

# **APPENDIX 'A'**

# **GEOTECHNICAL REPORTS**



March 8, 2019

File No. 19-0535-002

3rd Floor  
865 Waverley Street  
Winnipeg,  
Manitoba  
R3T 5P4  
204.896.1209  
fax: 204.896.0754  
www.ksgroup.com

KGS Group  
865 Waverley Street  
Winnipeg, Manitoba  
R3T 5P4

ATTENTION: Mr. Craig Rowbotham, P.Eng.  
Senior Project Engineer

RE: 2019 City of Winnipeg Alleys Package  
Clifton, Garfield, Ingersoll, Victor and Sherbrook Alleys  
Geotechnical Investigation – Final

---

Dear Mr. Rowbotham:

This letter summarizes KGS Group's geotechnical investigation for Clifton, Garfield, Ingersoll, Victor and Sherbrook Alleys that was required as part of the City of Winnipeg Alleys Package in Winnipeg, Manitoba.

## 1.0 INTRODUCTION

KGS Group completed a geotechnical investigation consisting of 36 test holes for the design of the alley pavement structures. The 2019 City of Winnipeg Alleys Package includes the following alleys:

- 332 m section of Clifton Alley located west of Clifton Street, east of Telfer Street South, extending north from Wolseley Avenue to Portage Avenue;
- 372 m section of Garfield Alley located west of Garfield Street North, east of Dominion Street, extending north from Wolever Avenue to St. Matthews Avenue;
- 379 m section of Ingersoll Alley located west of Ingersoll Street, east of Sherburn Street, extending north from Ellice Avenue to Sargent Avenue;
- 350 m section of Victor Alley located west of Victor Street, east of Toronto Street, extending north from St. Matthews Avenue to Ellice Avenue; and
- 522 m section of Sherbrook Alley located east of Sherbrook Street, west of Furby Street, extending north from Portage Avenue to Ellice Avenue.

This report details the results of the geotechnical investigation completed by KGS Group in January and February 2019.

## 2.0 GEOTECHNICAL INVESTIGATION SERVICES

The scope of this assignment included the following:

- **Utility Clearances** – Prior to undertaking any drilling activities KGS Group obtained necessary underground utility clearances. Hydrovac excavation was required to expose underground utilities owned by Manitoba Hydro to facilitate drilling on Sherbrook Avenue. No other alley required hydrovac excavation as the distance between the test hole locations and any identified underground utilities had sufficient clearance.
- **Traffic Protection** – KGS Group arranged for traffic protection throughout the geotechnical investigation in accordance with City of Winnipeg Manual for Temporary Traffic Control requirements.
- **Geotechnical Investigation** – A geotechnical investigation was completed to investigate the subsurface conditions below the pavement surface in accordance with City of Winnipeg geotechnical requirements for public works projects. The breakdown of the requested number of test holes by alley is outlined in the table below. All the test holes were completed to a total depth of 3.1 m.

ALLEY NAME	CORE / TEST HOLE LOCATIONS
Clifton Alley	6
Victor Alley	8
Sherbrook Alley	6
Garfield Alley	8
Ingersoll Alley	8
<b>Total</b>	<b>36</b>

- **Laboratory Testing** – Laboratory testing including grain size analyses, Atterberg limits and moisture contents were performed on select soil samples for correlation to relevant engineering properties.

## 3.0 GEOTECHNICAL INVESTIGATION

### 3.1 TEST HOLE DRILLING AND SOIL SAMPLING PROGRAM

A drilling and sampling program consisting of 36 test holes advanced 3.1 m in depth was completed from January 22, 2019 to February 4, 2019. Drilling services were provided by Maple Leaf Drilling Ltd. of Winnipeg, Manitoba with KGS Group supervision. Test holes were completed using either a mobile B40 truck mounted or Geoprobe track mounted drill rig. Test holes were cored through the existing pavement and advanced the remaining depth using 125 mm diameter solid stem continuous flight augers. The locations of the test holes are shown on Figures attached in Appendices A through E and the approximate UTM coordinates (Zone 14) and ground elevations are listed on Table 1 to 5.

The first soil sample in each test hole was obtained no deeper than 0.1 m below the existing pavement structure, with subsequent soil samples recovered at 0.3 m intervals to a total depth of 3.1 m. Soil samples were collected directly off the auger flights and visually classified in the field in accordance with the modified Unified Soil Classification System (USCS). Field Torvane's were complete on the clay soils to estimate the undrained shear strength.

Upon completion of drilling, the test holes were examined for indications of sloughing and seepage, and then backfilled with bentonite chips, auger cuttings and cold-mix asphalt patch to the pavement surface. Summary soil logs incorporating all field observations details are attached in Appendices A through E.

**TABLE 1**  
**CLIFTON ALLEY – TEST HOLE COORDINATES AND ELEVATIONS**

TEST HOLE ID	APPROXIMATE UTM COORDINATES		GROUND ELEV. (m)
	NORTHING (m)	EASTING (m)	
TH19-101	5,527,106	630,251	232.85
TH19-102	5,527,052	630,249	233.12
TH19-103	5,527,014	630,248	233.33
TH19-104	5,526,969	630,247	231.93
TH19-105	5,526,922	630,247	231.17
TH19-106	5,526,884	630,245	230.98

**TABLE 2**  
**VICTOR ALLEY – TEST HOLE COORDINATES AND ELEVATIONS**

TEST HOLE ID	APPROXIMATE UTM COORDINATES		GROUND ELEV. (m)
	NORTHING (m)	EASTING (m)	
TH19-201	5,528,338	631,893	232.58
TH19-202	5,528,295	631,892	232.39
TH19-203	5,528,241	631,891	232.11
TH19-204	5,528,198	631,890	232.05
TH19-205	5,528,155	631,889	231.95
TH19-206	5,528,112	631,888	231.84
TH19-207	5,528,065	631,887	231.76
TH19-208	5,528,022	631,886	231.87

**TABLE 3**  
**SHERBROOK ALLEY – TEST HOLE COORDINATES AND ELEVATIONS**

TEST HOLE ID	APPROXIMATE UTM COORDINATES		GROUND ELEV. (m)
	NORTHING (m)	EASTING (m)	
TH19-301	5,528,310	632,288	232.20
TH19-302	5,528,261	632,295	231.89
TH19-303	5,528,179	632,293	231.93
TH19-304	5,528,124	632,292	232.22
TH19-305	5,528,010	632,290	231.85
TH19-306	5,527,935	632,288	231.98

**TABLE 4**  
**GARFIELD ALLEY – TEST HOLE COORDINATES AND ELEVATIONS**

TEST HOLE ID	APPROXIMATE UTM COORDINATES		GROUND ELEV. (m)
	NORTHING (m)	EASTING (m)	
TH19-401	5,528,015	630,923	232.70
TH19-402	5,527,952	630,922	232.87
TH19-403	5,527,916	630,921	232.77
TH19-404	5,527,870	630,920	232.67
TH19-405	5,527,815	630,918	232.48
TH19-406	5,527,768	630,917	232.58
TH19-407	5,527,719	630,916	232.78
TH19-408	5,527,681	630,915	232.87

**TABLE 5**  
**INGERSOLL ALLEY – TEST HOLE COORDINATES AND ELEVATIONS**

TEST HOLE ID	APPROXIMATE UTM COORDINATES		GROUND ELEV. (m)
	NORTHING (m)	EASTING (m)	
TH19-501	5,528,757	631,103	232.88
TH19-502	5,528,710	631,102	232.76
TH19-503	5,528,659	631,101	232.68
TH19-504	5,528,610	631,099	232.80
TH19-505	5,528,552	631,098	232.99
TH19-506	5,528,510	631,097	233.11
TH19-507	5,528,465	631,096	233.22
TH19-508	5,528,416	631,095	233.10

Test hole UTM coordinates were surveyed using a hand held unit ( $\pm 5$  m) with ground elevations selected based on KGS Group's topographic survey.

### **3.2 LABORATORY TESTING**

Laboratory testing was completed on select representative soil samples for correlation to relevant engineering properties of the subsurface soils. Laboratory testing included ten (10) particle size analyses, ten (10) Atterberg limits and two hundred fifty-three (253) moisture contents. Laboratory testing was completed at a Canadian Council of Independent Laboratories (CCIL) certified soil testing laboratory in Winnipeg, Manitoba in general accordance with ASTM Standards.

## **4.0 INVESTIGATION RESULTS**

### **4.1 STRATIGRAPHY – CLIFTON ALLEY**

Six (6) test holes were drilled on Clifton Alley west of Clifton Street, east of Telfer Street South, extending north from Wolseley Avenue to Portage Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure with partial asphalt overlay, overlying fat clay and silt.

The location of the test holes are provided on Figure A1 in Appendix A. Atterberg limits and grain size analysis test results are presented on the attached Figures A2 and A3 in Appendix A.

#### ***Concrete Pavement Structure with Partial Asphalt Overlay***

The existing pavement structure at the test hole locations consisted of 140 to 250 mm of concrete. A 40 to 60 mm asphalt overlay existed at test hole locations of TH19-101 and TH19-106. No granular base was encountered below the concrete at any of the test hole locations, with the exception of TH19-101, where approximately 100 mm of granular base was encountered. The granular base was black in colour, frozen, well-graded and consisted of fine to coarse grained sand, fine to coarse grained gravel and trace clay. The moisture content of

the granular base was 43% as measured from one (1) sample. The high moisture content measured in the granular base is likely not representative of the material and due to contamination of the samples with the underlying clay.

### ***Fat Clay (CH)***

Fat clay was encountered below the concrete in all test holes with the exception of TH19-101 where the fat clay was encountered below the granular base. In all test holes, the fat clay extended to the end of each test hole at 3.1 m, with the exception of TH19-105 where silt was encountered at 2.1 m extending to the bottom of the test hole. The fat clay was generally brown in colour, moist, stiff in consistency and of high plasticity. At the time of the investigation the fat clay was frozen to a depth of 0.9 to 1.2 m.

The moisture content of the fat clay generally ranged from 21 to 47%, as measured from 39 samples. Atterberg limits on two (2) fat clay samples at depths of 0.3 m to 0.6 m measured a liquid limit of 76 to 79, a plastic limit of 27 to 29 and a plasticity index of 49 to 50, classifying the material as fat clay (CH). Grain size analyses completed on the same samples measured 60 to 66% clay sized particles, 27 to 35% silt sized particles, 6 to 7% sand sized particles and 0 to 0.1% gravel sized particles.

### ***Silt (ML)***

A 0.1 to 0.9 m thick layer of silt was encountered within the fat clay at a depth of 1.2 to 2.5 m below the top of pavement in TH19-101, TH19-102, TH19-103 and TH19-105. The silt was light brown in colour, moist, soft in consistency, with no to low plasticity. The moisture content of the silt was 21 to 24% as measured from two (2) samples.

## **4.2 STRATIGRAPHY – VICTOR ALLEY**

Eight (8) test holes were drilled on Victor Alley west of Victor Street, east of Toronto Street, extending north from St. Matthews Avenue to Ellice Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure with partial asphalt overlay, overlying fat clay and silt.

The location of the test holes are provided on Figure B1 in Appendix B. Atterberg limits and grain size analysis test results are presented on the attached Figures B2 and B3 in Appendix A.

### ***Concrete Pavement Structure with Partial Asphalt Overlay***

The existing pavement structure at the test hole locations consisted of 95 to 175 mm of concrete. A 20 to 30 mm asphalt overlay existed at the locations of both TH19-205 and TH19-206. No granular base was encountered below the concrete.

### ***Fat Clay (CH)***

Fat clay was encountered below the concrete in all test holes and extended to the end of each test hole at 3.1 m, with the exception of TH19-203 where a thick silt deposit was encountered below 1.8 m that extended to the bottom of the test hole. The fat clay was generally black or brown in colour, moist, stiff in consistency, of high plasticity and contained trace fine to coarse grained sand and trace fine grained gravel. At the time of the investigation the fat clay was frozen to a depth of 0.9 m to 1.2 m.

The moisture content of the fat clay generally ranged from 27 to 62%, as measured from thirty-nine (39) samples. Atterberg limits completed on one (1) fat clay sample at a depth of 0.3 m measured a liquid limit of 66, a plastic limit of 18 and a plasticity index of 48, classifying

the material as fat clay (CH). Grain size analysis completed on the same sample measured 61% clay sized particles, 27% silt sized particles, 12% sand sized particles and 0% gravel sized particles.

***Silt (ML)***

A 0.3 to 1.3 m thick layer of silt was encountered within the fat clay at a depth of 0.6 to 1.8 m below the top of pavement in all test holes. The silt was light brown in colour, moist, soft in consistency and of no to low plasticity. At the time of the investigation the silt was frozen to a depth of 0.8 m in TH19-201. The moisture content of the silt ranged from 20 to 28% as measured from thirteen (13) samples.

***Silty Clay (CL-ML)***

A 0.8 m thick layer of silty clay was encountered within the fat clay at a depth of 1.1 m in TH19-206. The silty clay was light brown in colour, moist, soft in consistency, no to low plasticity and contained trace fine grained sand.

The moisture content of the silty clay generally ranged from 20 to 23%, as measured from two (2) samples. Atterberg limits completed on one (1) silt clay sample at a depth of 1.2 m measured a liquid limit of 21, a plastic limit of 17 and a plasticity index of 4, classifying the material as silty clay (CL-ML). Grain size analysis completed on the same sample measured 19% clay sized particles, 76% silt sized particles, 5% sand sized particles and 0% gravel sized particles.

***Lean Clay (CL)***

A 0.7 m thick layer of lean clay was encountered at a depth of 1.5 m in TH19-207. The clay was brown, moist, stiff in consistency, and of low to intermediate plasticity.

The moisture content of the lean clay ranged from 27 to 34%, as measured from two (2) samples.

**4.3 STRATIGRAPHY – SHERBROOK ALLEY**

Six (6) test holes were drilled on Sherbrook Alley, east of Sherbrook Street, west of Furby Street and north of Portage Avenue to Ellice Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure with a partial asphalt overlay, overlying granular base and fat clay.

The location of the test holes are provided on Figure C1 in Appendix C. Atterberg limits and grain size analysis test results are presented on the attached Figures C2 and C3 in Appendix C.

***Concrete Pavement Structure with Partial Asphalt Overlay***

The existing pavement structure at the test hole locations consisted of 145 to 210 mm of concrete. A 25 mm asphalt overlay existed at the locations of TH19-301. Granular base was encountered below the concrete in all of the test holes with thicknesses ranging from 50 to 230 mm. The granular base was brown in colour, frozen, well-graded and consisted of fine to coarse grained sand and fine to coarse grained gravel. The moisture content of the granular base ranged from 10 to 31% as measured from five (5) samples.

### ***Fat Clay (CH)***

Fat clay was encountered below the granular base in all test holes. In all test holes the fat clay extended to the end of each test hole at 3.1 m. The fat clay was generally black to brown in colour, moist, stiff in consistency, of high plasticity and contained trace coarse grained sand. At the time of the investigation the fat clay was frozen to a depth of 1.4 to 1.5 m.

The moisture content of the fat clay generally ranged from 22 to 51%, as measured from thirty-one (31) samples. Atterberg limits completed on one (1) fat clay sample at a depth of 0.9 m measured a liquid limit of 78, a plastic limit of 22 and a plasticity index of 56, classifying the material as fat clay (CH). Grain size analysis completed on the same sample measured 79% clay sized particles, 17% silt sized particles, 4% sand sized particles and 0% gravel sized particles.

### ***Silt (ML)***

A 0.6 to 0.8 m thick layer of silt was encountered within the fat clay at a depth of 0.9 to 1.1 m below the top of pavement in TH19-305 and TH19-306. The silt was light brown in colour, moist, and soft in consistency. At the time of the investigation the silt was frozen to a depth of 1.2 to 1.4 m. The moisture content of the silt ranged from 21 to 38% as measured from four (4) samples.

### ***Lean Clay (CL)***

A 0.6 m thick layer of lean clay was encountered within the fat clay at a depth of 0.6 m below top of pavement. The lean clay was light brown in colour, and contained trace fine to medium grained sand. At the time of the drilling the lean clay layer was frozen.

The moisture content of the lean clay ranged from 24 to 28%, as measured from two (2) samples. Atterberg limits completed on one (1) lean clay sample at a depth of 0.6 m measured a liquid limit of 27, a plastic limit of 17 and a plasticity index of 10, classifying the material as lean clay (CL). Grain size analysis completed on the same sample measured 27% clay sized particles, 68% silt sized particles, 5% sand sized particles and 0% gravel sized particles.

## **4.4 STRATIGRAPHY – GARFIELD ALLEY**

Nine (9) test holes were drilled on Garfield Alley west of Garfield Street North, east of Dominion Street, extending north from Wolever Avenue to St. Matthews Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure with asphalt overlay, overlying fat clay and silt.

The location of the test holes are provided on Figure D1 in Appendix E. Atterberg limits and grain size analysis test results are presented on the attached Figures D2 and D3 in Appendix A.

### ***Concrete Pavement Structure with Asphalt Overlay***

The existing pavement structure at the test hole locations consisted of 20 to 70 mm of asphalt over 100 to 190 mm of concrete. No granular base was encountered below the concrete at any of the test hole locations.

### ***Fat Clay (CH)***

Fat clay was encountered below the concrete in all test holes with the exception of TH19-406, where clay fill was encountered below the concrete. In all of the test holes, the fat clay extended to the end of the hole at 3.1 m. The fat clay was generally black or brown in colour, moist, stiff in

consistency, of high plasticity and contained trace fine to coarse grained sand, and trace fine grained gravel. At the time of the investigation the fat clay was frozen to a depth of 0.9 to 1.1 m.

