

**DATE:** March 4, 2013                                   **FILE:** 121-23863-00

**TO:**       **Mr. Lou Chubenko**  
THE CITY OF WINNIPEG  
Planning, Property and  
Development Department  
Mun. Accommodations Division  
185 King Street, 4<sup>th</sup> Floor  
Winnipeg, Manitoba R3B 1J1

**FROM:** **Silvestre S. Urbano Jr., P.Eng.**  
GENIVAR  
10 Prairie Way  
Winnipeg, Manitoba R2J 3J8  
Tel: (204) 477-6650

**FAX:** (204) 474-2864

**FAX:**

**PAGES:**

**RE:**       **Pavement Recommendations for Terry Sawchuk Arena Parking Lot Reconstruction Project in Winnipeg, MB.**

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#### **PAVEMENT RECOMMENDATIONS**

A pavement investigation was conducted to assess the general subsurface conditions for the existing Terry Sawchuk Arena parking lot. It was requested that pavement recommendations for the existing structure be provided. A total of nine testholes drilled between 4.6m and 6.1m depth revealed a general soil profile of a layer of fill (granular over clay fill) followed by either a fill composed mainly of GARBAGE (plastic bags, bottles, wood chips mixed with organic clay) or in-situ upper clay layer over a silt layer and followed by a thick lower clay layer, which extended to the depth explored. Detailed descriptions of the testhole logs as well as the site plan and laboratory test results are attached. *Seepage and caving conditions were observed during our investigation from the GARBAGE layer and SILT layer.*

The pavement recommendation for light duty traffic at the existing parking lot is discussed below. Based on the SPT test and approximate  $C_w$ , the approximate CBR of the CLAY FILL over CLAY layer subgrade and CLAY FILL over GARBAGE layer subgrade is 1.0 and 0.6, respectively. The pavement recommendation is based on two subgrade conditions as mentioned above. Visually, the two subgrade conditions could be differentiated by existing elevations; the CLAY FILL over GARBAGE layer has lower elevations (dips) than the CLAY FILL over in-situ CLAY.

In addition, the existing thickness of the granular fill and the asphalt was incorporated into the design; note that the average existing asphalt thickness is 50mm and the granular thickness ranged from 150mm to 850mm. Based on the Equivalent Single Axle Load (ESAL) of about 23,000 for light duty traffic, the recommended pavement construction for two subgrade conditions at this site should be as follows:



PAVEMENT STRUCTURE

	Light Duty Traffic (CLAY FILL over CLAY)	Light Duty Traffic (CLAY FILL over GARBAGE)	% Compaction
Asphaltic Concrete	75 mm	75 mm	98% Marshall
Base Course	150mm	150mm	100% Std Proctor
Subbase(Class "C")	250mm	375mm	100% Std Proctor

The intention is to leave the existing asphalt and granular fill and overlay the parking lot with additional granular fill (if less than the total of the required granular fill) and 75mm of ASPHALT.

*Due to the presence of the GARBAGE layer, underneath the pavement, long term settlement would be expected when these materials decayed. When needed, additional granular fill will be used to fill up the anticipated settlement. Thus, long term maintenance is expected at this site.*

The granular base course and subbase materials should include organic-free, non-frozen, aggregate conforming to the City of Winnipeg gradation limits (CW 3110). The subbase material is preferably 50mm crushed max. limestone aggregate.

Sieve analysis and compaction testing of the granular base and subbase materials should be conducted by qualified geotechnical personnel to ensure that the materials supplied and percent compactions are in accordance with design specifications. For the hot mix asphaltic concrete, gradation analysis of the aggregates (i.e. stone, fines and additive), compaction testing and sampling of at least one representative hot mix asphalt mixture (during construction) for laboratory Marshall testing should be undertaken. This would provide data to confirm that the asphaltic concrete pavement complies with the project specification. Hot mix asphaltic concrete should not be placed at ambient temperatures lower than +4°C. During placement, the temperature of the paving mix should be in the range of +120°C to +150°C and compaction should not take place at paving mix temperatures lower than +85°C.

The combined aggregate gradation limits and physical requirements of the asphaltic concrete should be in accordance with the City of Winnipeg specification.

**CONCRETE PAD**

For any concrete pad, sidewalk, curbs, the pavement structure should consist of 200mm reinforced concrete followed by 300mm of compacted (98% Standard Proctor Density) base course over the compacted subgrade. If a silt layer was encountered as subgrade, the application of woven geotextile over the silt layer is recommended. Exterior, grade supported concrete slabs will be subjected to some seasonal vertical movements related to frost. Exterior concrete slabs should not be tied into rigid structures.

To minimize the movements, consideration should be given to the use of rigid synthetic insulation, outward laterally (minimum 1.8m length and about 100mm thick) and beneath the structure. In addition, localized subsurface drainage should be provided around the structure.



### **LIGHT STANDARD**

Due to significant presence of GARBAGE and wet SILT layer, the light standard should be supported on cast-in place friction piles with temporary sleeve. *Seepage and sloughing conditions should be expected from the GARBAGE and SILT layers depths during the pile installation. Depth of temporary sleeve is entirely dependent on the foundation contractor.*

An allowable shaft adhesion values of 13.2 kPa (275 psf) applied to the pile circumference within the native clay was calculated. These numbers may be used for the pile design using a pile length of 7.6m (25 ft); pile length of 7.6m from grade should not be exceeded due to unknown conditions beyond the 7.6m depth. With Limit State Design (LSD), the bearing resistances at Ultimate Limit State (ULS) and Serviceability Limit State (SLS) are 32.9 kPa and 13.2 kPa, respectively. The Resistance Factor is 0.55.

