AGRA Earth & Environmental
ENGINEERING GLOBAL SOLUTIONS

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July 7, 1999
Project No. WX-04612

Canadian Tire Real Estate
c/o Nejmark Architect
2-54 Adelaide Street
Winnipeg, Manitoba
R3A 0V7

Attention: Mr. Tat-Liang Cheam

Dear Sir;

RE: GEOTECHNICAL INVESTIGATION
ABERDEEN AVENUE
CANADIAN TIRE STORE
BRANDON, MANITOBA

1.0 INTRODUCTION

At the authorization of Canadian Tire Real Estate, AGRA Earth & Environmental Limited (AEE) completed a geotechnical investigation for the proposed construction of Aberdeen Avenue in Brandon, Manitoba. The purpose of the investigation was to determine the subsurface conditions along the proposed roadway and provide geotechnical recommendations for design and construction of the road.

2.0 PROJECT DESCRIPTION

Based on plans provided to AEE, Aberdeen Avenue is to be upgraded to provide the primary truck entrance to the new Canadian Tire store currently being constructed. Given that it will be the primary truck route for the site, it is expected that the road will be subject to a high degree of heavy truck traffic. At present, the Aberdeen right-of-way consists of a moderately defined gravel and dirt road. In addition to the proposed road construction, a truck turnaround area is to be constructed east of the proposed loading dock.

Based on the plans, it appears that the road will generally follow the existing topography, which drops significantly from west to east. The new road surface will generally be about 0.5 m above the existing grades.

City of Brandon construction specifications indicate that the roadway is to have a minimum of 100 mm of asphaltic concrete, underlain by at least 300 mm of compacted granular base course.

3.0 FIELD AND LABORATORY INVESTIGATION

On June 8, 1999, AEE supervised the drilling of four test holes (TH1 to TH4) along the Aberdeen Avenue right-of -way and one test hole (TH5) in the proposed truck turnaround area. The test hole locations are shown on the attached site plan, Figure 1. The test holes were drilled using a track mounted drill rig supplied by Paddock Drilling Limited and equipped with 125 mm diameter solid stem continuous flight augers. Continuous logs of the subsurface soil and groundwater conditions, as encountered at the time of drilling, were recorded by AEE's Field Engineer and are shown on the test hole logs in Appendix A.

After completion of drilling, all test holes were visually examined for indications of sloughing and seepage conditions within the test holes, after which the test holes were backfilled to grade with auger cuttings and bentonite.

Disturbed soil samples were obtained from the auger cuttings at regular intervals in each of the five test holes and bagged for examination and testing in AEE's Winnipeg laboratory. The shear strength of all cohesive subsoils was estimated in the field using a pocket penetrometer. In the laboratory, all soil samples were tested for soil moisture content, to determine the consistency of the subsoils with depth and across the site area.

4.0 DESCRIPTION OF THE SOIL PROFILE

The general soil profile, as noted at the test hole locations, was as follows:

- Fill materials and/or organic soils
- Variable low plastic clays or silt
- Sand

A thin layer of gravel fill (about 100 mm or less) was noted at the ground surface at each of the four test holes along Aberdeen Avenue. At TH5, located in the truck turnaround, organic soils were noted at the ground surface. Clay fill was present below the surface materials at each test hole except TH2. The total fill thickness varied from 0.1 to 1.1 m.

Underlying the fill was a low to medium plastic silty clay of variable thickness. The clay was generally brown, soft to firm, sandy and moist to very moist. The shear strength of the clay typically reduced with depth. At TH2, clay was not encountered and a low plastic sandy silt was found. At TH3, a silty sand was present below the clay fill, with a low to medium plastic clay zone encountered from 1.1 to 1.4 m from grade.

A silty, fine grained sand was identified below the clay (and silt) at each of the test holes, extending to the depths explored. The silty sand was generally poorly graded, brown and loose to medium dense. Where the sand was shallower, it was initially moist, however, became wet with depth. The sand was generally saturated below about 1.5 m from grade.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 ABERDEEN AVENUE

Based on the plans provided to this office, it appears that the new roadway will generally follow the existing topography, although will be raised by up to 0.5 m above the existing ground surface. On this basis, the following recommendations are provided for road design and construction.