The moisture content of the fat clay generally ranged from 30 to 55%, as measured from forty-four (44) samples. Atterberg limits completed on one (1) fat clay sample at a depth of 0.3 m measured a liquid limit of 50, a plastic limit of 15 and a plasticity index of 35, classifying the material as fat clay (CH). Grain size analysis completed on the same sample measured 46% clay sized particles, 30% silt sized particles, 24% sand sized particles and 0.1% gravel sized particles.

#### ***Silt (ML)***

A 0.4 to 1.0 m thick layer of silt was encountered within the fat clay at a depth of 0.9 to 1.5 m below the top of pavement in TH19-402, TH19-406, TH19-407 and TH19-408. The silt was light brown or light grey in colour, moist, soft in consistency, with no to low plasticity. The moisture content of the silt ranged from 20 to 25% as measured from nine (9) samples.

#### ***Clay Fill (CH)***

A 0.8 m thick layer of clay fill was encountered below the concrete in TH19-406. The clay fill was black in colour, frozen at the time of drilling, of high plasticity and contained trace coarse grained sand and trace fine grained gravel.

The moisture content of the clay fill generally ranged from 47 to 50%, as measured from two (2) samples. Atterberg limits completed on one (1) clay fill sample at a depth of 0.3 m measured a liquid limit of 54, a plastic limit of 21 and a plasticity index of 33, classifying the material as fat clay (CH). Grain size analysis completed on the same sample measured 40% clay sized particles, 36% silt sized particles, 24% sand sized particles and 1% gravel sized particles.

#### ***Organic Clay (OH)***

A 0.3 m thick layer of organic clay was encountered below the clay fill and above the silt in TH19-406. The organic clay was black in colour, moist, stiff in consistency, contained rootlets and had a strong organic odour. The moisture content of the silt was 42% as measured from one (1) sample.

### **4.5 STRATIGRAPHY – INGERSOLL ALLEY**

Eight (8) test holes were drilled on Ingersoll Alley west of Ingersoll Street, east of Sherburn Street, extending north from Ellice Avenue to Sargent Avenue. In general, the stratigraphy at the site was interpreted by KGS Group to consist of a concrete pavement structure with partial asphalt overlay, overlying fat clay and silt.

The location of the test holes are provided on Figure E1 in Appendix E. Atterberg limits and grain size analysis test results are presented on the attached Figures E2 and E3 in Appendix A.

#### ***Concrete Pavement Structure with Partial Asphalt Overlay***

The existing pavement structure at the test hole locations consisted of 95 to 180 mm of concrete. A 20 to 30 mm asphalt overlay existed at both TH19-503 and TH19-507. No granular base was encountered below the concrete.

### ***Fat Clay (CH)***

Fat clay was encountered below the concrete in all test holes with the exception of TH19-503 where clay fill was encountered, and TH19-505 where sandy silt was encountered below the concrete. In all test holes the fat clay extended to the end of each test hole at 3.1 m. The fat clay was generally black or brown in colour, moist, stiff in consistency, of high plasticity and contained trace fine to coarse grained sand and trace fine grained gravel. At the time of the investigation the fat clay was frozen to a depth of 0.9 to 1.1 m. The moisture content of the fat clay ranged from 26 to 62%, as measured from forty-four (44) samples.

### ***Silt (ML)***

A 0.2 to 0.7 m thick layer of silt was encountered within the fat clay at depths ranging from 0.8 to 1.1 m below the top of pavement in TH19-502, TH19-503, TH19-504, TH19-505 and TH19-508. The silt was light brown in colour, moist, soft in consistency, with no to low plasticity. At the time of the investigation, the silt was frozen to depths of 0.9 and 1.1 m in TH19-504 and TH19-508, respectively. The moisture content of the silt ranged from 20 to 44% as measured from eight (8) samples.

### ***Sandy Silt (ML)***

A 0.5 m thick layer of sandy silt was encountered 0.2 m below grade in TH19-505. The sandy silt was black in colour, frozen, of low plasticity and contained fine to medium grained sand, trace coarse grained sand and trace fine grained gravel.

The moisture content of the sandy silty was 40%, as measured from one (1) sample. Atterberg limits completed on one (1) sandy silt sample at a depth of 0.5 m measured a liquid limit of 36, a plastic limit of 25 and a plasticity index of 11, classifying the material as low plasticity silt (ML). Grain size analysis completed on the same sample measured 10% clay sized particles, 31% silt sized particles, 57% sand sized particles and 1% gravel sized particles.

### ***Intermediate Clay (CI)***

A 1.0 m thick layer of lean clay was encountered at a depth of 0.6 m in TH19-507. The clay was light brown, moist, soft in consistency, of intermediate plasticity and contained trace fine grained sand.

The moisture content of the lean clay ranged from 22 to 60%, as measured from three (3) samples. Atterberg limits completed on one (1) sample at a depth of 0.9 m measured a liquid limit of 38, a plastic limit of 19 and a plasticity index of 19, classifying the material as intermediate clay (CI). Grain size analysis completed on the same sample measured 38% clay sized particles, 57% silt sized particles, 6% sand sized particles and 0% gravel sized particles.

## **4.6 GROUNDWATER CONDITIONS**

Upon completion of drilling the test holes were left open to observe potential groundwater inflow for five (5) minutes. All test holes were open and remained dry five (5) minutes after the completion of drilling within the exploration depths of 3.1 m.

Groundwater levels should be expected to fluctuate seasonally and following precipitation events; hence, the actual water level at the time of construction could differ from those reported in this report.

## 5.0 STATEMENT OF LIMITATIONS AND CONDITIONS

### 5.1 THIRD PARTY USE OF REPORT

This report has been prepared for KGS Group and any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

### 5.2 GEOTECHNICAL INVESTIGATION STATEMENT OF LIMITATIONS

The geotechnical investigation findings and recommendations of this report were prepared in accordance with generally accepted professional engineering principles and practice. The findings and recommendations are based on the results of field and laboratory investigations, combined with an interpolation of soil and groundwater conditions found at and within the depth of the test holes drilled by KGS Group at this site. If conditions encountered during construction appear to be different from those shown by the test holes drilled by KGS Group or if the assumptions stated herein are not in keeping with the design, this office should be notified in order that the recommendations can be reviewed and modified if necessary.

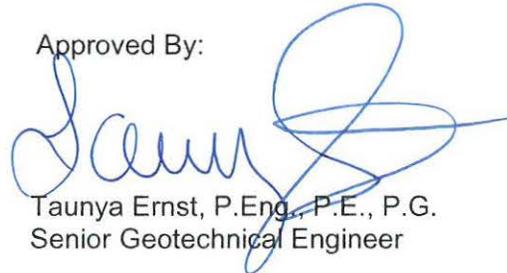
If you have any questions regarding the enclosed information or require additional information, please contact the undersigned.

Prepared By:



Jacqueline MacLennan, P.Eng.  
Geotechnical Engineer

Approved By:



Taunya Ernst, P.Eng., P.E., P.G.  
Senior Geotechnical Engineer

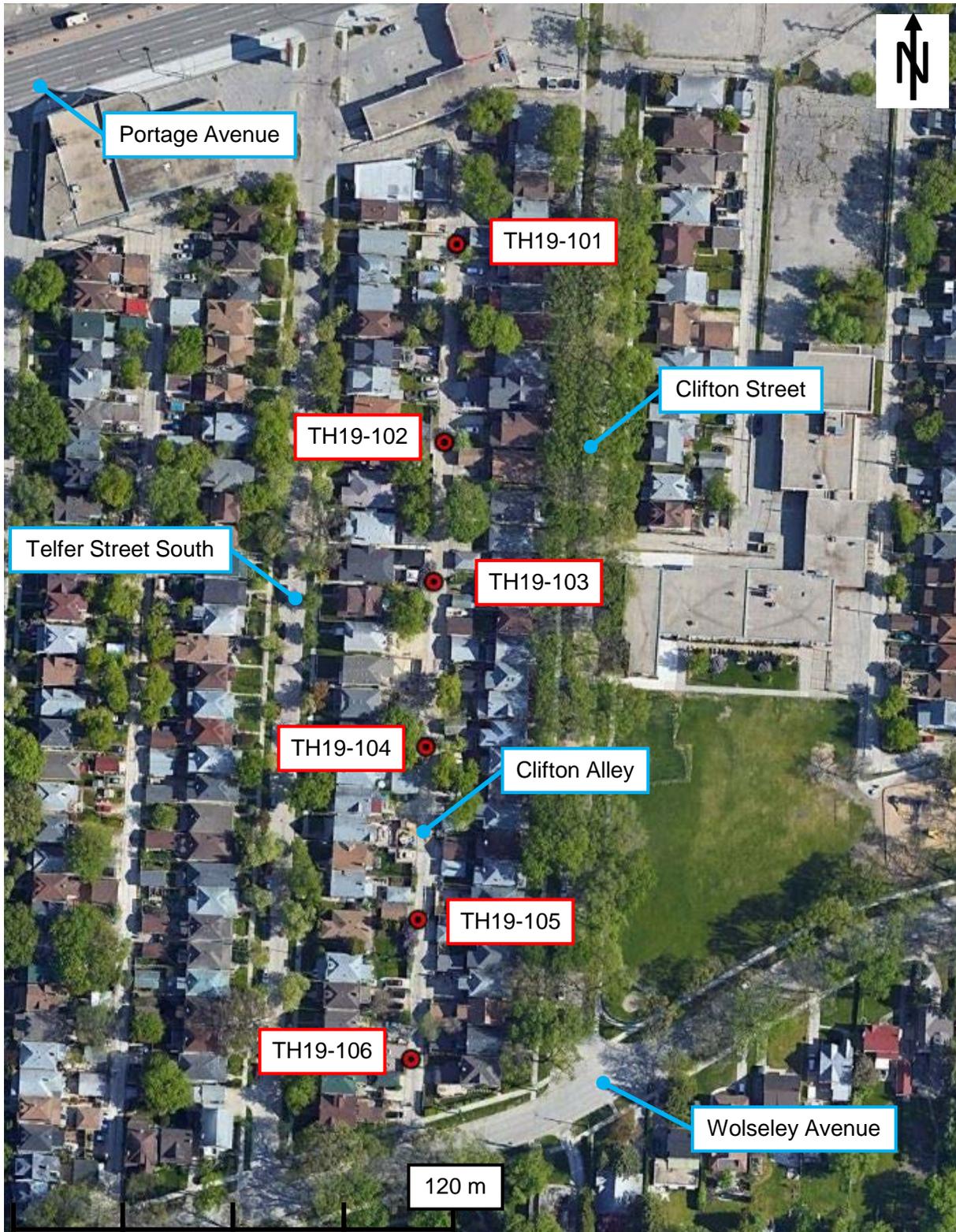
JRM/jkb  
Enclosure

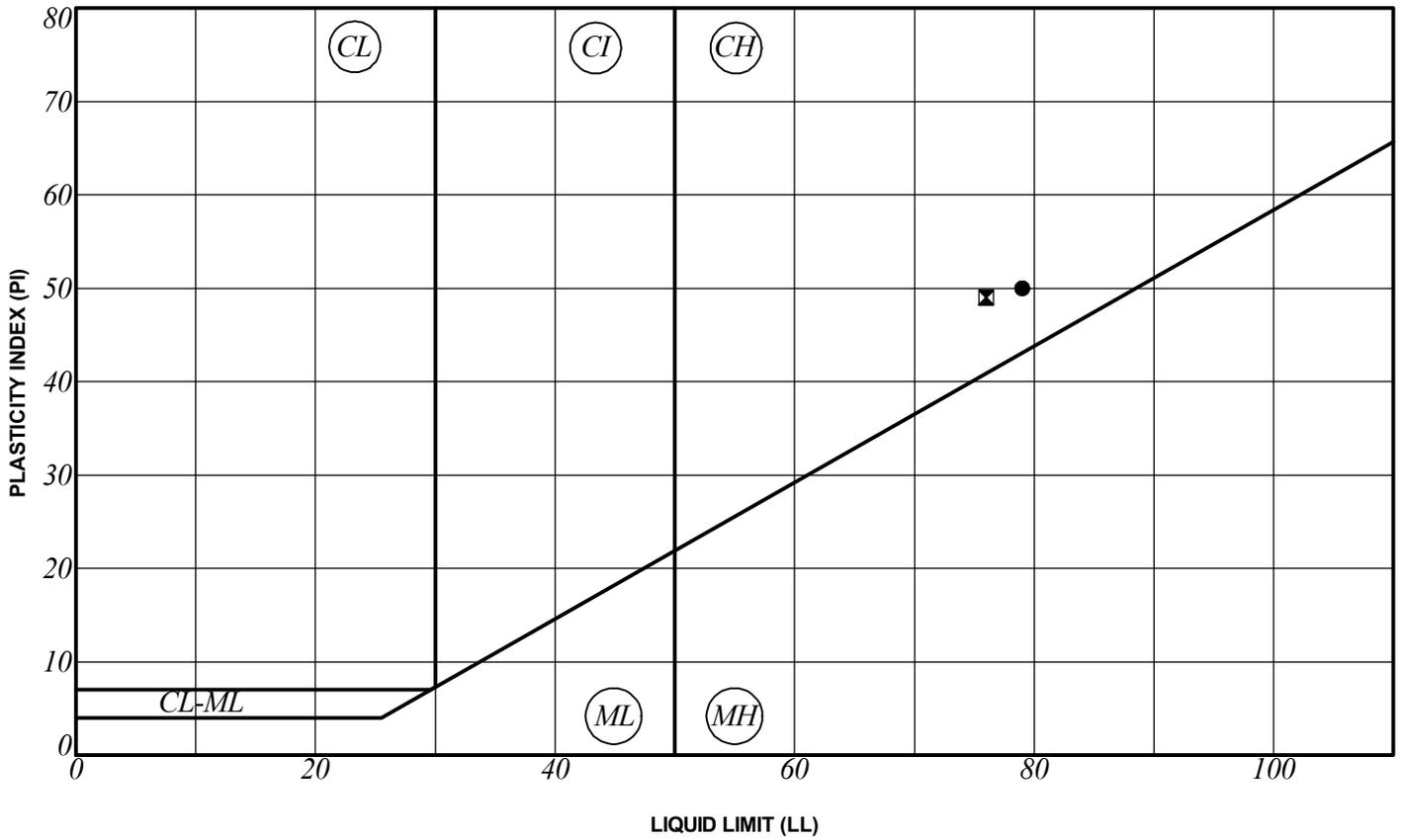
## **APPENDIX A**

### **Clifton Alley**

- Figure A1 – Test Hole Locations
- Figure A2 – A-Line Plot
- Figure A3 – Grain Size Analyses
- Summary Logs TH19-101 to TH19-106

**FIGURE A1**  
**CLIFTON ALLEY – TEST HOLE LOCATIONS**





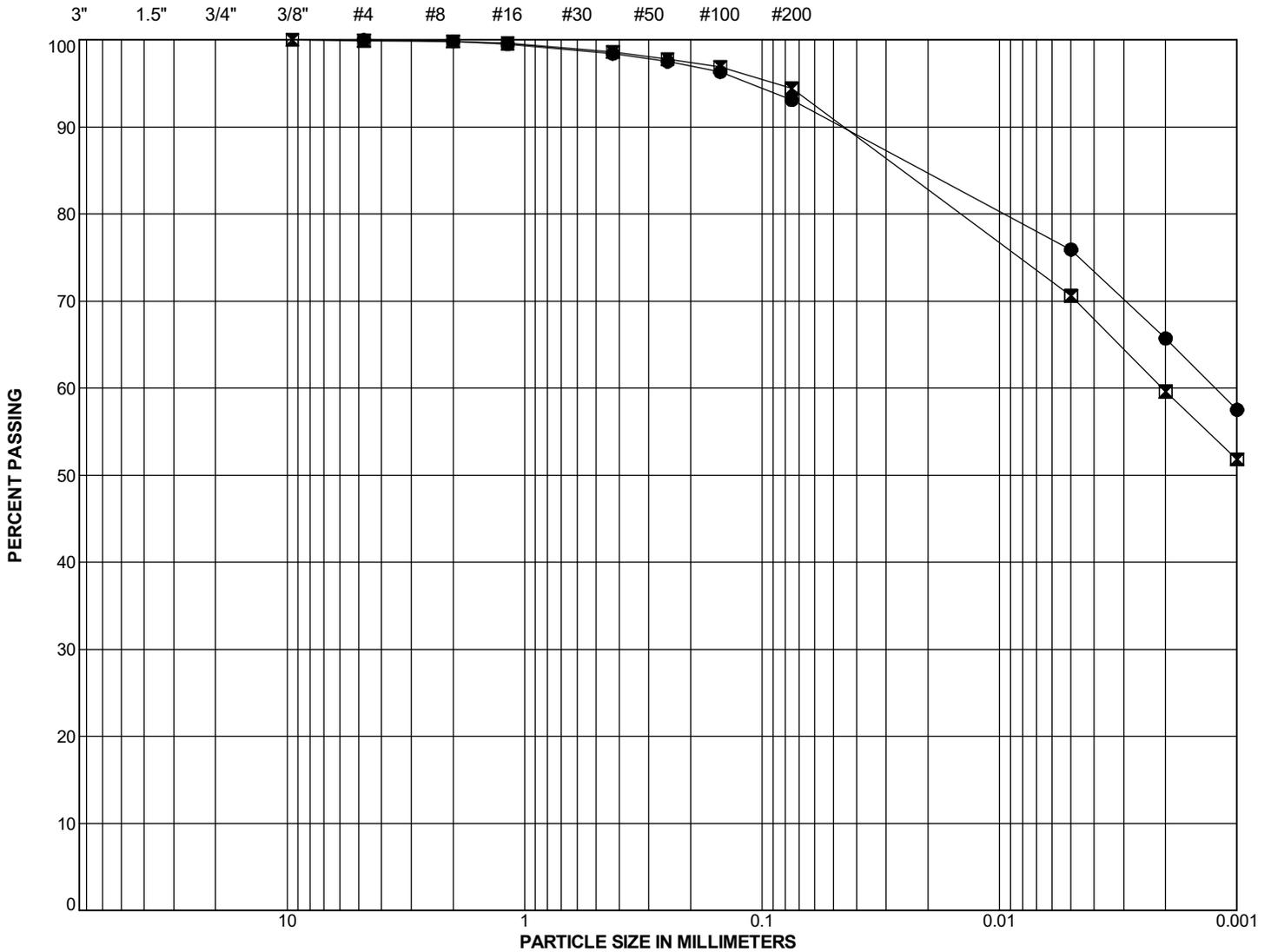
SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-103	0.3	S2	79	29	50	6.9	27.4	65.7	44.2	CH
⊠	TH19-104	0.6	S3	76	27	49	5.5	34.8	59.6	41.1	CH