### **CLOSURE**

The findings and recommendations provided in this report were prepared by GENIVAR (the Consultant) in accordance with generally accepted professional engineering principles and practices. The recommendations are based on the results of field and laboratory investigations and are reflective only of the actual testhole(s) and/or excavation(s) examined. If conditions encountered during construction appear to be different than those shown by the testhole(s) and/or excavation(s) at this site, the Consultant should be notified immediately in order that the recommendations can be reviewed and modified as necessary to address actual site conditions.

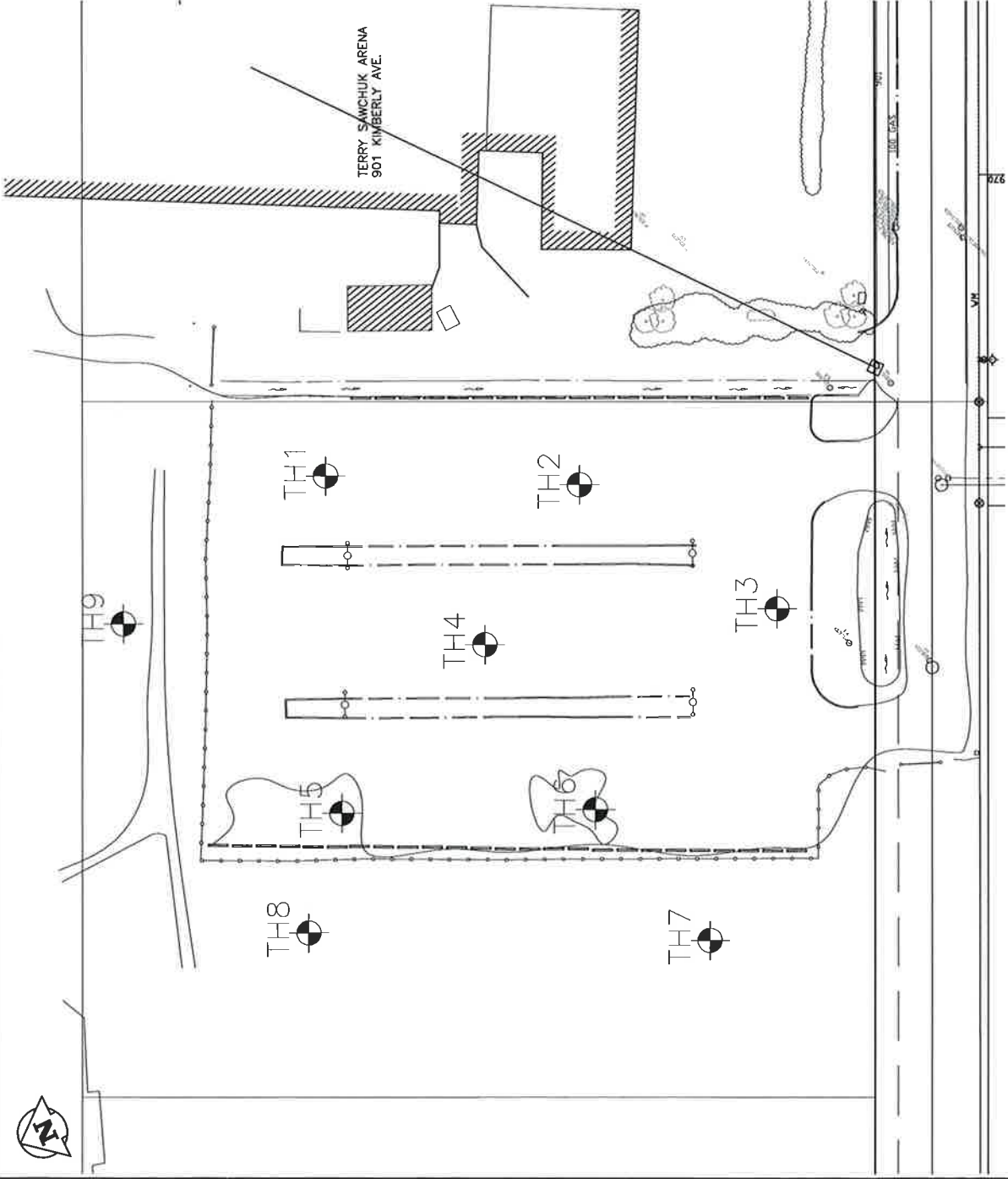
This report is limited in scope to only those items that are specifically referenced in this report. There may be existing conditions that were not recorded in this report. Such conditions were not apparent to the Consultant due to the limitations imposed by the scope of work. The Consultant, therefore, accepts no liability for any costs incurred by the Client for subsequent discovery, manifestation or rectification of such conditions.

This report is intended solely for the Client named as a general indication of the visible or reported physical condition of the items addressed in the report at the time of the geotechnical investigation. The material in this report reflects the Consultant's best judgment in light of the information available to it at the time of preparation.

This report and the information and data contained herein are to be treated as confidential and may be used only by the Client and its officers and employees in relation to the specific project that it was prepared for. Any use a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The report has been written to be read in its entirety, do not use any part of this report as a separate entity.

All files, notes, source data, test results and master files are retained by the Consultant and remain the property of the Consultant.



TERRY SAWCHUK ARENA  
901 KIMBERLY AVE.

