moist, very stiff, low plasticity, some fine to coarse grained sand, trace fine to coarse grained gravel, silt till pockets (up to 50 mm), trace cobbles, trace boulders. - Grain size distribution at 2.29 m: Gravel (8%), Sand (10%), Silt (25%), Clay (57%).	S3					
243.8	10								
243									
242.2	15								
242			END OF TEST PIT ON SUSPECTED BOULDER AT 3.51 m						
241	20		Notes: 1. Backfilled test pit to grade upon completion.						
240									
239									

SAMPLE TYPE Grab from Bucket

CONTRACTOR TERRY LAVALLEE CONSTRUCTIONS. REPA INSPECTOR APPROVED DRAFT DATE 7/2/15

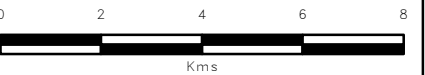
File Name: P:\Projects\2012\12-0300-011\Draw\GIS\MXDs\RevA\Willow_Pt_Testpit_Investigations_2015_Internal_Memo\12-0300-001-Fig02_RevA.mxd
11"x17" PLOT SCALE 1:1

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LEGEND:

- 2015 Investigations
- Test Pit
 - Test Hole
 - Forestry Road
 - Reach 3E - Johnson Beach Option
 - Reach 3E - Willow Point Alternate Option
 - 2012 Reach 3 Winter Road Access
 - 2012 Reach 1 Access Road
 - Reach 2 Winter Road Access Option A
 - Reach 2 Winter Road Access Option B
 - Reach 2 (Proposed)
 - Reach 1
 - Buffalo Creek Channel
 - Road
 - Limited Use Road
 - Trail
 - Campsite
 - Watercourse
 - First Nation
 - Wetlands
 - Waterbody



SCALE: 1:150,000 METRIC 11"x17"

All units are metric and in metres unless otherwise specified.
Transverse Mercator Projection, NAD 1983, Zone 14
Elevations are in metres above sea level (MSL)

X	15/02/24	ISSUED FOR INFORMATION	TNN
NO.	YY/MM/DD	DESCRIPTION	BY

REVISIONS / ISSUE



ASSINIBOINE RIVER AND LAKE
MANITOBA BASINS FLOOD MITIGATION
STUDY

2015 STAGE 2 INVESTIGATIONS