- Notes:**  
 ML - Low Plasticity Silt  
 MH - High Plasticity Silt  
 CL-ML - Silty Clay  
 CL - Low Plasticity Clay  
 CI - Intermediate Plasticity Clay  
 CH - High Plasticity Clay  
 LL - Liquid Limit  
 PL - Plastic Limit  
 PI - Plasticity Index  
 MC - Moisture Content  
 NP - Non-Plastic

<b>KGS GROUP</b>	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>A-LINE PLOT</b>		
March 2019	Figure A2	Page 1 of 1

SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

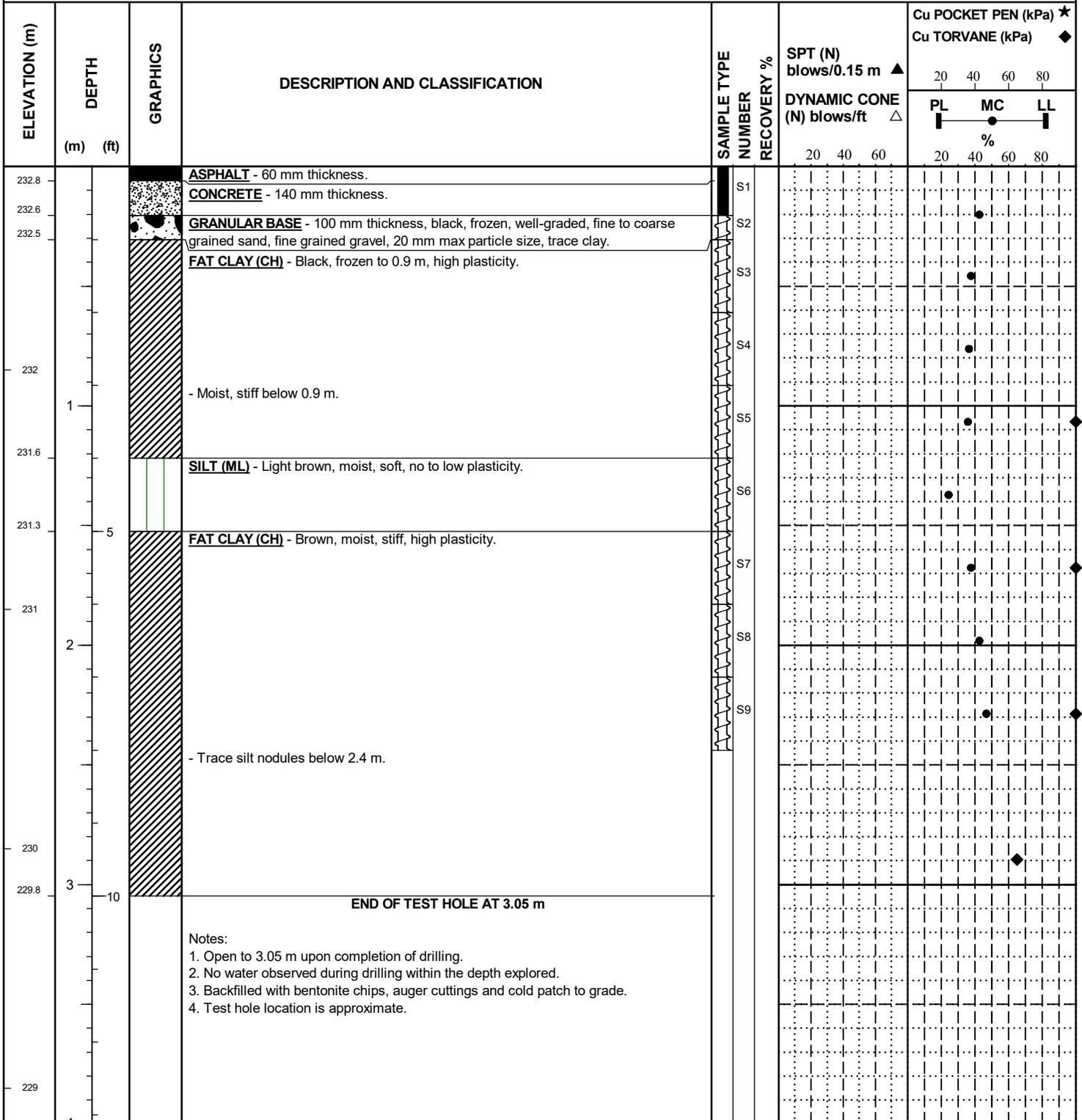
SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-103	0.3	S2	0.0	6.9	27.4	65.7	93.1			CH
⊠	TH19-104	0.6	S3	0.1	5.5	34.8	59.6	94.4			CH

SIEVE ANALYSIS C:\USERS\JMACLENNAN\DESKTOP\2019\_COW\_ALLEYS\WAYS.GPJ

	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>GRAIN SIZE ANALYSES</b>		
March 2019	Figure A3	Page 1 of 1

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 250 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.85  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,527,106  
 E 630,251



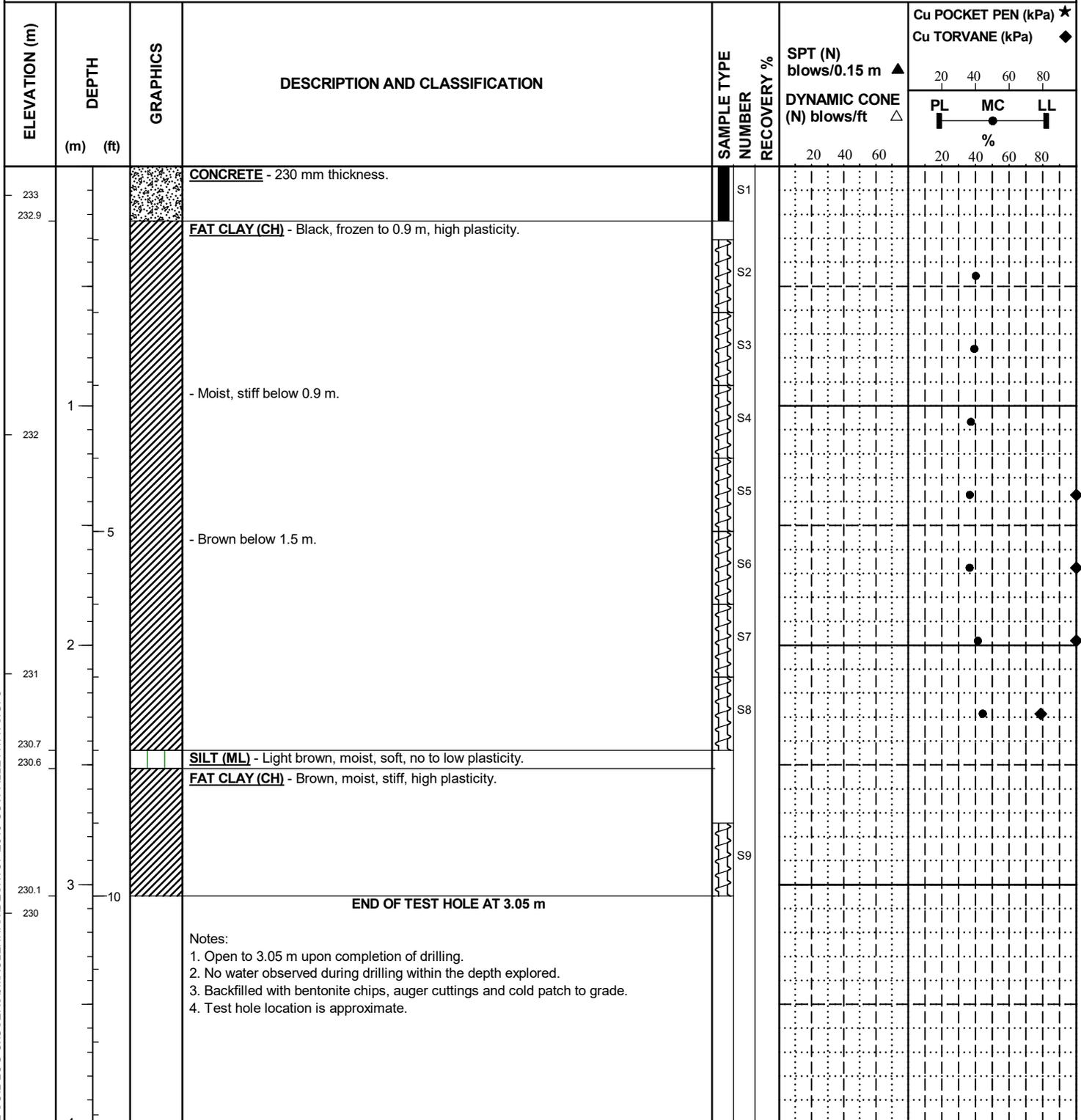
G:\TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR **Maple Leaf Drilling** INSPECTOR **C. FRIESEN** APPROVED **KWH** DATE **3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 196 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 233.12  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,527,052  
 E 630,249



- Notes:
- Open to 3.05 m upon completion of drilling.
  - No water observed during drilling within the depth explored.
  - Backfilled with bentonite chips, auger cuttings and cold patch to grade.
  - Test hole location is approximate.

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

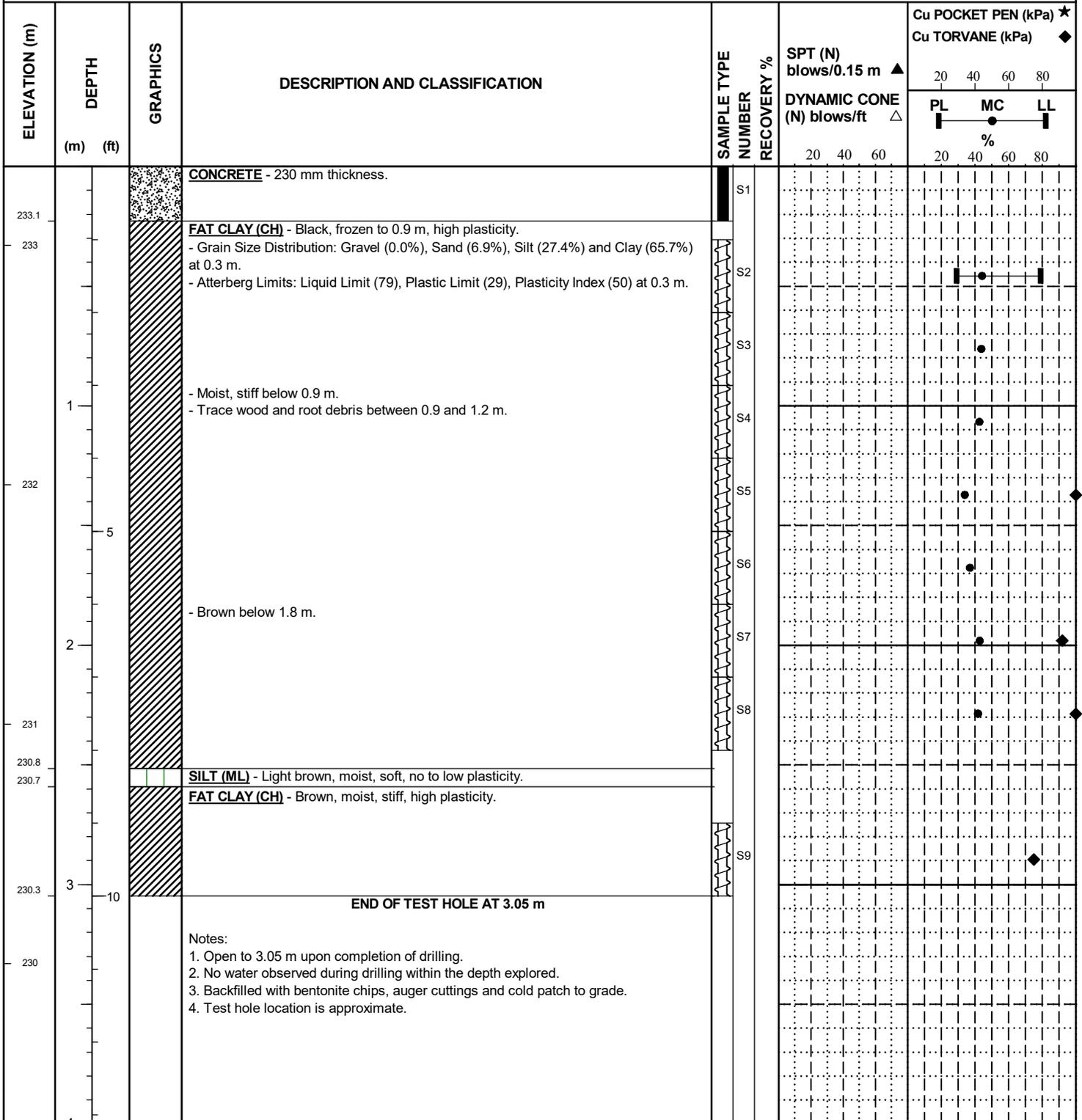
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 158 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 233.33  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,527,014  
 E 630,248



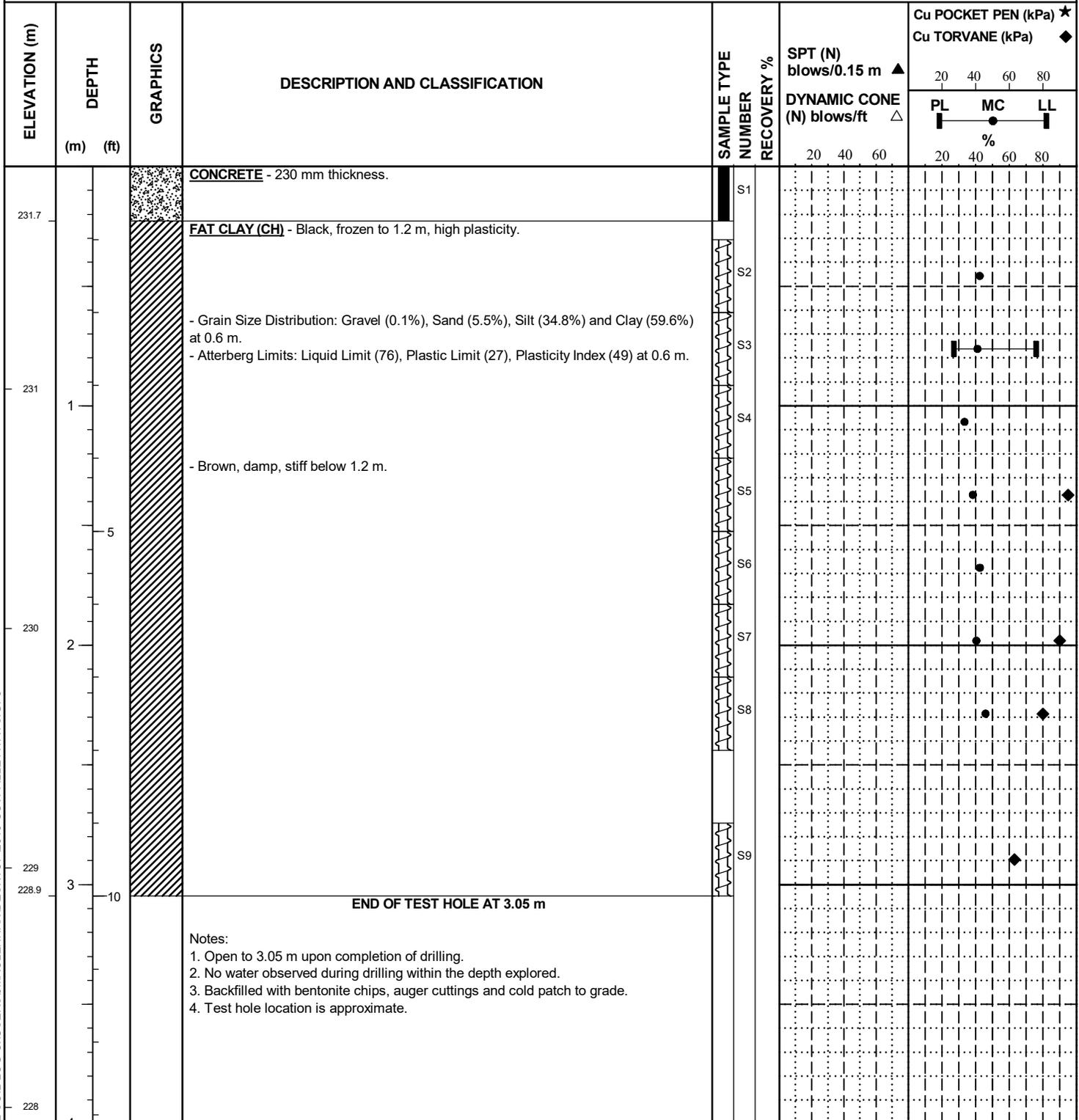
GEO-TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR **Maple Leaf Drilling**      INSPECTOR **C. FRIESEN**      APPROVED **KWH**      DATE **3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 113 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.93  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,526,969  
 E 630,247