**PRELIMINARY**  
NOT FOR CONSTRUCTION

**METRIC**  
WHOLE NUMBERS INDICATE MILLIMETRES  
DECIMALS INDICATE METRES

NO.	DESCRIPTION	DATE	BY	REVISION	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
1	WATERMAIN	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
2	SEWER	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
3	LAND DRAINAGE STREETS	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
4	WASTE WATER SEWER	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
5	MANHOLE	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
6	CHASIS INLET	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
7	SOON	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
8	LAMP STANDARDS	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
9	UTILITY POLE	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
10	GAS	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
11	PROVIDENTIAL	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
12	GROUND ELEVATION	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
13	PAVEMENT ELEVATION	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
14	CONCRETE	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
15	SUNWAY BAR	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
16	CURB STOP	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
17	TRIPPOLE	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
18	LEGEND - PLAN	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING
19	LEGEND - PROFILE	151-2011-001	GENIVAR	NEW	LEGEND - PLAN	LEGEND - PROFILE	NEW	DISTING	NEW	DISTING

**GENIVAR**  
INCORPORATED  
151-2011-001

DATE: 151-2011-001  
BY: GENIVAR  
CHECKED BY: GENIVAR  
APPROVED BY: GENIVAR  
DATE: 151-2011-001

ORIGINAL DRAWING  
R. CABOTING  
AND DATED  
05-JUL-11  
CONTRACT NUMBER NO.  
121-23869-001

LOCATION APPROVED  
UNDERGROUND STRUCTURES

DATE: 151-2011-001

THE CITY OF WINNIPEG  
PLANNING, PROPERTY & DEVELOPMENT

TERRY SAWCHUK ARENA  
PARKING LOT RECONSTRUCTION PROJECT  
SITE SURVEY

CITY DRAWING NO.  
151-2011-001  
SHEET 1 OF 6  
REV.

DATE: 151-2011-001  
BY: GENIVAR  
CHECKED BY: GENIVAR  
APPROVED BY: GENIVAR  
DATE: 151-2011-001



Project No: 121-23863-00

**TH1**

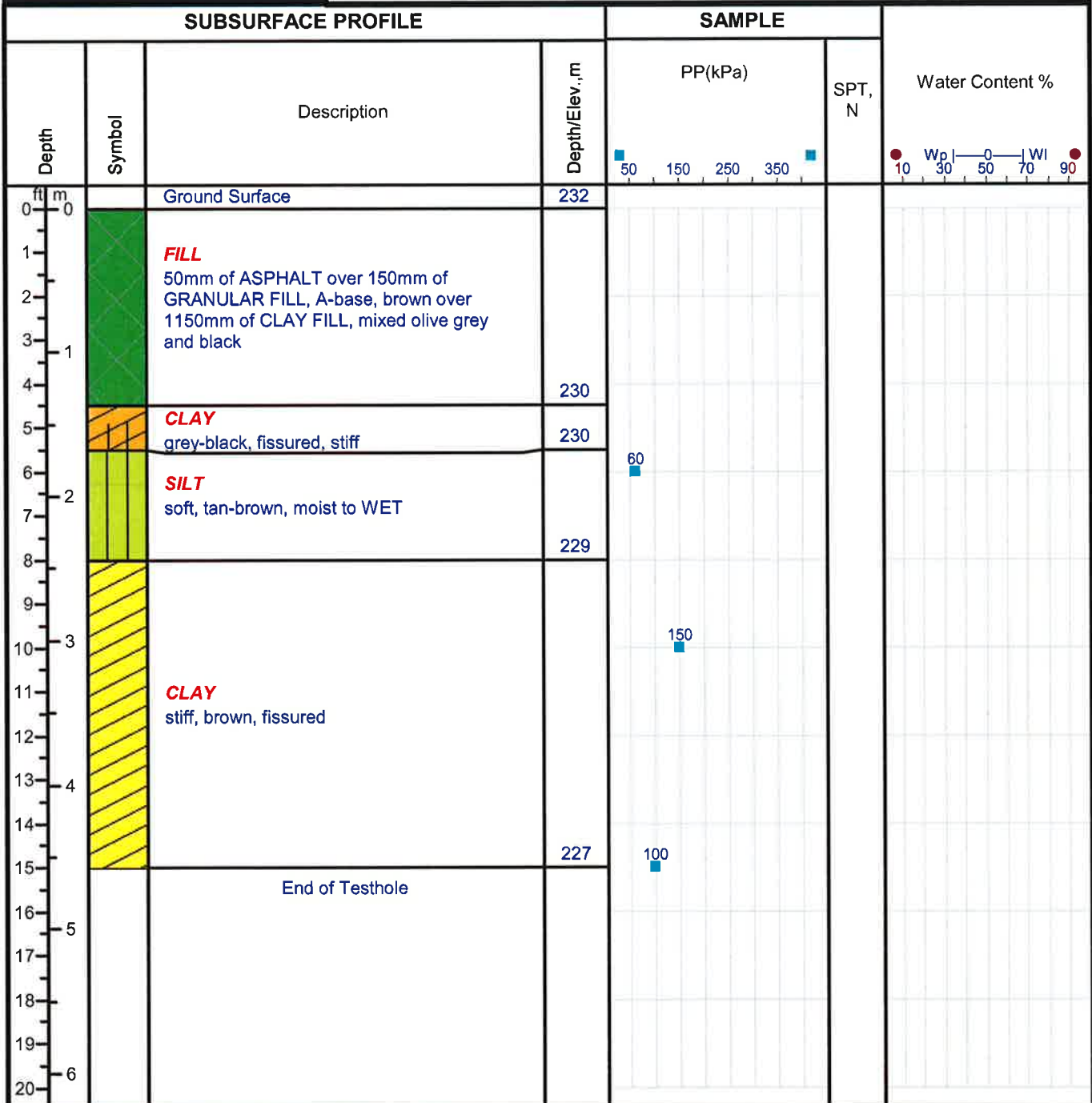
Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU



Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.8M

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH2**

Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU

SUBSURFACE PROFILE			SAMPLE		Water Content %
Depth	Symbol	Description	Depth/Elev., m	PP(kPa)	
0		Ground Surface	231		
1		<b>FILL</b> 50mm of ASPHALT over 850mm of GRANULAR FILL, A-base, brown over 300mm of CLAY FILL, mixed grey and black			
2					
3					
4		<b>GARBAGE FILL</b> garbage consisting of wood chips, plastic bags: WET at 2.7m			
5					
6					
7					
8					
9					
10					
11					
12			228	100	
13		<b>CLAY</b> stiff, brown, fissured. WATER AND SLOUGHING CONDITIONS WERE MEASURED AT 2.7M DEPTH AFTER COMPLETION OF DRILLING.			
14					
15				100	
16					
17					
18					
19					
20			225	100	
21		End of Testhole			
22					
23					
24					
25					
26					
27					
28					
29					
30					

Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.4m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH3**

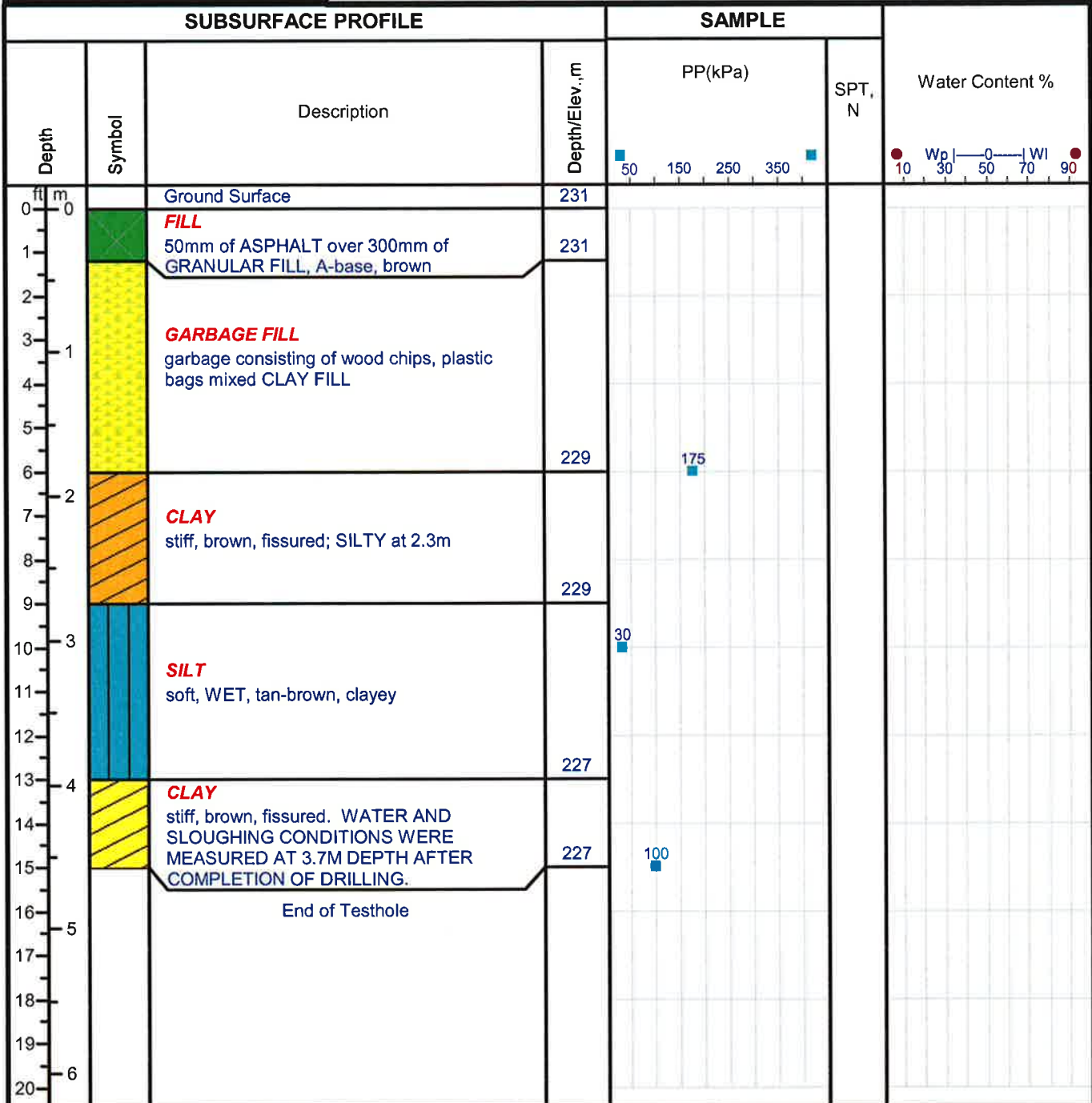
Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU



Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.3m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH4**