- Subgrade preparation along the road alignment should include complete removal of the surficial granular fill layer and any underlying organic soils (including organic fills). Excavation depths are likely to be in the order of 0.3 to 0.5 m. As well, any obviously poor quality fill materials identified at the subgrade elevation should be removed. Caution should be exercised to avoid over excavation, as the subsoils are expected to become weaker with depth.

- Once excavation of the surficial soils has been completed, the exposed subgrade should be proofrolled with heavy equipment to identify any soft or weak areas. Any such areas should be further sub-cut to at least 1 m below the final road surface. Any highly organic soils should be removed to their full depth.

- Backfill below the pavement section noted below should consist of a well graded granular subbase (maximum particle size of 75 mm), placed in 200 mm thick lifts and compacted to a minimum of 98% of standard Proctor maximum dry density.

- Where the subgrade is found to be weak, a woven geotextile should be utilized to improve the subgrade conditions.

- The pavement section should consist of 300 mm of granular base course, overlain by 100 mm of asphaltic concrete. The base course should have a maximum particle size of 19 mm and should be placed in 150 mm thick lifts and compacted to 100% of standard Proctor maximum dry density. Asphalt should be placed in maximum 60 mm lifts and compacted to 98% of Marshall density.

All materials used for road and pavement construction should meet City of Brandon specifications.

5.2 TRUCK TURNAROUND AREA

As identified during construction of the building foundations at the east end of the building, subgrade conditions in the proposed truck turnaround area are expected to be wet and weak. The general recommendations noted above for the roadway also apply to construction in this area, with the following modifications:

- Excavation within the entire area should proceed to a minimum of 0.75 m below finished pavement surface, ensuring that at least the upper 300 mm of existing fill or organic soils are removed. Further excavation of weak or organic soils should be completed, as required by the geotechnical engineer.
- A woven geotextile should be used for the entire area, regardless of subgrade conditions.
- The first layer of fill (granular subbase) should be at least 400 mm thick and compacted to 95% of standard Proctor density using non-vibratory equipment

6.0 CLOSURE

This report was prepared exclusively for Canadian Tire Real Estate and their Consultants for the proposed works described in the text. The purpose of this report was to provide a general summary of conditions in the various areas and detailed design recommendations are not included.

The findings and recommendations provided in this report were prepared in accordance with generally accepted professional engineering principles and practice. The findings and recommendations have been based on the results of field and laboratory investigations combined with an interpolation of soil and ground water conditions between test hole locations. If conditions encountered during construction are different from those noted above, this office should be contacted in order that the recommendations can be reviewed in light of the additional information.

Yours truly,
AGRA Earth & Environmental Limited

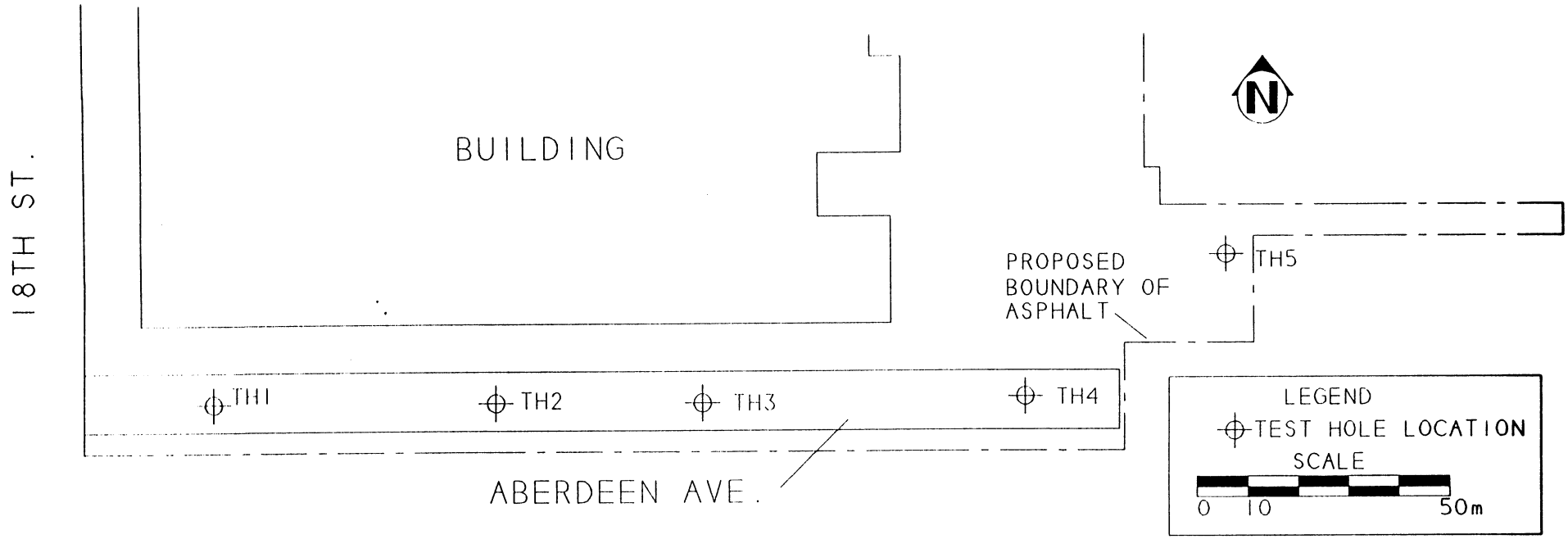
Reviewed by:

Harley Pankratz, P. Eng.

Joel Wortley, P. Eng.

Dist: (3) Canadian Tire; c/o Mr. Tat Liang Cheam, Nejmark Architect
(1) Man-Shield; Attn: Mr. Greg Fiorentino

WX-04612G



AGRA Earth & Environmental Limited		CANADIAN TIRE CORPORATION LTD.			TEST HOLE LOCATION PLAN PROPOSED ABERDEEN AVE. UPGRADE BRANDON, MANITOBA
Drawn: WTH	Scale: AS SHOWN	Date: JULY 99	Proj. No: WX-04612.3	Figure: 1	

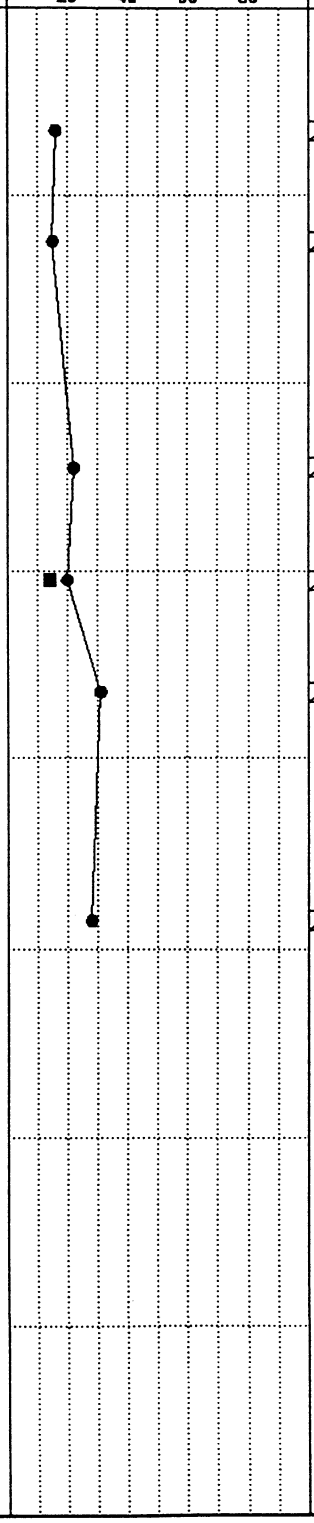
APPENDIX A

APPENDIX A

TEST HOLE LOGS

Proposed Road	Drill Co: Paddock Drilling Ltd.	TEST HOLE NO: 1
Canadian Tire Corporation Limited	Drill Rig: RM30 Track Mounted	PROJECT NO: WX-04612.3
Brandon, Manitoba	Drill: 125mm SSA	ELEVATION:

SAMPLE TYPE ■ SHELBY TUBE ⊘ CUTTINGS ⊠ SPT ☰ CORE ▯▯ NO RECOVERY ▮▯ CONT. SAMPLE



DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	COMMENTS	ELEVATION(m)
0.0			GP		GRAVEL (FILL)- poorly graded, fine to medium grained, damp to moist, medium dense to dense, brown.		0.0
			OL		CLAY (FILL)- low plastic, sandy, moist, black, organics, roots.		
		1			CLAY- low plastic, silty, moist, firm, black, trace organics, trace sand.		
		2	CL				
1.0					CLAY- low to medium plastic, moist, soft to firm, light brown. -silty from 0.8m to 1.5m.		-1.0
		3	CL-CI				
		4			CLAY -low plastic, very sandy, moist, firm, brown.		
		5	CL		-very moist, soft at 1.8m.		
2.0							-2.0
			SM		SAND- silty, poorly graded, fine grained, wet,loose to medium dense, brown, some clay.		
		6			End hole at 2.4m below grade. Sloughing and seepage to 2.1m below grade.		
3.0							-3.0
4.0							-4.0

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LOGGED BY: DB	COMPLETION DEPTH: 2.4 m
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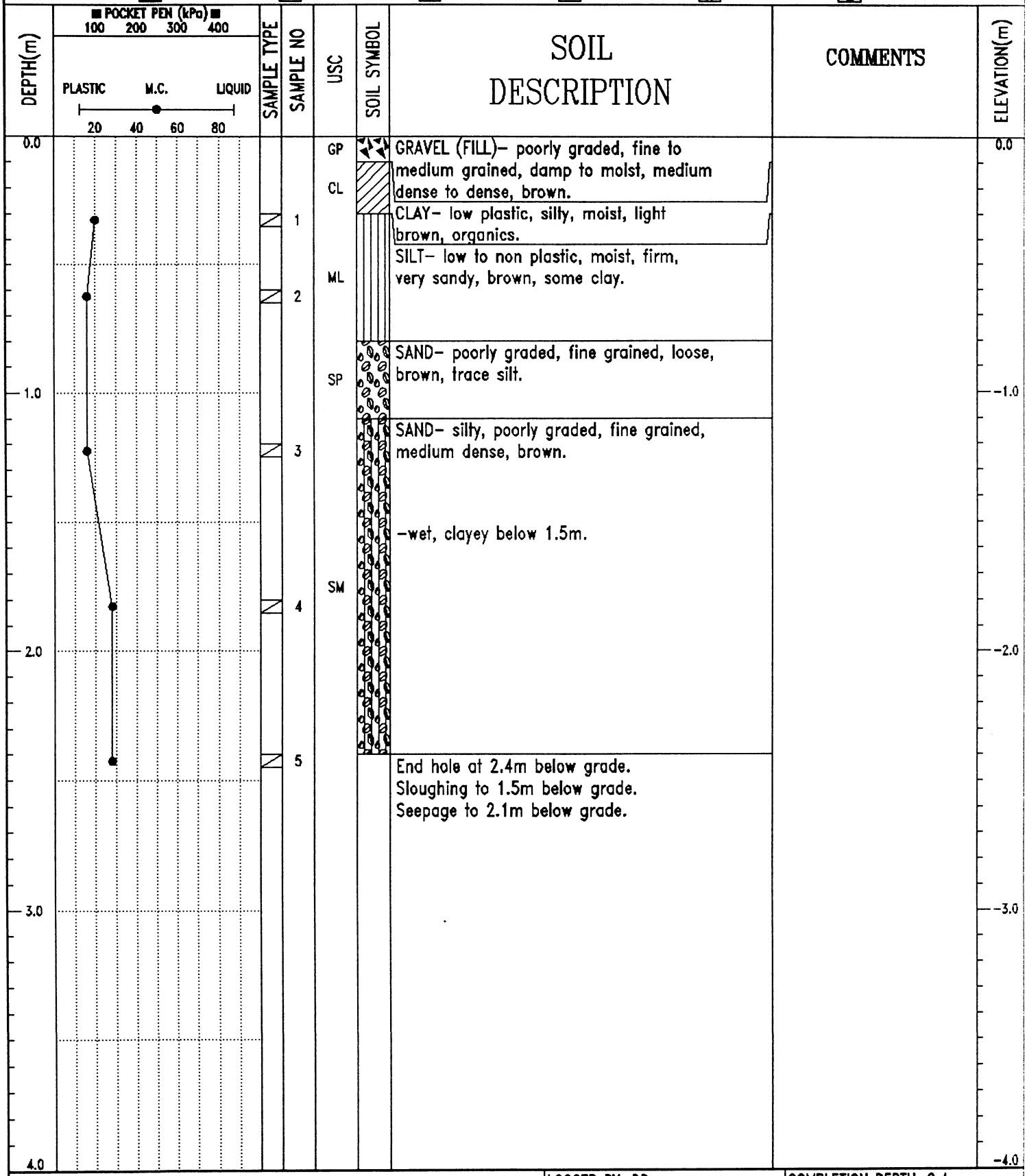
Proposed Road	Drill Co: Paddock Drilling Ltd.	TEST HOLE NO: 2
Canadian Tire Corporation Limited	Drill Rig: RM30 Track Mounted	PROJECT NO: WX-04612.3
Brandon, Manitoba	Drill: 125mm SSA	ELEVATION:

SAMPLE TYPE ■ SHELBY TUBE ⊘ CUTTINGS ⊠ SPT ▤ CORE ▥ NO RECOVERY ▮▯ CONT. SAMPLE



AGRA Earth & Environmental Limited Winnipeg, Manitoba	LOGGED BY: DB	COMPLETION DEPTH: 2.4 m
	REVIEWED BY: HP	COMPLETE: 99/06/08
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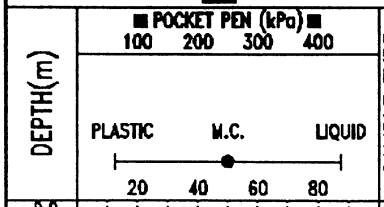
Proposed Road	Drill Co: Paddock Drilling Ltd.	TEST HOLE NO: 3
Canadian Tire Corporation Limited	Drill Rig: RM30 Track Mounted	PROJECT NO: WX-04612.3
Brandon, Manitoba	Drill: 125mm SSA	ELEVATION:

SAMPLE TYPE ■ SHELBY TUBE ⊘ CUTTINGS ⊠ SPT ▤ CORE ▥ NO RECOVERY ▮ CONT. SAMPLE



DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	COMMENTS	ELEVATION(m)
0.0			GP		GRAVEL (FILL)– poorly graded, fine to medium grained, damp to moist, medium dense to dense, brown.		0.0
		1	CL		CLAY (FILL)– low plastic, moist, firm, dark brown, organics, trace gravel and sand.		
		2	SM		SAND– very silty, poorly graded, fine grained, brown, trace clay. –clayey from 0.8m to 1.1m.		
1.0							–1.0
		3	CL-CI		CLAY– low to medium plastic, silty, moist, soft to firm, brown, sandy.		
		4	SM		SAND– silty, poorly graded, fine grained, loose to medium dense, moist, brown.		
2.0							–2.0
		5			End hole at 2.4m below grade. Sloughing to 2.1m below grade. No seepage.		
3.0							–3.0
4.0							–4.0

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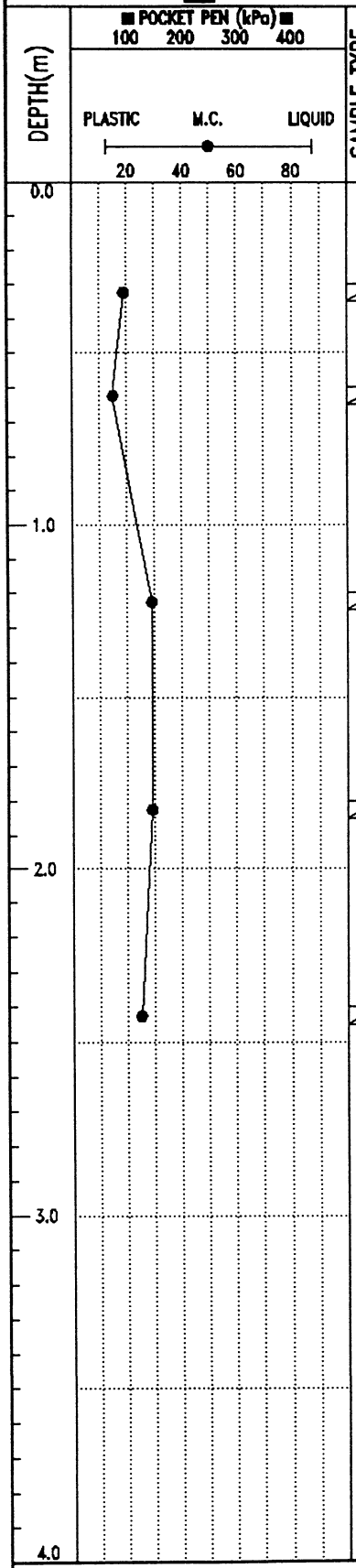
Proposed Road	Drill Co: Paddock Drilling Ltd.	TEST HOLE NO: 4
Canadian Tire Corporation Limited	Drill Rig: RM30 Track Mounted	PROJECT NO: WX-04612.3
Brandon, Manitoba	Drill: 125mm SSA	ELEVATION:

SAMPLE TYPE ■ SHELBY TUBE ⊘ CUTTINGS ⊠ SPT ▤ CORE ▥ NO RECOVERY ▮▮ CONT. SAMPLE



SOIL DESCRIPTION

GRAVEL (FILL)– poorly graded, fine to medium grained, damp to moist, medium dense to dense, brown.

CLAY (FILL)– low plastic, silty, moist, soft to firm, black, organics, some gravel, roots.

–sandy at 0.6m

CLAY– low plastic, silty, moist, soft, light brown, sandy.

SAND– silty, poorly graded, fine grained, medium dense, wet, brown.
–some clay from 1.5m to 2.0m.

End hole at 2.4m below grade.
Sloughing to 2.1m below grade.
Seepage to 1.5m below grade.

COMMENTS

ELEVATION(m): 0.0, –1.0, –2.0, –3.0, –4.0

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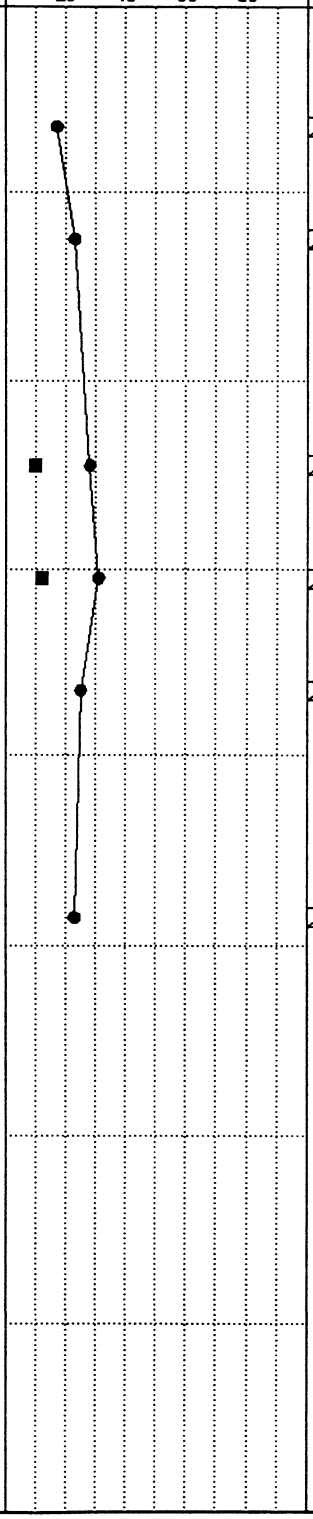
Proposed Road	Drill Co: Paddock Drilling Ltd.	TEST HOLE NO: 5
Canadian Tire Corporation Limited	Drill Rig: RM30 Track Mounted	PROJECT NO: WX-04612.3
Brandon, Manitoba	Drill: 125mm SSA	ELEVATION:

SAMPLE TYPE ■ SHELBY TUBE ⊘ CUTTINGS ⊠ SPT ▤ CORE ▥ NO RECOVERY ◧ CONT. SAMPLE



DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	COMMENTS	ELEVATION(m)
0.0			GP		TOPSOIL– loamy, moist, soft, black, prairie grass, roots.		0.0
		1			CLAY (FILL)– silty, low plastic, moist, firm, black, organics, some gravel.		
		2	CL				
1.0							-1.0
		3			CLAY– low to medium plastic, silty, moist, soft to firm, light brown, some sand.		
		4	CL-CI				
		5			–sandy, soft, wet below 1.8m.		
2.0							-2.0
			SP		SAND– poorly graded, fine to medium grained, wet, very loose to loose, reddish brown.		
		6			End hole at 2.4m below grade. Sloughing to 2.1m below grade. Seepage to 1.8m below grade.		
3.0							-3.0
4.0							-4.0

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