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

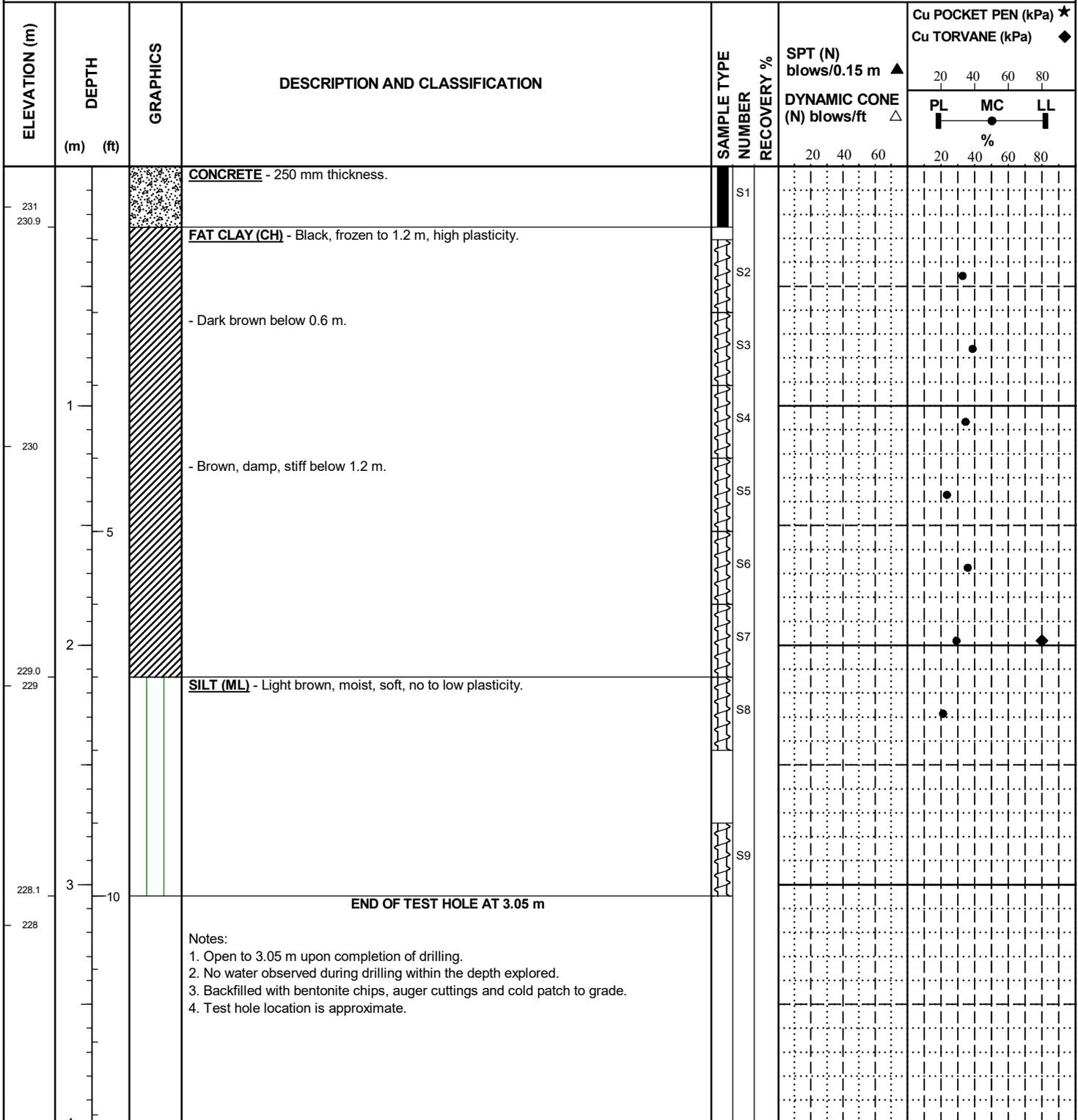
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 66 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.17  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,526,922  
 E 630,247



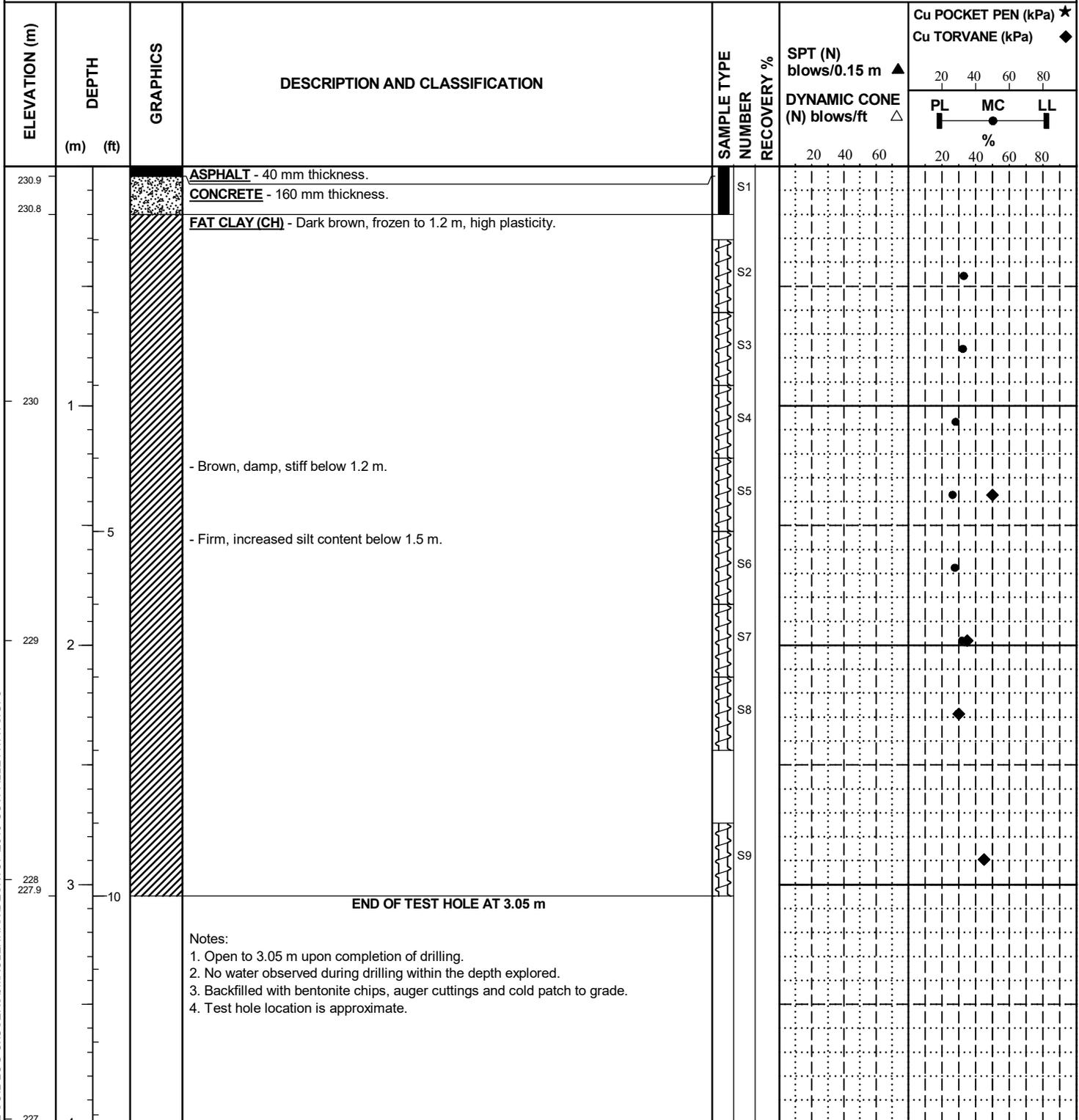
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.S.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR <b>Maple Leaf Drilling</b>	INSPECTOR <b>C. FRIESEN</b>	APPROVED <b>KWH</b>	DATE <b>3/7/19</b>
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Clifton Alley, W of Clifton St., E of Telfer St. S, N from Wolseley Ave. to Portage Ave.  
**LOCATION** 28 m North of Wolseley Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 230.98  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,526,884  
 E 630,245



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

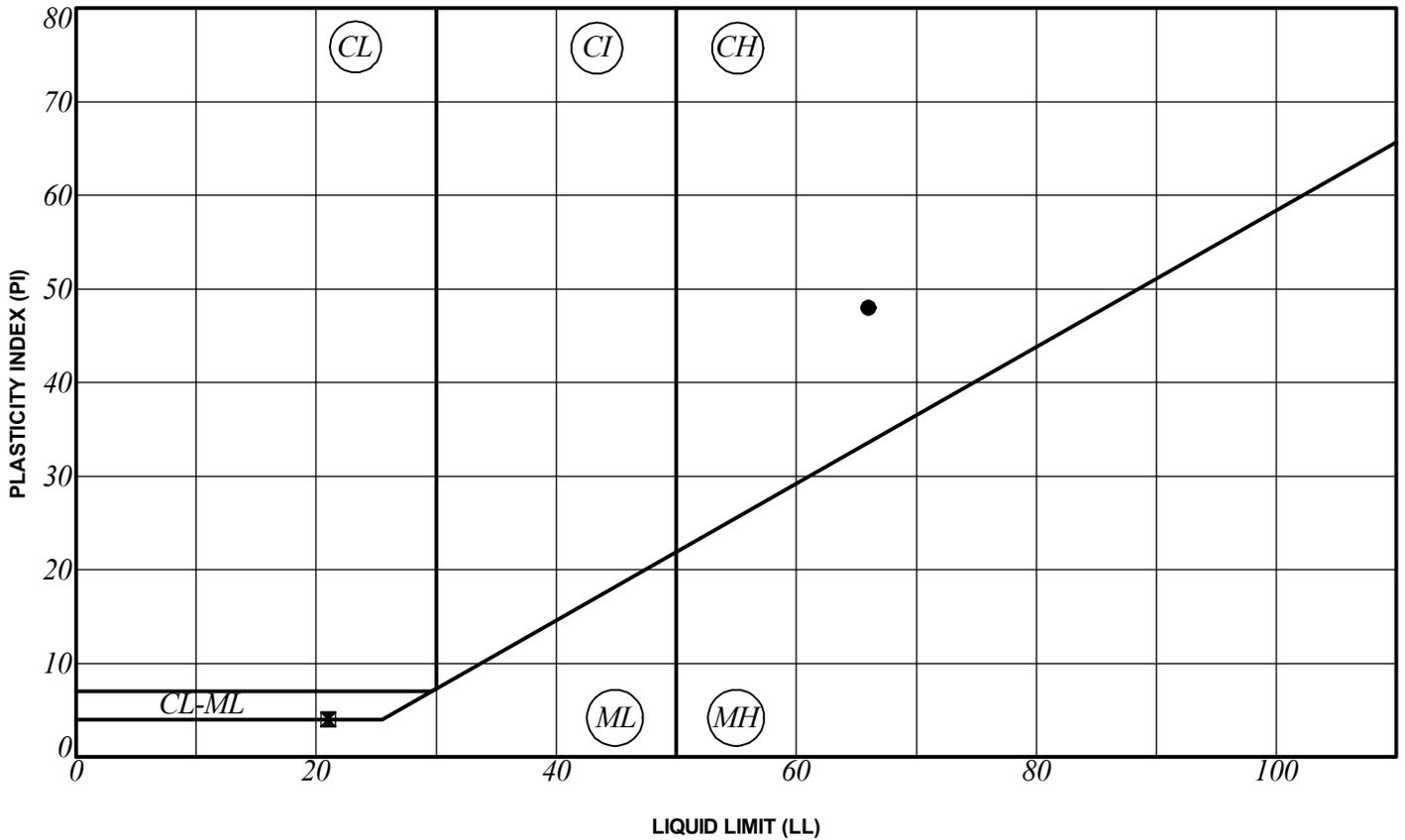
## **APPENDIX B**

### **Victor Alley**

Figure B1 – Test Hole Locations  
Figure B2 – A-Line Plot  
Figure B3 – Grain Size Analyses  
Summary Logs TH19-201 to TH19-108

**FIGURE B1**  
**VICTOR ALLEY – TEST HOLE LOCATIONS**





SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-206	0.3	S2	66	18	48	12.2	26.5	61.3	29.7	CH
⊠	TH19-206	1.2	S5	21	17	4	5.2	76.2	18.5	19.5	CL-ML

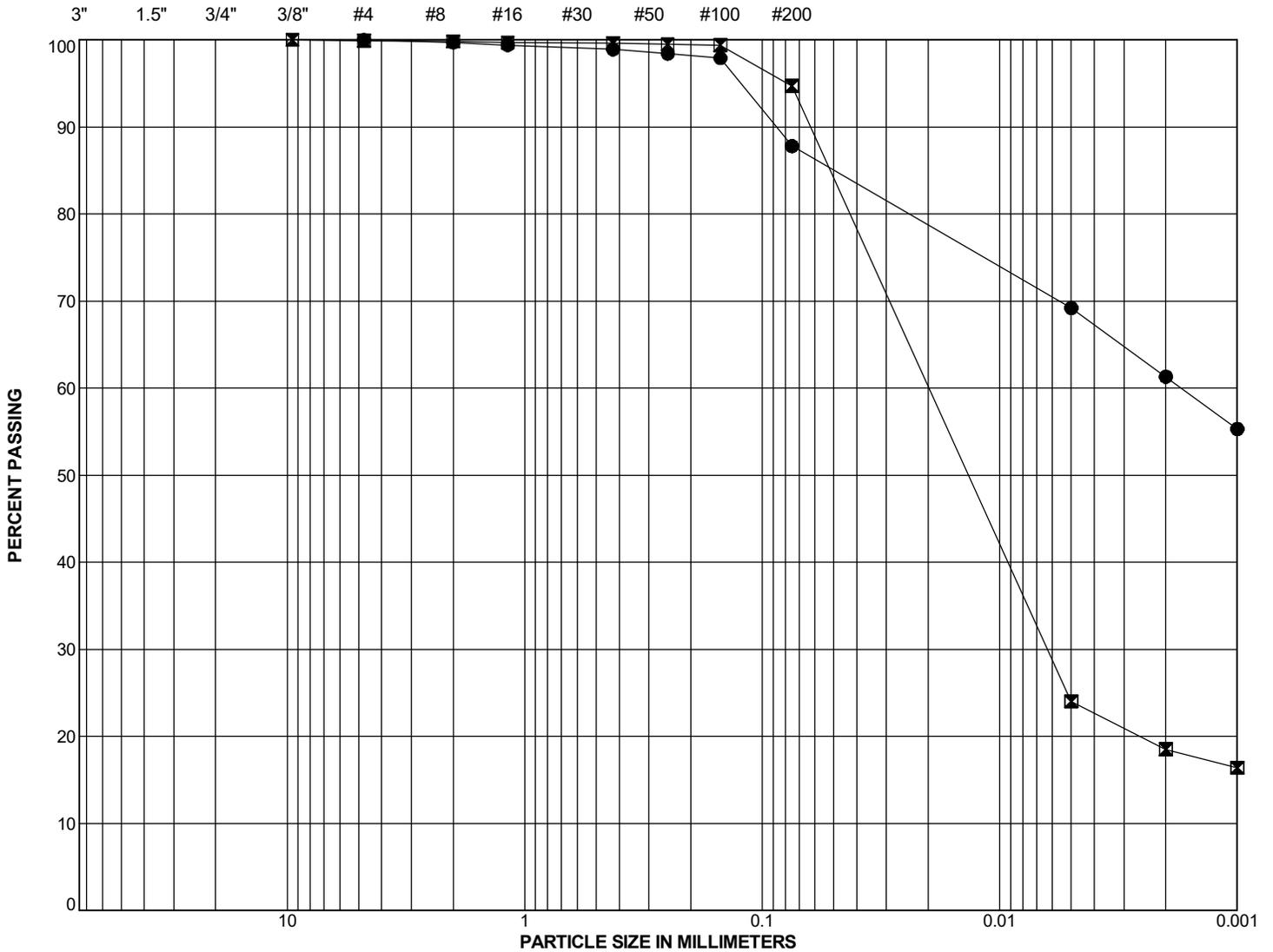
**Notes:**

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content
- NP - Non-Plastic

<b>KGS GROUP</b>	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>A-LINE PLOT</b>		
March 2019	Figure B2	Page 1 of 1

SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

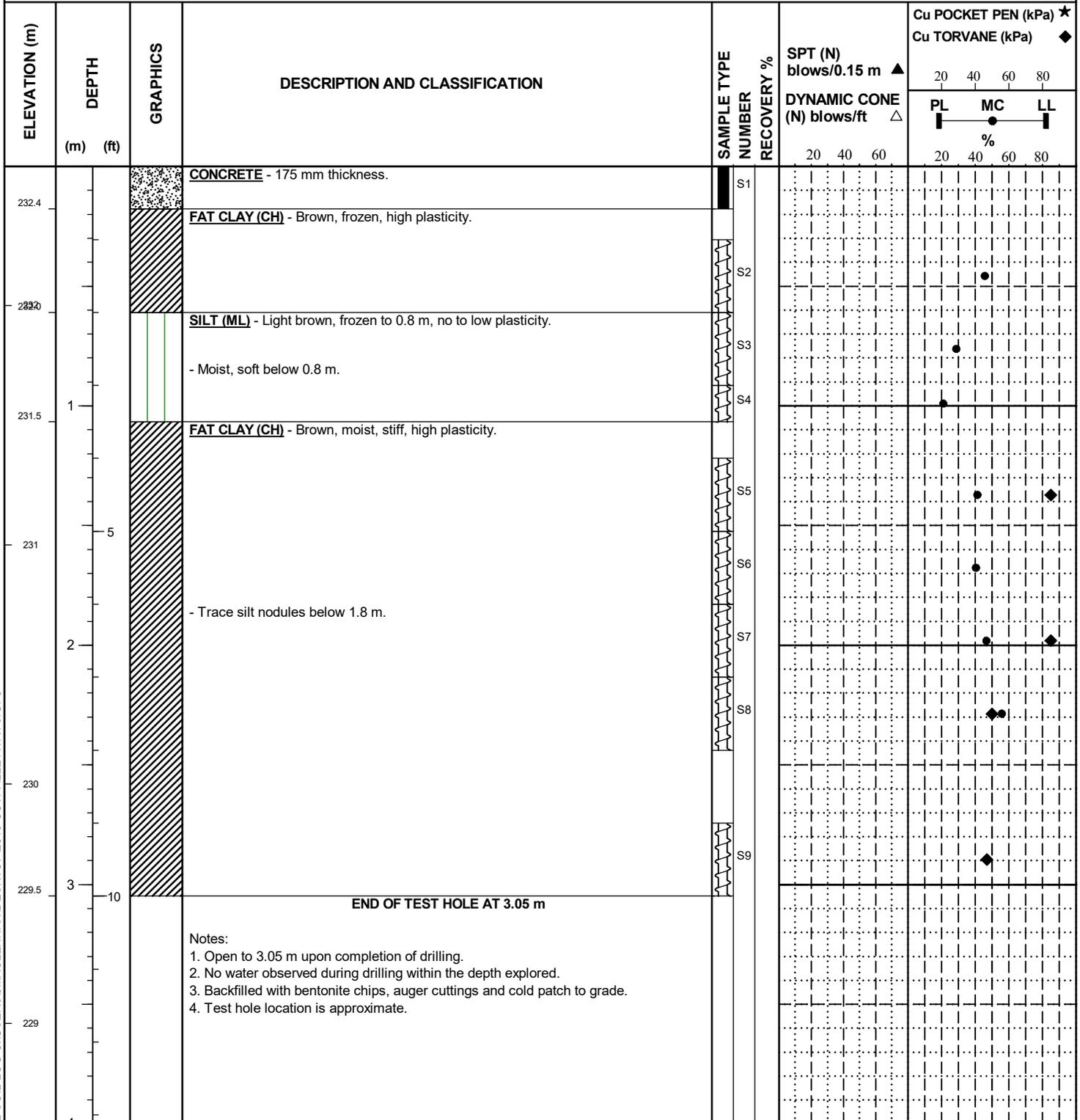
SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-206	0.3	S2	0.0	12.2	26.5	61.3	87.8			CH
⊠	TH19-206	1.2	S5	0.1	5.2	76.2	18.5	94.7			CL-ML

SIEVE ANALYSIS C:\USERS\JMACLENNAN\DESKTOP\2019\_COW\_ALLEYS\WAYS.GPJ

	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>GRAIN SIZE ANALYSES</b>		
March 2019	Figure B3	Page 1 of 1

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 334 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.58  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,528,338  
 E 631,893



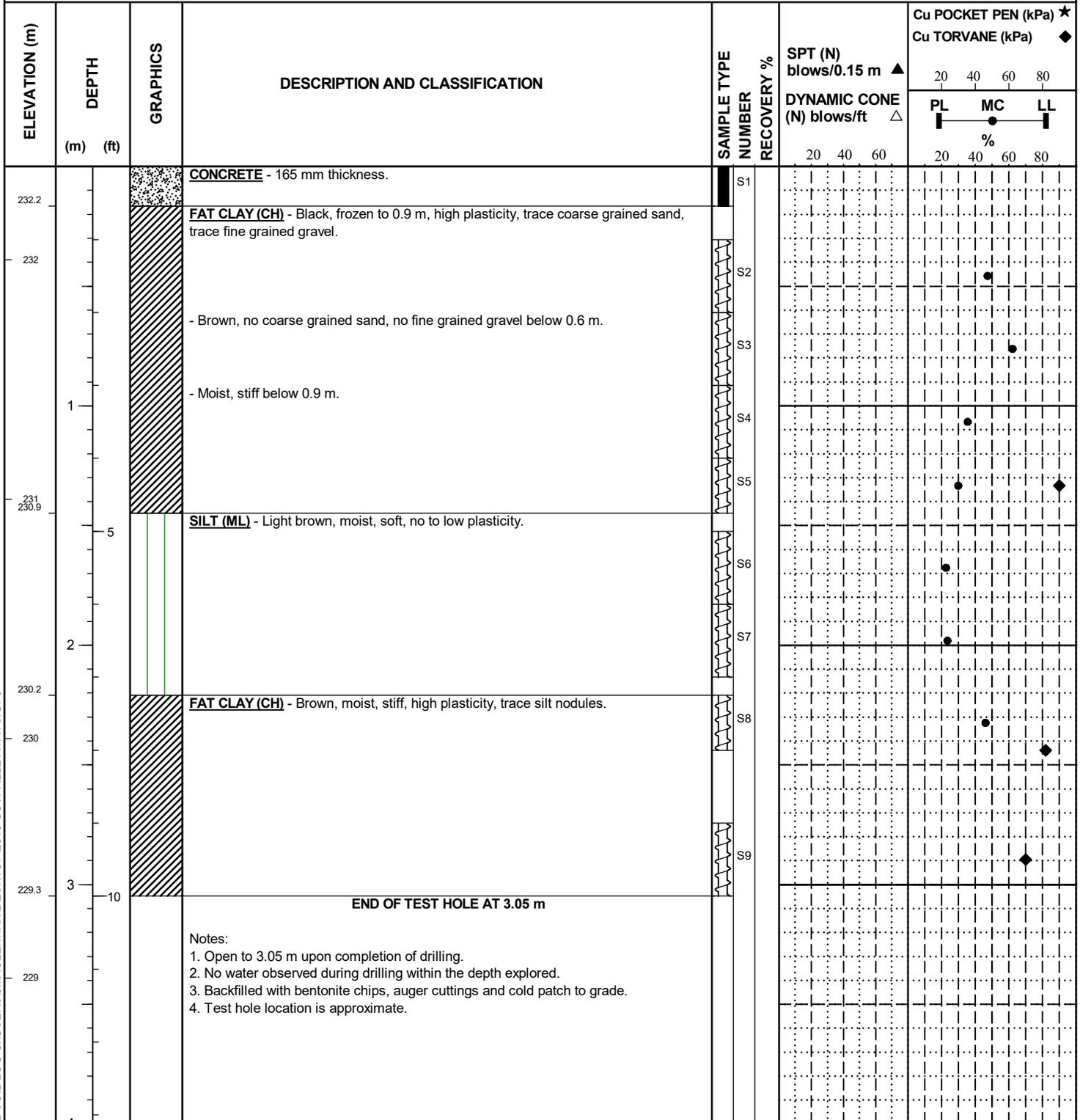
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR <b>Maple Leaf Drilling</b>	INSPECTOR <b>C. FRIESEN</b>	APPROVED <b>KWH</b>	DATE <b>3/7/19</b>
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 291 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.39  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,528,295  
 E 631,892



SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

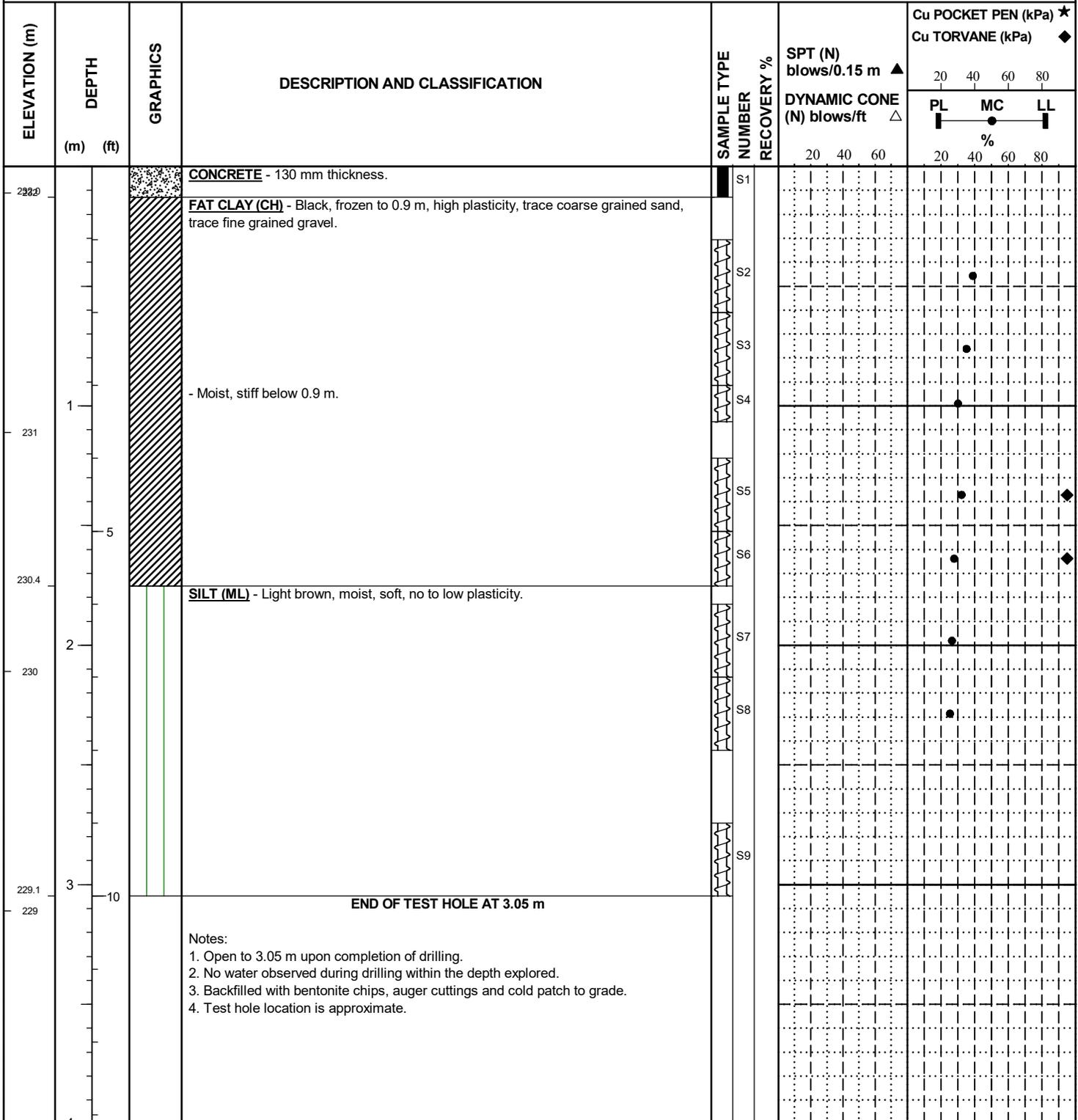
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 237 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.11  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,528,241  
 E 631,891



G:\TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR **Maple Leaf Drilling**      INSPECTOR **C. FRIESEN**      APPROVED **KWH**      DATE **3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 194 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.05  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,528,198  
 E 631,890

ELEVATION (m)	DEPTH		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) ◆		
	(m)	(ft)								20	40	60	80	20	40
232				CONCRETE - 140 mm thickness.		S1									
231.9				FAT CLAY (CH) - Dark brown, frozen to 0.9 m, high plasticity, trace coarse grained sand, trace fine grained gravel.  - Brown, no coarse grained sand, no fine grained gravel below 0.5 m.  - Moist, stiff below 0.9 m.		S2									
		1				S3									
		5				S4									
						S5									
230.4				SILT (ML) - Light brown, moist, soft, no to low plasticity.		S6									
		2				S7									
						S8									
229.6				FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.		S9									
229.0		3		END OF TEST HOLE AT 3.05 m											
229		10		Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.											

GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

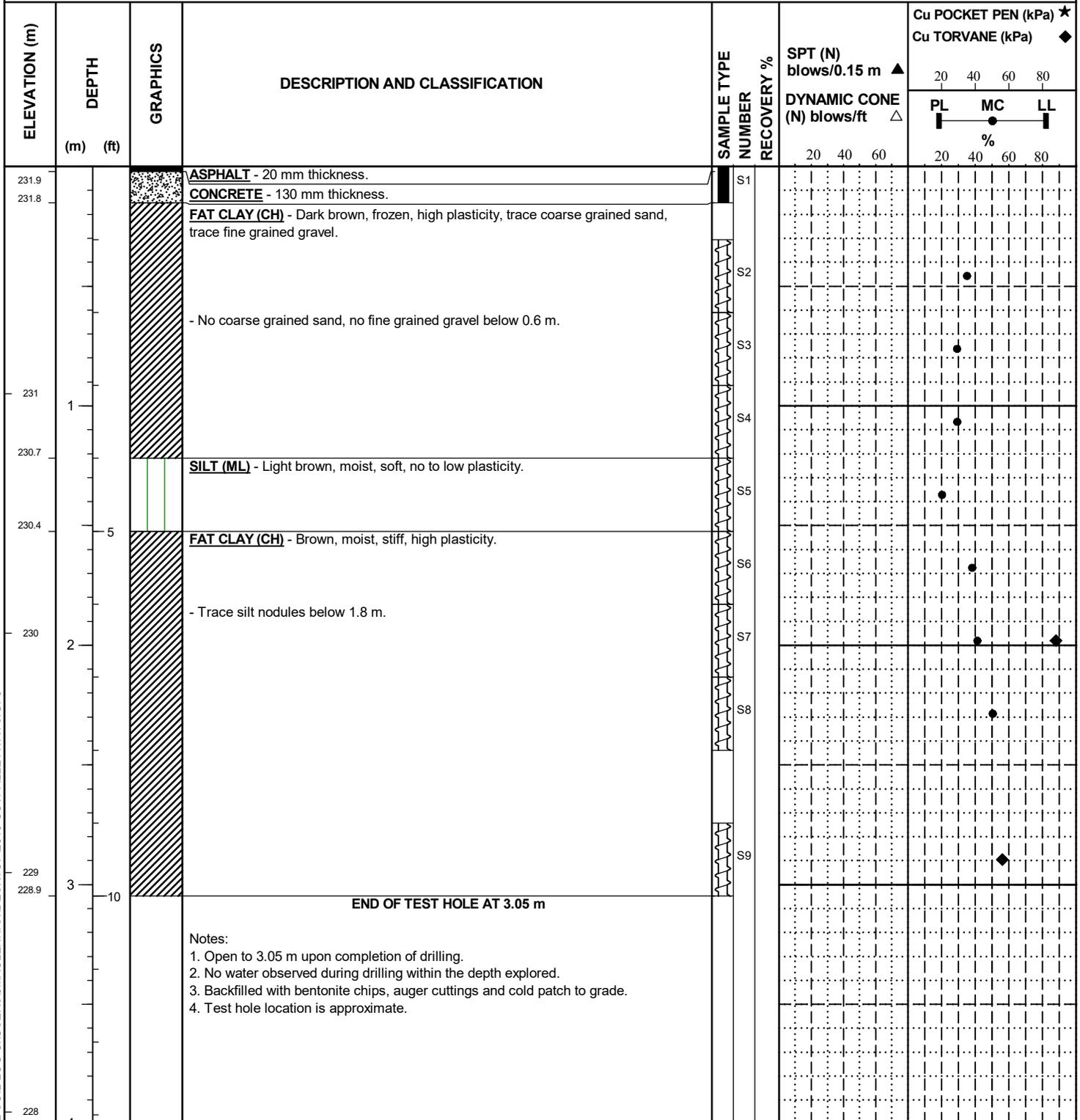
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 151 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.95  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/23/2019  
**UTM (m)** N 5,528,155  
 E 631,889



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 108 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.84  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/23/2019  
**UTM (m)** N 5,528,112  
 E 631,888

ELEVATION (m)	DEPTH		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) ◆		
	(m)	(ft)								PL	MC	LL	PL	MC	LL
231.8				<b>ASPHALT</b> - 30 mm thickness.		S1									
231.7				<b>CONCRETE</b> - 95 mm thickness.											
				<b>FAT CLAY (CH)</b> - Brown, frozen, high plasticity. - Grain Size Distribution: Gravel (0.0%), Sand (12.2%), Silt (26.5%) and Clay (61.3%) at 0.3 m. - Atterberg Limits: Liquid Limit (66), Plastic Limit (18), Plasticity Index (48) at 0.3 m.		S2									
						S3									
231						S4									
230.8	1			<b>SILTY CLAY (CL-ML)</b> - Light brown, moist, soft, no to low plasticity, trace fine grained sand. - Grain Size Distribution: Gravel (0.1%), Sand (5.2%), Silt (76.2%) and Clay (18.5%) at 1.2 m. - Atterberg Limits: Liquid Limit (21), Plastic Limit (17), Plasticity Index (4) at 1.2 m.		S5									
						S6									
230.0				<b>FAT CLAY (CH)</b> - Brown, moist, stiff, high plasticity, trace silt nodules.		S7									
230						S8									
						S9									
229															
228.8	3	10		<b>END OF TEST HOLE AT 3.05 m</b>											
				Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.											
228															