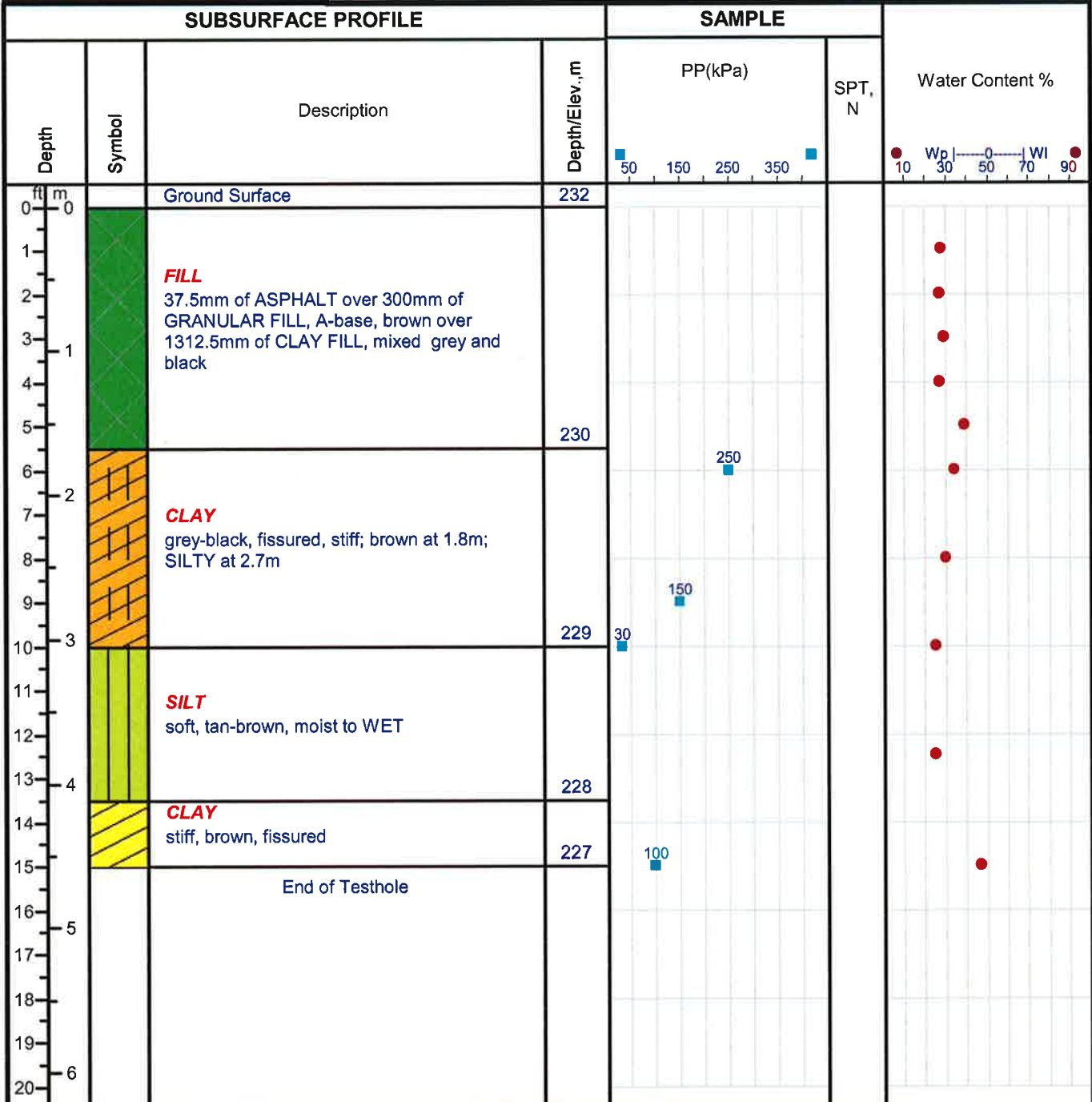
Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU



Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.9M

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1





Project No: 121-23863-00

**TH5**

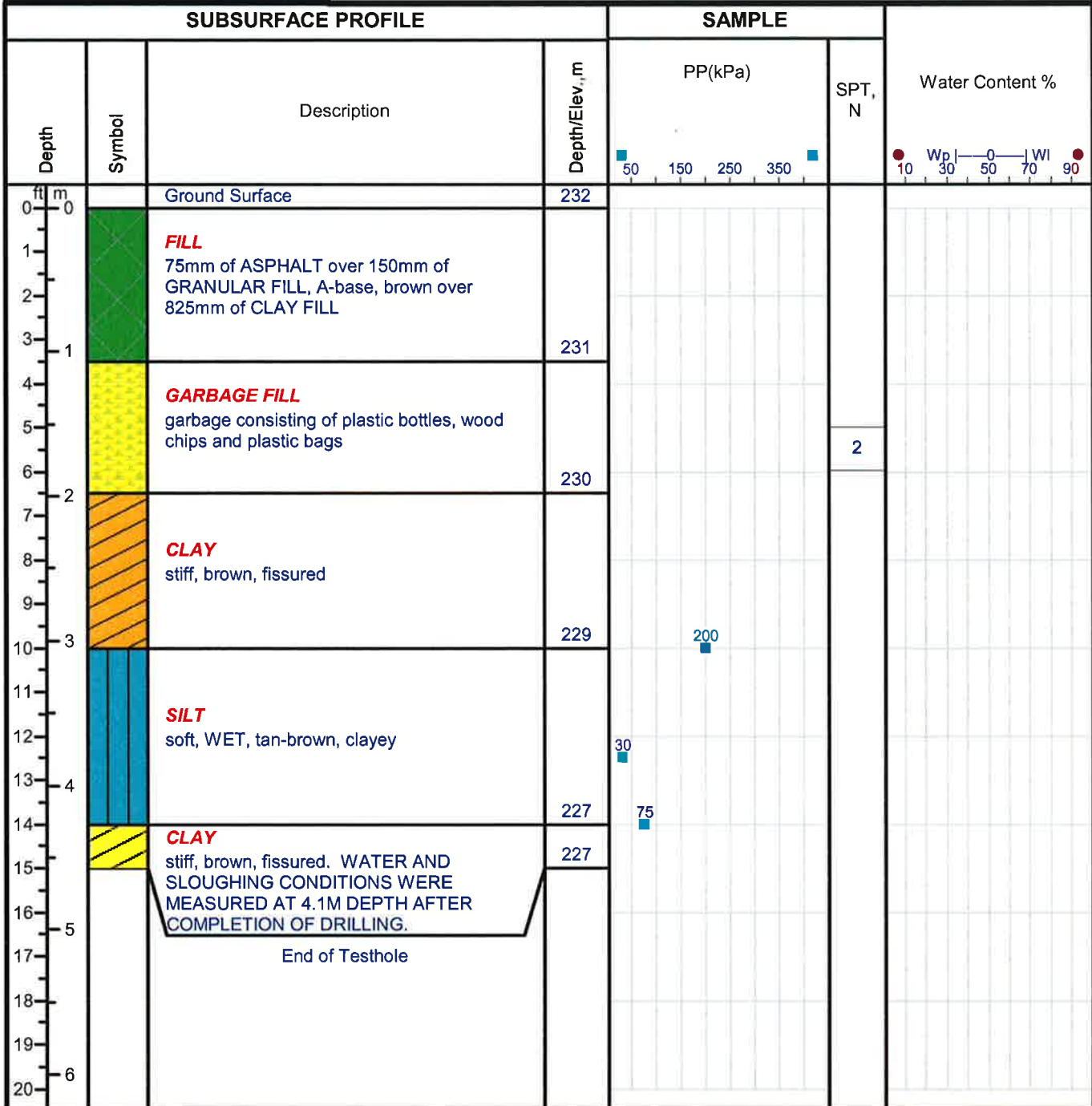
Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU



Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.7m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH6**

Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU

SUBSURFACE PROFILE				SAMPLE		Water Content %
Depth	Symbol	Description	Depth/Elev.,m	PP(kPa)	SPT, N	
0		Ground Surface	231			
0 to 1		<b>FILL</b> 50mm of ASPHALT over 300mm of GRANULAR FILL, A-base, brown over 850mm of CLAY FILL, mixed grey and black	230			
1 to 4		<b>GARBAGE FILL</b> garbage consisting of plastic bags mixed with CLAY, traces of organics; WET at 3m	227			
4 to 15		<b>CLAY</b> stiff, brown, fissured. WATER AND SLOUGHING CONDITIONS WERE MEASURED AT 4M DEPTH AFTER COMPLETION OF DRILLING.	227	100		
15 to 20		End of Testhole				

Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.4m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH7**

Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU

SUBSURFACE PROFILE				SAMPLE		Water Content %
Depth	Symbol	Description	Depth/Elev. m	PP(kPa)	SPT, N	
0		Ground Surface	232			
1		<b>FILL</b> 100mm of SODDED TOPSOIL FILL over 1850mm of CLAY FILL, mixed grey and black				
2		<b>CLAY</b> stiff, brown, fissured	230			
3		<b>SILT</b> soft, tan-brown, moist to wet	229	150		
4		<b>CLAY</b> stiff, brown, fissured. TESTHOLE WAS OPEN ALL THE WAY AFTER COMPLETION OF DRILLING.	229	25		
5			227	150		
6		End of Testhole				

Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 231.6m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



**GENIVAR**

Project No: 121-23863-00

**TH8**

Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU

SUBSURFACE PROFILE			SAMPLE		Water Content %
Depth	Symbol	Description	Depth/Elev.,m	PP(kPa)	
0		Ground Surface	232		
0 to 1		<b>FILL</b> 150mm of SODDED TOPSOIL FILL over 1050mm of CLAY FILL, mixed grey and black	231		
1 to 4		<b>GARBAGE FILL</b> garbage consisting of plastic bags mixed with CLAY	230		
4 to 6		<b>CLAY FILL</b> mixed, grey and black	230	25	
6 to 13		<b>SILT</b> soft, tan-brown, moist to wet; STRATIFIED with firm, brown CLAY at 2.6m.	228		
13 to 15		<b>CLAY</b> stiff, brown, fissured. SLOUGHING CONDITIONS WAS MEASURED AT 3M DEPTH AFTER COMPLETION OF DRILLING.	227	100	
15 to 20		End of Testhole			

Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 232.0m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1



Project No: 121-23863-00

**TH9**

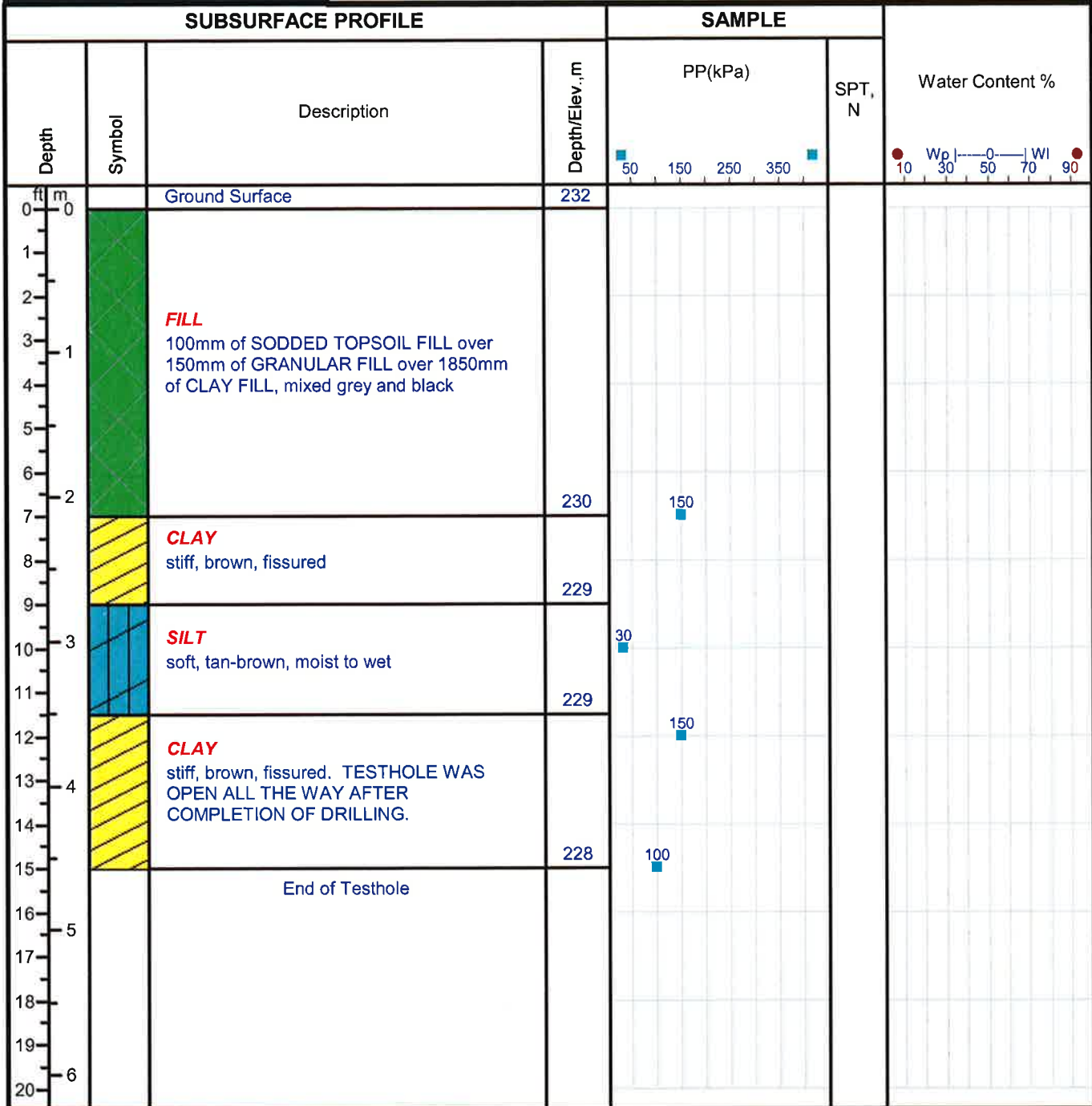
Project: Terry Sawchuk Arena Parking Lot