GEO-TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

CONTRACTOR **Maple Leaf Drilling** INSPECTOR **C. FRIESEN** APPROVED **KWH** DATE **3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 61 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.76  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/23/2019  
**UTM (m)** N 5,528,065  
 E 631,887

ELEVATION (m)	DEPTH		GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★			Cu TORVANE (kPa) ◆		
	(m)	(ft)							20	40	60	80	20	40
231.6				CONCRETE - 140 mm thickness.	S1									
				FAT CLAY (CH) - Brown, frozen, high plasticity.	S2									
231					S3									
	1				S4									
230.6				SILT (ML) - Light brown, moist, soft, no to low plasticity.	S5									
230.2		5		LEAN CLAY (CL) - Brown, moist, stiff, low to intermediate plasticity.	S6									
230					S7									
	2				S8									
229.5				FAT CLAY (CH) - Brown, moist, stiff, high plasticity, trace silt nodules.	S9									
229														
228.7		10		END OF TEST HOLE AT 3.05 m										
				Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.										
228														

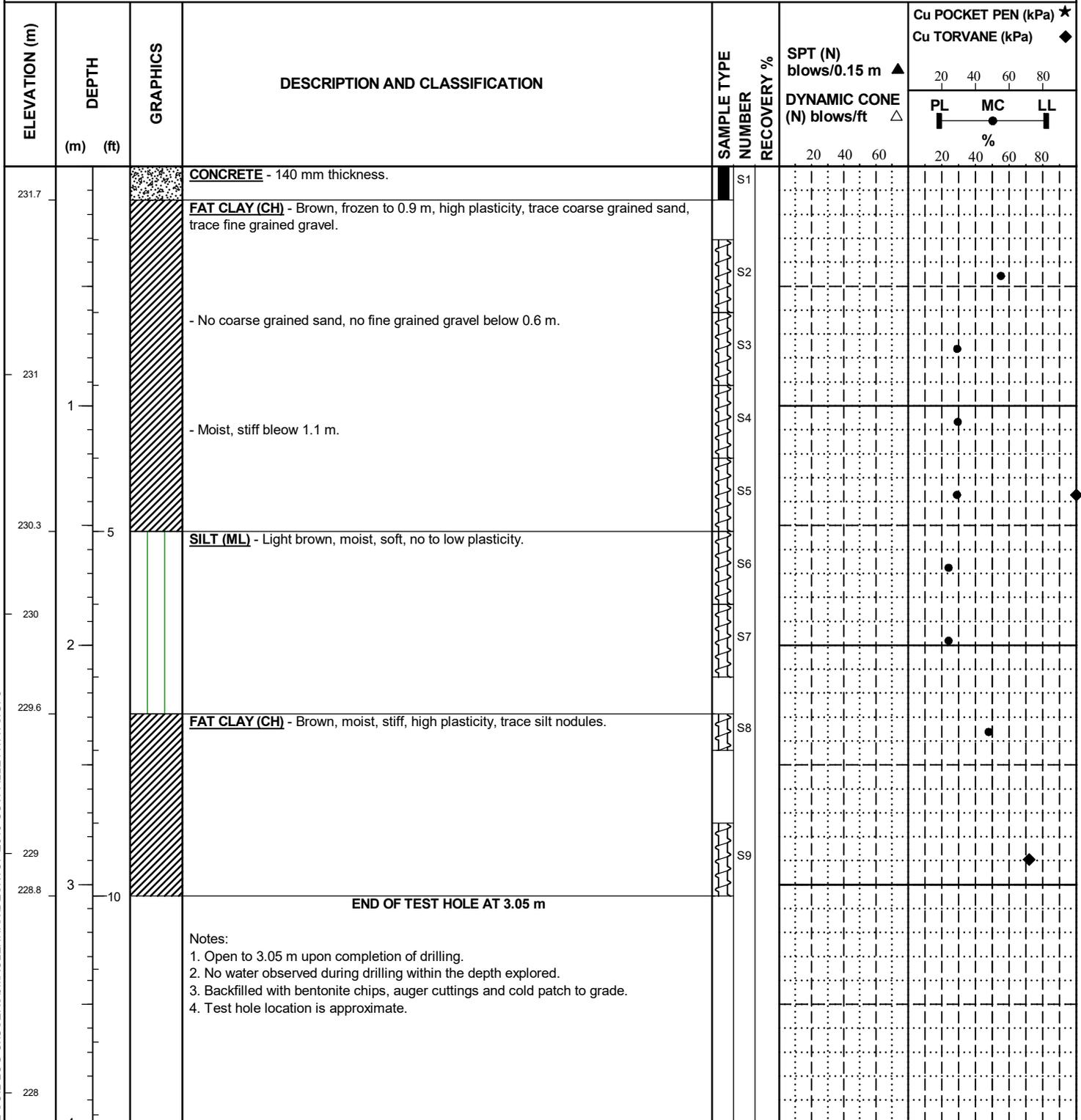
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

<b>CONTRACTOR</b> Maple Leaf Drilling	<b>INSPECTOR</b> C. FRIESEN	<b>APPROVED</b> KWH	<b>DATE</b> 3/7/19
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Victor Alley, W of Victor St., E of Toronto St., N of St. Matthews Ave. to Ellice Ave.  
**LOCATION** 18 m North of St. Matthews Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.87  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/23/2019  
**UTM (m)** N 5,528,022  
 E 631,886



SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

## **APPENDIX C**

### **Sherbrook Alley Alley**

Figure C1 – Test Hole Locations

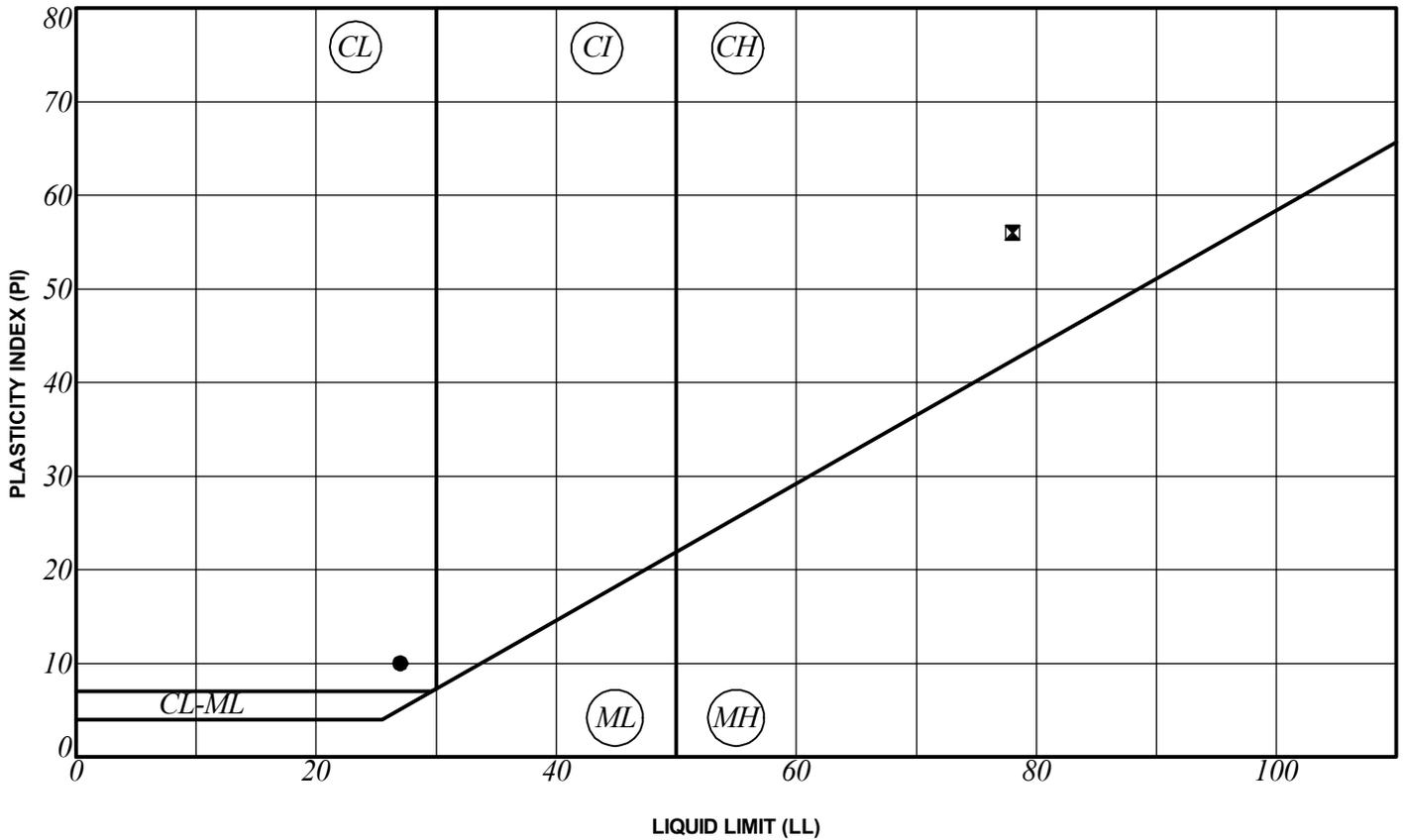
Figure C2 – A-Line Plot

Figure C3 – Grain Size Analyses

Summary Logs TH19-301 to TH19-306

**FIGURE C1**  
**SHERBROOK ALLEY – TEST HOLE LOCATIONS**





SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-302	0.6	S3	27	17	10	5.3	68.0	26.7	27.6	CL
⊠	TH19-304	0.9	S4	78	22	56	3.6	17.1	79.3	31.6	CH

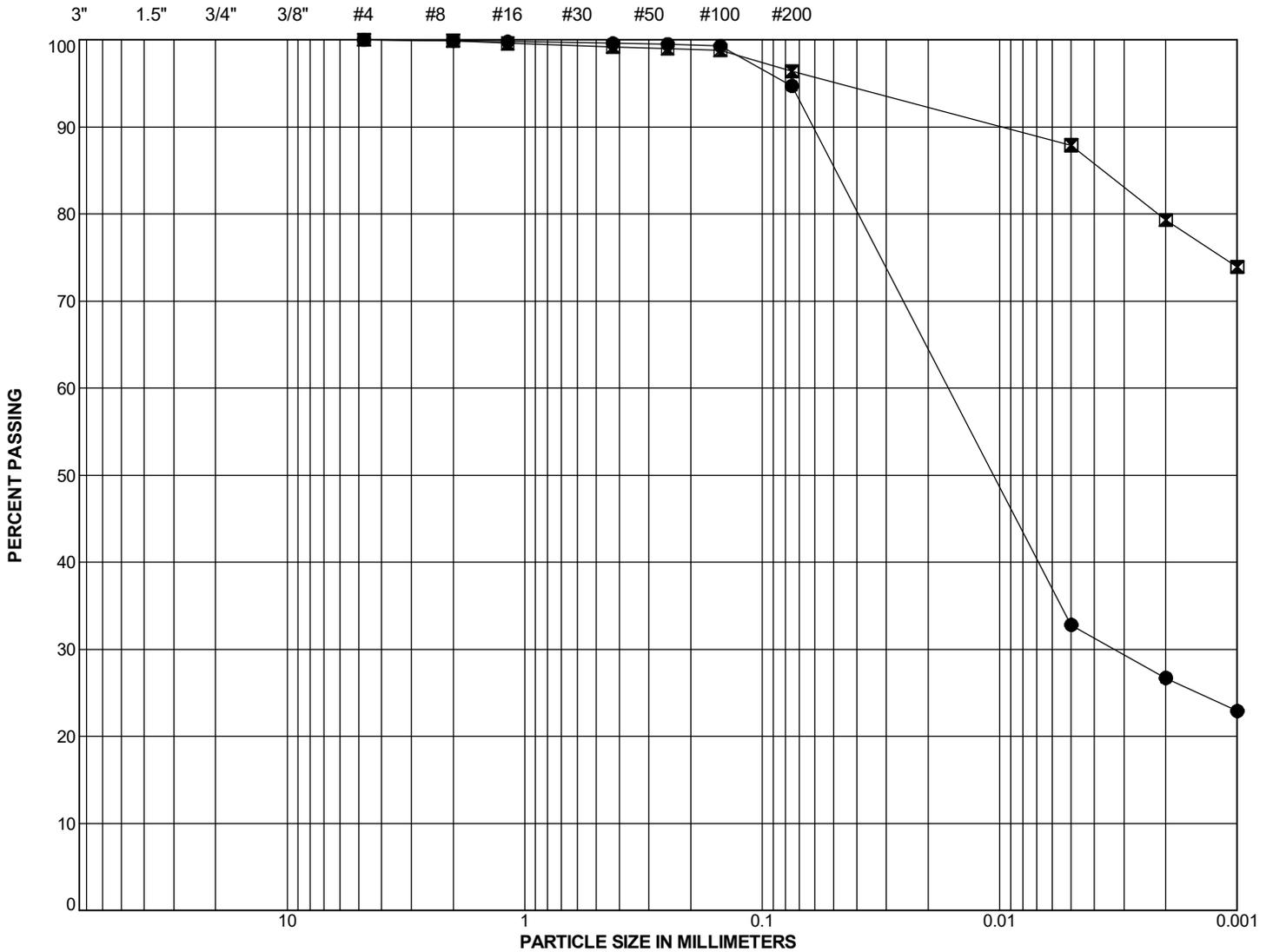
**Notes:**

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content
- NP - Non-Plastic

<b>KGS GROUP</b>	<b>KGS GROUP</b>
2019 City of Winnipeg Alleys Package	
<b>A-LINE PLOT</b>	
March 2019	Page 1 of 1

SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

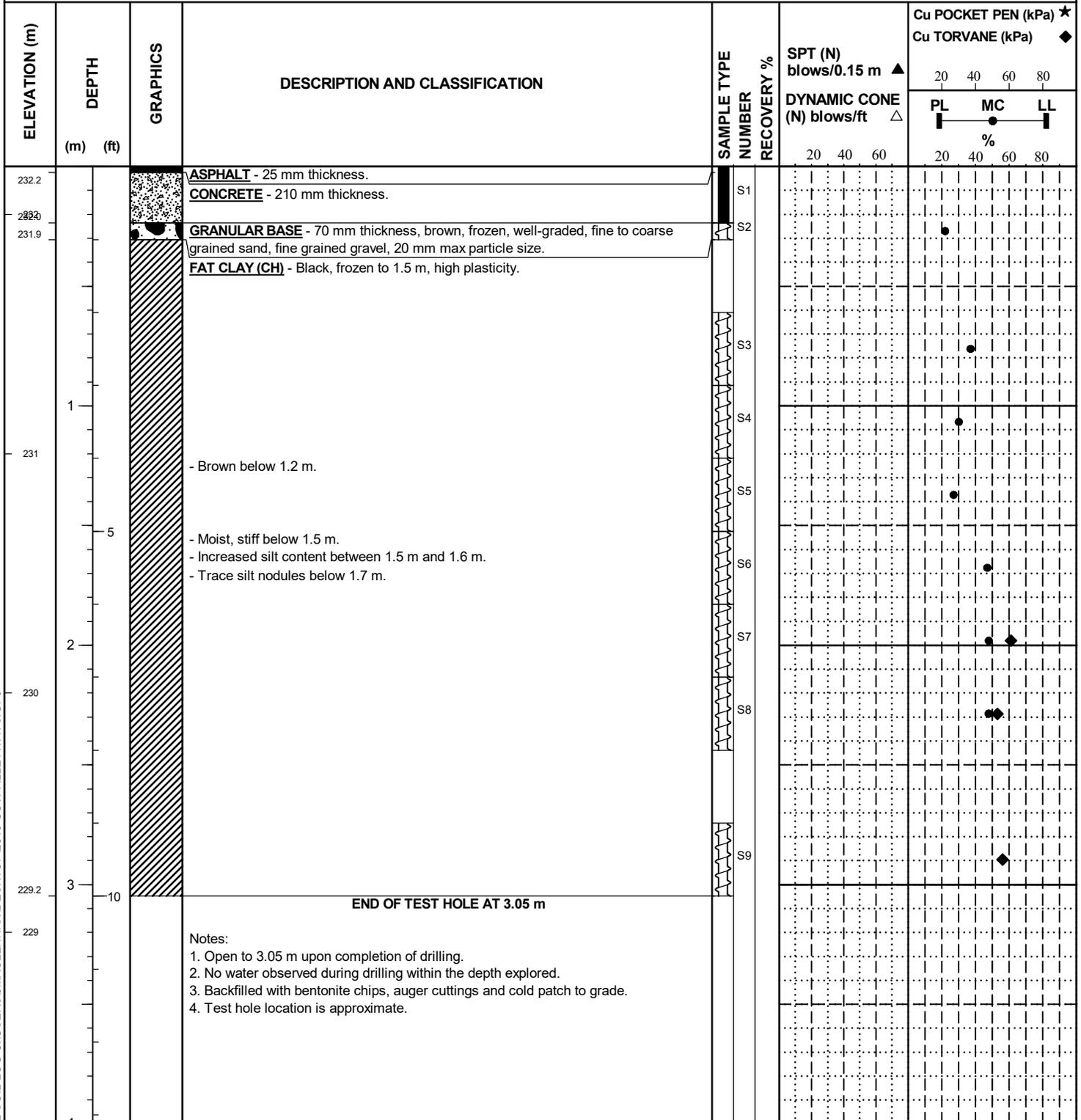
SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-302	0.6	S3	0.0	5.3	68.0	26.7	94.7			CL
⊠	TH19-304	0.9	S4	0.0	3.6	17.1	79.3	96.4			CH

SIEVE ANALYSIS C:\USERS\JMACLENNAN\DESKTOP\2019\_COW\_ALLEYS\WAYS.GPJ

	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>GRAIN SIZE ANALYSES</b>		
March 2019	Figure C3	Page 1 of 1

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 443 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.20  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,528,310  
 E 632,288



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 391 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.89  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,528,261  
 E 632,295

ELEVATION (m)	DEPTH		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) ◆		
	(m)	(ft)								20	40	60	80	20	40
231.7				<b>CONCRETE</b> - 150 to 200 mm thickness.	Core Barrel	S1									
231.6				<b>GRANULAR BASE</b> - 130 mm thickness, brown, frozen, well-graded, fine to coarse grained sand, fine grained gravel, 20 mm max particle size.	Auger Grab	S2									
231.3				<b>FAT CLAY (CH)</b> - Brown, frozen, high plasticity.	Auger Grab	S3									
231	1			<b>LEAN CLAY (CL)</b> - Light brown, frozen, trace fine to medium grained sand. - Grain Size Distribution: Gravel (0.0%), Sand (5.3%), Silt (68.0%) and Clay (26.7%) at 0.6 m. - Atterberg Limits: Liquid Limit (27), Plastic Limit (17), Plasticity Index (10) at 0.6 m.	Auger Grab	S4									
230.7		5		<b>FAT CLAY (CH)</b> - Brown, frozen to 1.4 m, high plasticity. - Moist, stiff below 1.4 m.	Auger Grab	S5									
230	2				Auger Grab	S6									
229					Auger Grab	S7									
228.8	3	10			Auger Grab	S8									
228	4			<b>END OF TEST HOLE AT 3.05 m</b>		S9									

- Notes:  
 1. Open to 3.05 m upon completion of drilling.  
 2. No water observed during drilling within the depth explored.  
 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade.  
 4. Test hole location is approximate.

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR  
**Maple Leaf Drilling**

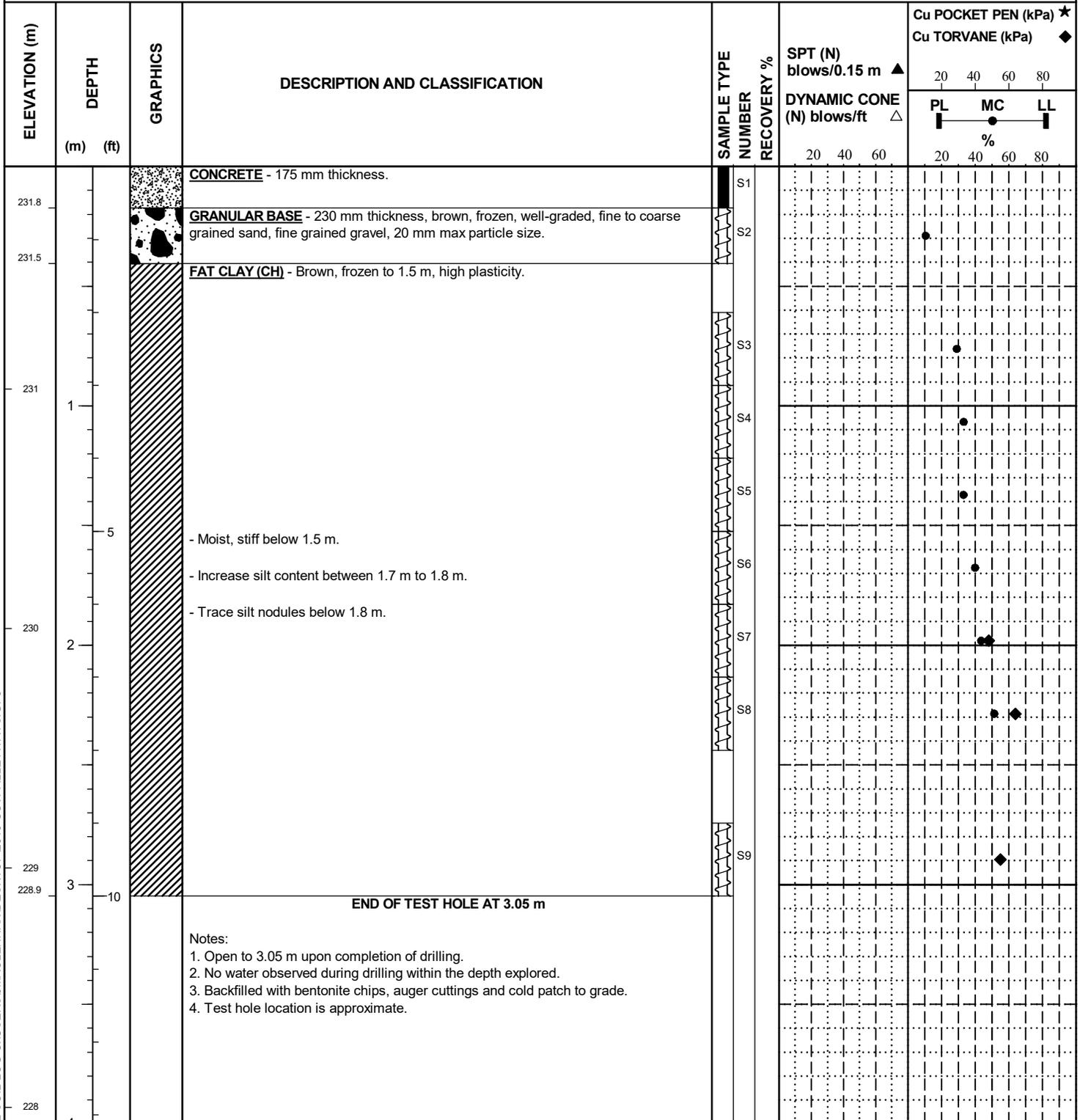
INSPECTOR  
**C. FRIESEN**

APPROVED  
**KWH**

DATE  
**3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 309 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.93  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,528,179  
 E 632,293



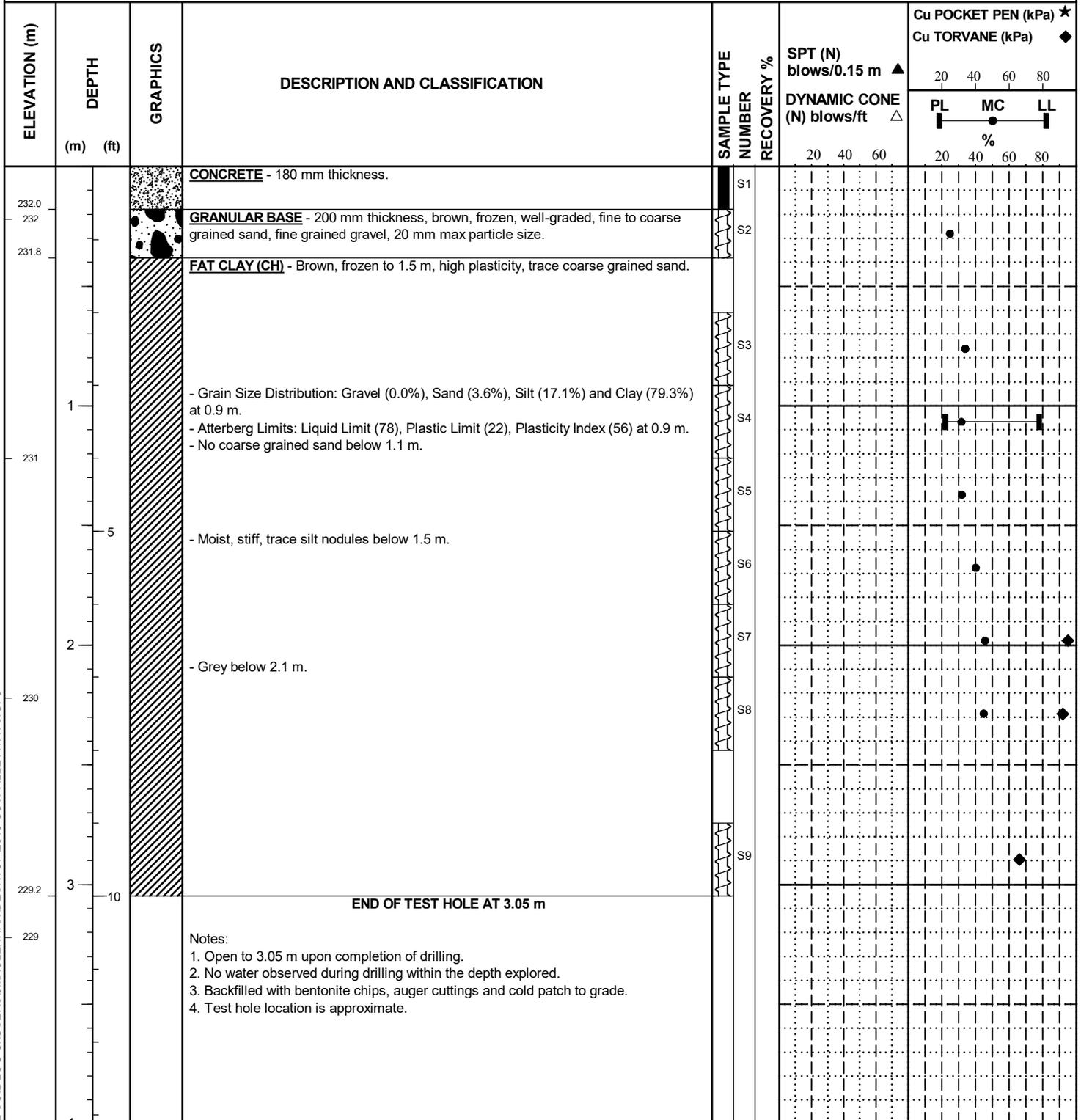
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR <b>Maple Leaf Drilling</b>	INSPECTOR <b>C. FRIESEN</b>	APPROVED <b>KWH</b>	DATE <b>3/7/19</b>
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 254 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.22  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,528,124  
 E 632,292



SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

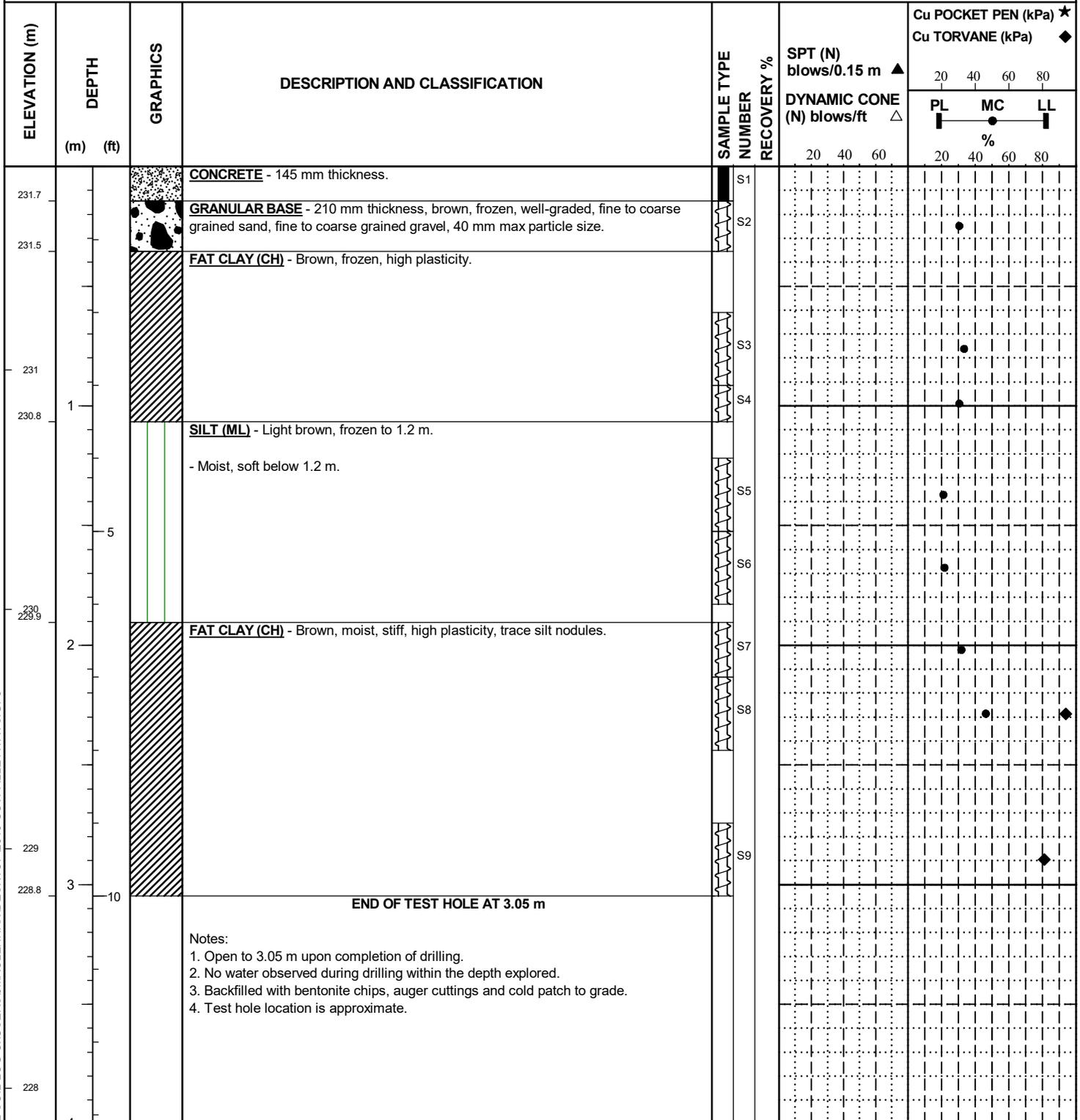
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 140 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.85  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,528,010  
 E 632,290



- Notes:
- Open to 3.05 m upon completion of drilling.
  - No water observed during drilling within the depth explored.
  - Backfilled with bentonite chips, auger cuttings and cold patch to grade.
  - Test hole location is approximate.

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

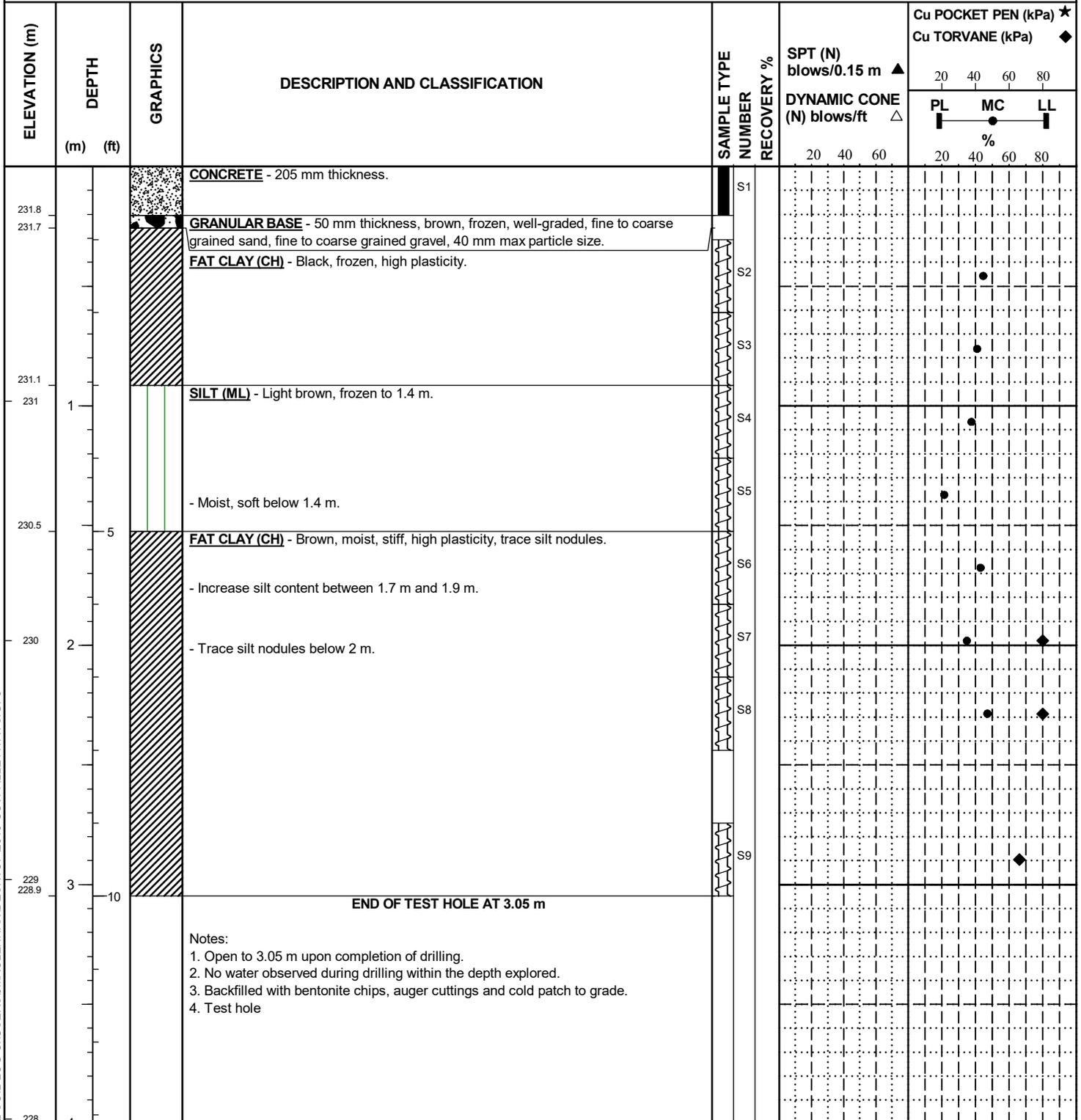
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Sherbrook Alley, E of Sherbrook St., W of Furby St., N of Portage Ave. to Ellice Ave.  
**LOCATION** 65 m North of Portage Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 231.98  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2/4/2019  
**UTM (m)** N 5,527,935  
 E 632,288