Client: City of Winnipeg, Property & Dev't

Enclosure:

Location: 901 Kimberly Avenue

Engineer: SSU



Drill Method: S/S Auger of Maple Leaf Enterprises

**GENIVAR**  
10 Prairie Way  
Winnipeg, MB.  
R2J 3J8

Elevation: 232.1m

Drill Date: 10/15/12

Checked by: SSU

Hole Size: 125mm

Sheet: 1 of 1

**LABORATORY DETERMINATION OF WATER (MOISTURE) CONTROL  
OF SOIL AND ROCK BY MASS - ASTM D 2216**

CLIENT: GENIVAR		TEST NO: 4		PROJECT NO: n/a	
PROJECT: Terry Sawchuk Parking		DATE SAMPLED: n/a		SAMPLED BY: client	
ATTN: Silvestre Urbano Jr., P. Eng.		DATE TESTED: 05-Nov-12		TESTED BY: ES	
Depth	1'	2'	3'	4'	5'
Tare No.	1	2	3	4	9
Wt Wet Sample + Tare	10.4	11.5	11	11.5	11.6
Wt Dry Sample + Tare	8.4	9.3	8.8	9.3	8.7
Wt Water	2.0	2.2	2.2	2.2	2.9
Wt Tare	1.3	1.3	1.3	1.3	1.3
Wt Dry Sample	7.1	8.0	7.5	8.0	7.4
<b>Moisture Content (%)</b>	<b>28.17</b>	<b>27.50</b>	<b>29.33</b>	<b>27.50</b>	<b>39.19</b>
Hole No. TH 4	6	7	8	9	10
Depth	6'	8'	10'	12.5'	15'
Tare No.	10	5	6	7	8
Wt Wet Sample + Tare	11.1	12.1	11.2	12.7	12
Wt Dry Sample + Tare	8.6	9.6	9.2	10.4	8.6
Wt Water	2.5	2.5	2	2.3	3.4
Wt Tare	1.3	1.3	1.3	1.3	1.3
Wt Dry Sample	7.3	8.3	7.9	9.1	7.3
<b>Moisture Content (%)</b>	<b>34.25</b>	<b>30.12</b>	<b>25.32</b>	<b>25.27</b>	<b>46.58</b>



Reviewed by: Hermie Manalo

## PARTICLE SIZE ANALYSIS TEST REPORT

CLIENT: GENIVAR  
10 Prairie Way, The Waters Business Park  
SW Corner of Mazenod and Dugald Road  
Winnipeg, MB R2J 3J8

PROJECT NO. HMCL 12-53

ATTN: Silvestre Urbano, P. Eng.

PROJECT: Terry Sawchuk Parking

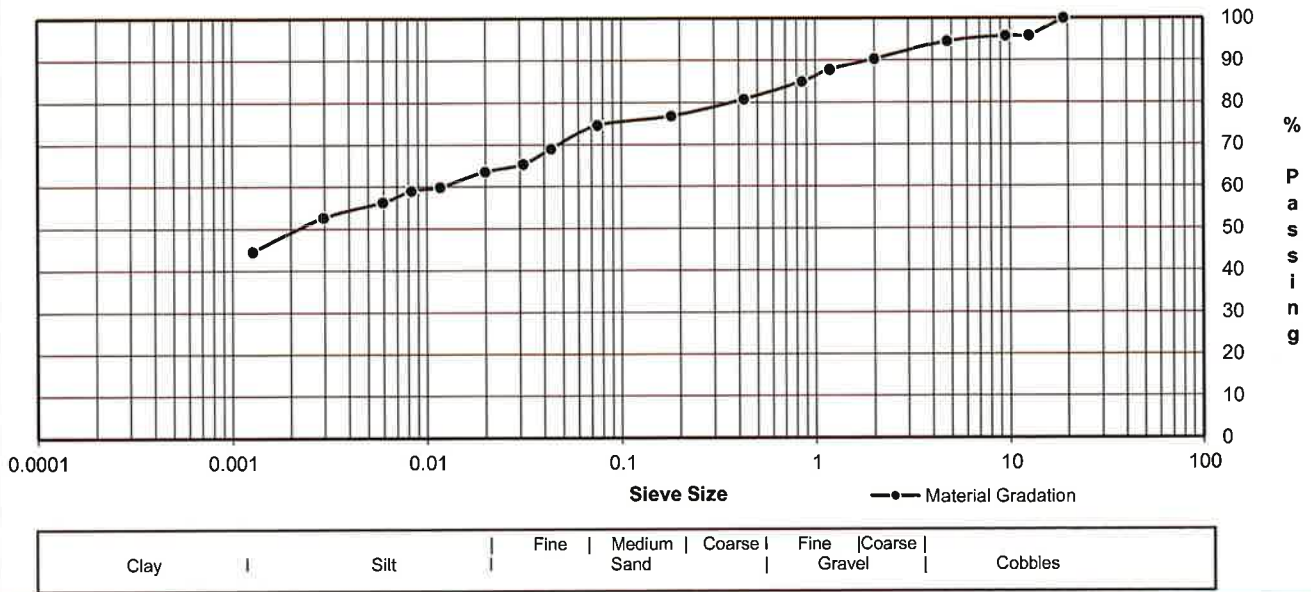
Date Sampled: Nov.1/12      Date Received: Nov. 2/12  
Sampled By: Client      Date Tested: Nov.2/12

Sieve Analysis		Hydrometer Analysis	
Sieve	% Passing	Diameter	% Finer
9.50 mm	95.8	0.0433	69.0
4.75 mm	94.5	0.0312	65.4
2.00 mm	90.3	0.0199	63.6
1.180 mm	87.7	0.0117	60.0
0.850 mm	85.0	0.0083	59.0
0.425mm	80.8	0.0059	56.3
0.180 mm	76.8	0.0029	52.7
0.075 mm	74.6	0.0013	44.5

**Material Identification**

B.H./T.H. No.                      n/a  
Sample No.                         TH4 @ 3 ft  
Sample Source                      n/a  
Specific Gravity of Material:      2.65

**Grain Size Analysis**



SOIL DESCRIPTION	% Composition		D10	0.01000
		5	Gravel	
	20	Sand	D60	
	20	Silt	Cu	
	55	Clay	Cc	

Remarks: Test Method: ASTM D422, D2216, D4318  
Technician: ECS

REVIEWED BY: Hermie Manalo

**PARTICLE SIZE ANALYSIS TEST REPORT**

CLIENT: GENIVAR  
10 Prairie Way, The Waters Business Park  
SW Corner of Mazenod and Dugald Road  
Winnipeg, MB R2J 3J8

PROJECT NO. HMCL 12-53

ATTN: Silvestre Urbano, P. Eng.

PROJECT: Terry Sawchuk Parking

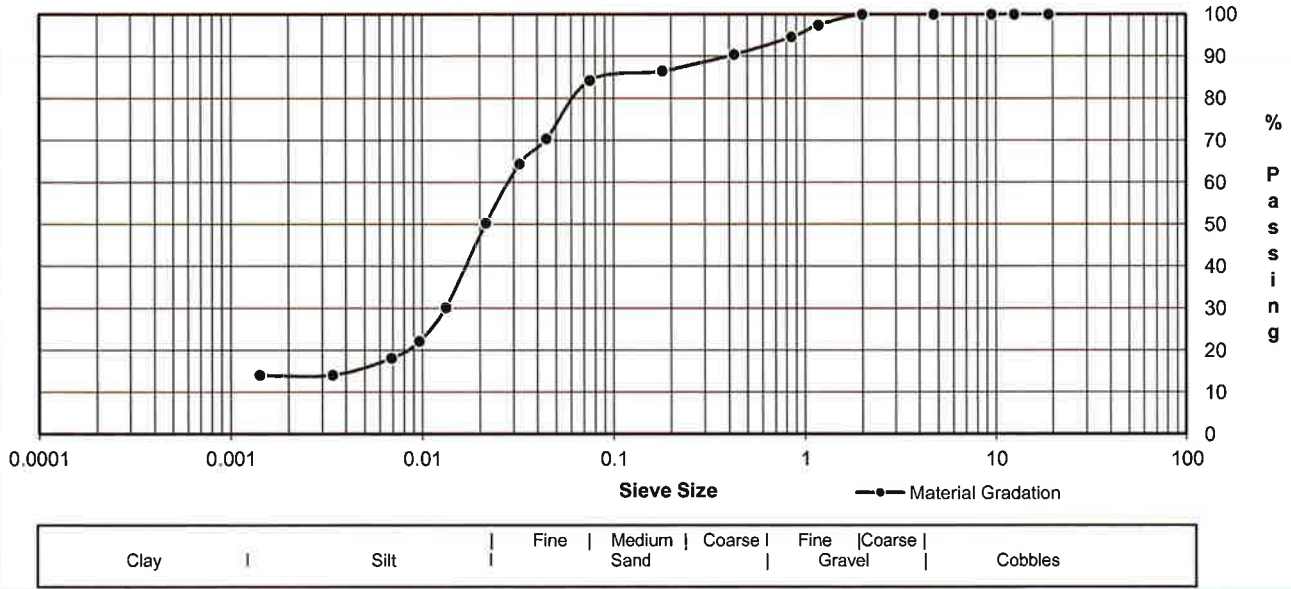
Date Sampled: Nov.1/12 Date Received: Nov. 2/12  
Sampled By: Client Date Tested: Nov.2/12

**Material Identification**

B.H./T.H. No. n/a  
Sample No. TH4 @ 12.5 ft  
Sample Source n/a  
Specific Gravity of Material: 2.65

Sieve Analysis		Hydrometer Analysis	
Sieve	% Passing	Diameter	% Finer
4.75 mm	100.0	0.0322	64.4
2.00 mm	100.0	0.0215	50.3
1.180 mm	97.4	0.0133	30.2
0.850 mm	94.6	0.0096	22.1
0.425mm	90.5	0.0069	18.1
0.180 mm	86.5	0.0034	14.1
0.075 mm	84.3	0.0014	14.1

**Grain Size Analysis**



SOIL DESCRIPTION	% Composition		D10	
	Poorly graded gravelly sand	16	Gravel	D30
69		Sand	D60	0.02750
		Silt	Cu	
15		Clay	Cc	

Remarks: Test Method: ASTM D422, D2216, D4318  
Technician: ECS

REVIEWED BY: Hermie Manalo