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

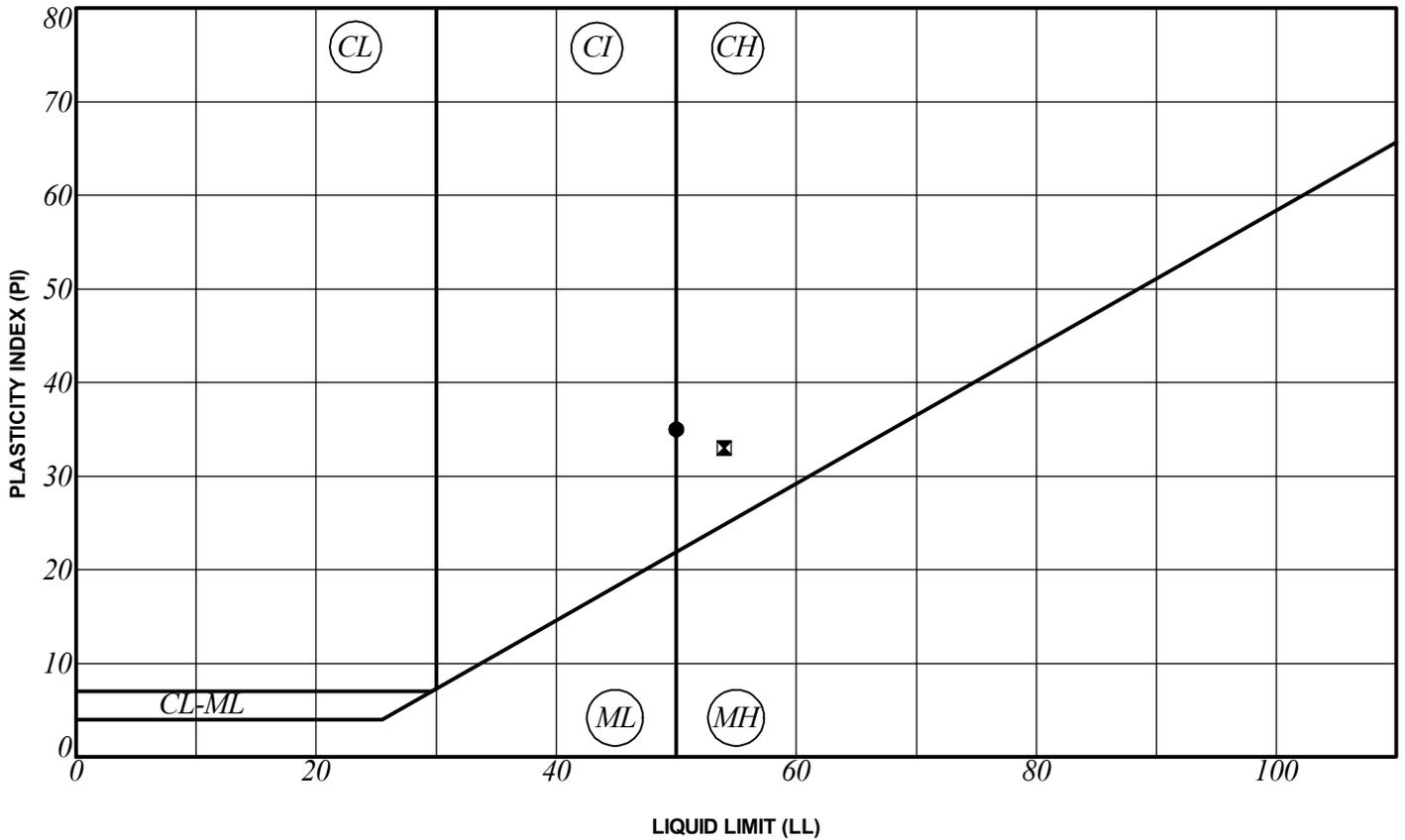
## **APPENDIX D**

### **Garfield Alley**

Figure D1 – Test Hole Locations  
Figure D2 – A-Line Plot  
Figure D3 – Grain Size Analyses  
Summary Logs TH19-401 to TH19-408

**FIGURE D1**  
**GARFIELD ALLEY – TEST HOLE LOCATIONS**





SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-404	0.3	S2	50	15	35	23.5	30.3	46.1	36.4	CH
⊠	TH19-406	0.3	S2	54	21	33	24.1	35.9	39.5	46.9	CH

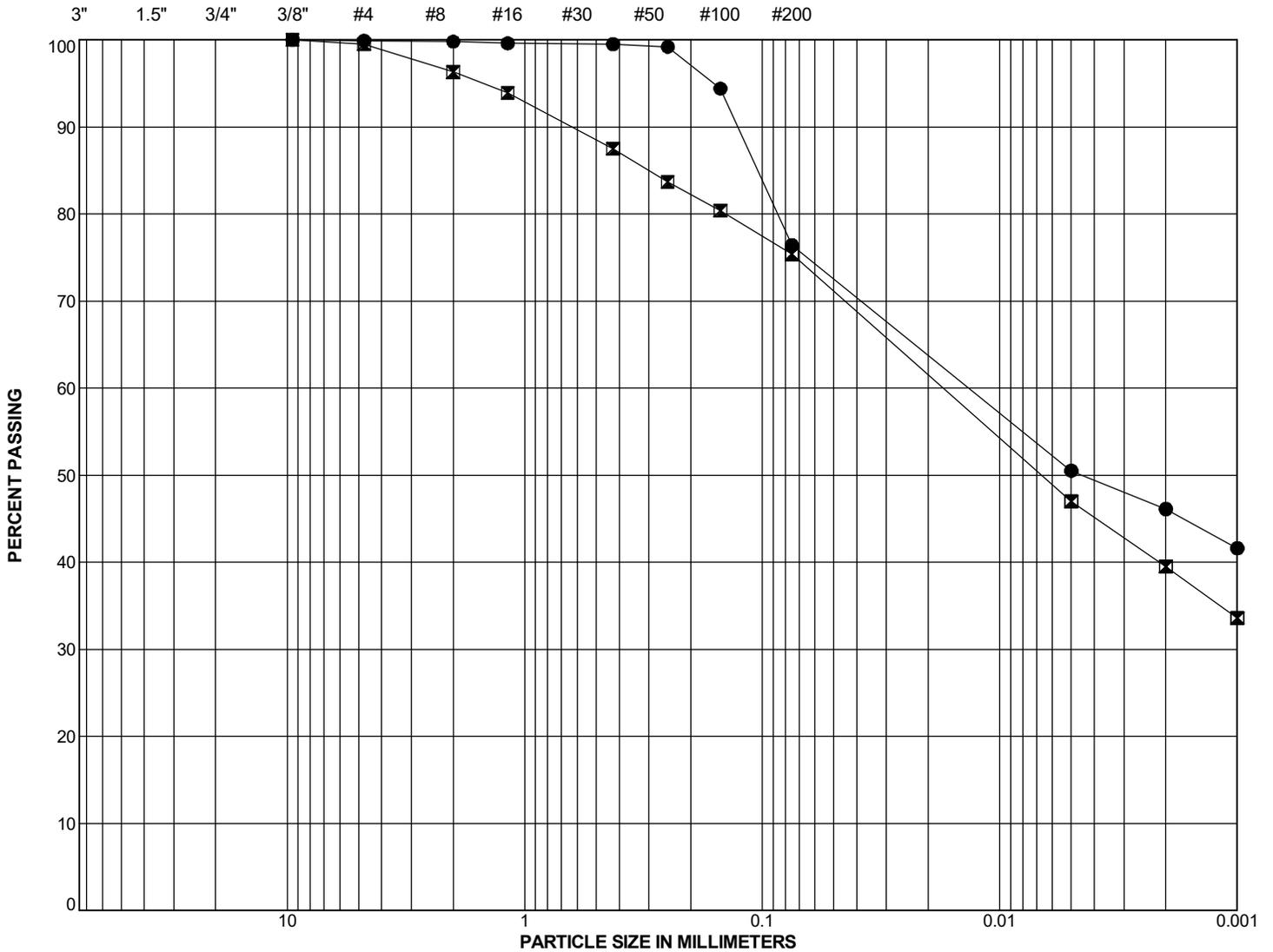
**Notes:**

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content
- NP - Non-Plastic

<b>KGS GROUP</b>	<b>KGS GROUP</b>	
2019 City of Winnipeg Alleys Package		
<b>A-LINE PLOT</b>		
March 2019	Figure D2	Page 1 of 1

SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

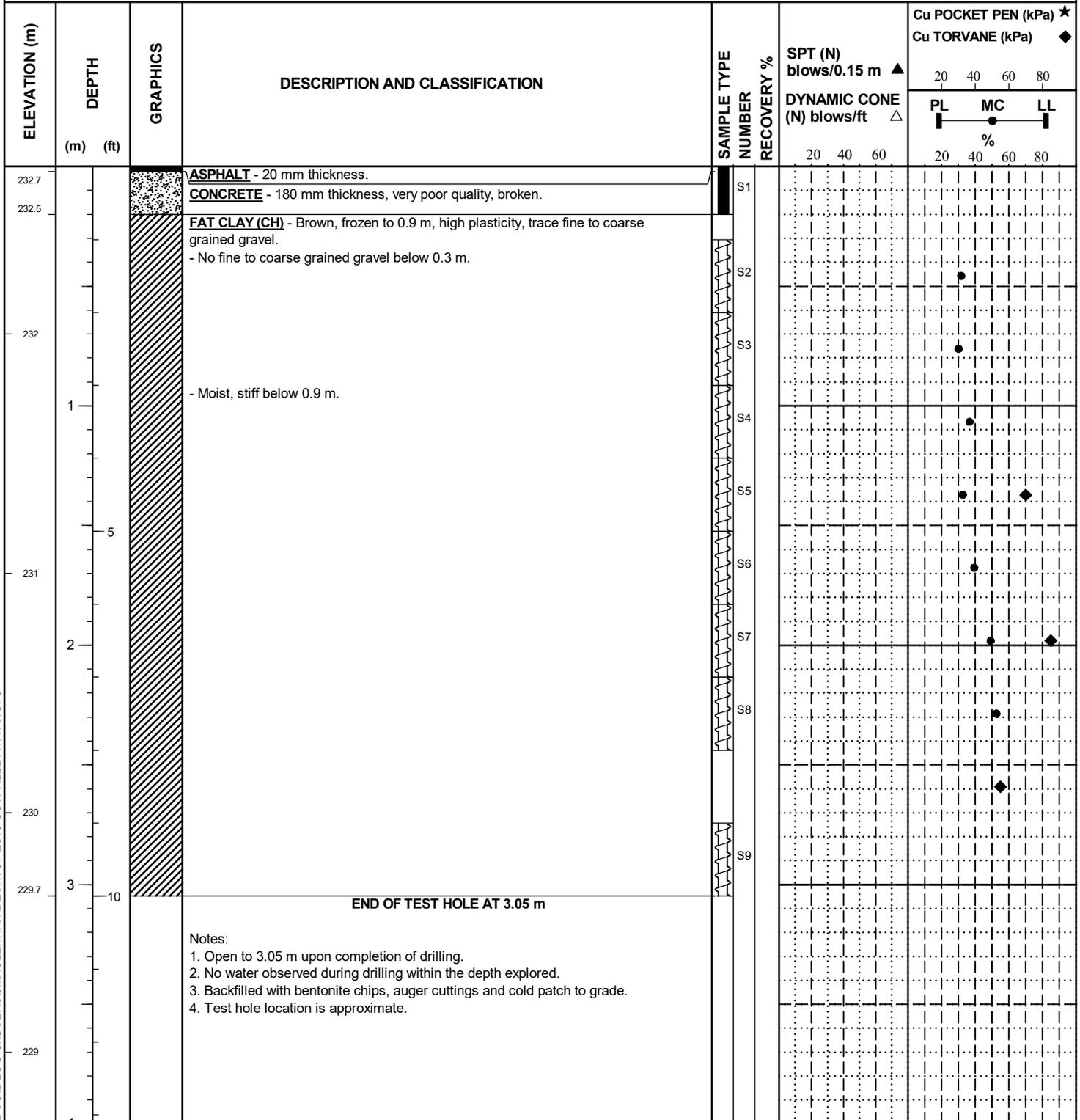
SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-404	0.3	S2	0.1	23.5	30.3	46.1	76.4			CH
■	TH19-406	0.3	S2	0.5	24.1	35.9	39.5	75.4			CH

SIEVE ANALYSIS C:\USERS\JMACLENNAN\DESKTOP\2019\_COW\_ALLEYS\WAYS.GPJ

	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>GRAIN SIZE ANALYSES</b>		
March 2019	Figure D3	Page 1 of 1

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 369 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.70  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,528,015  
 E 630,923



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

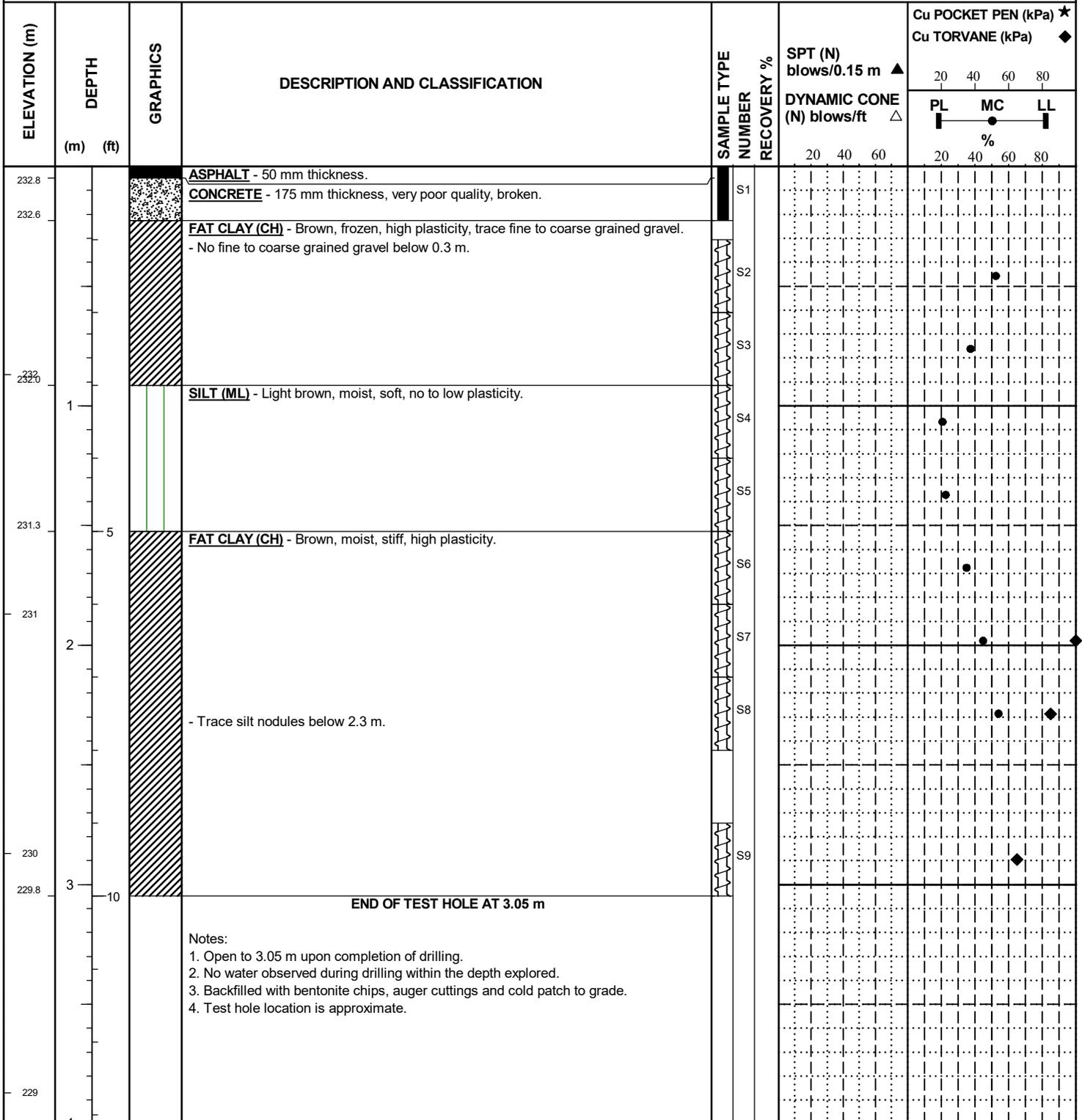
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 306 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.87  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,527,952  
 E 630,922



Notes:  
 1. Open to 3.05 m upon completion of drilling.  
 2. No water observed during drilling within the depth explored.  
 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade.  
 4. Test hole location is approximate.

SAMPLE TYPE Core Barrel Auger Grab

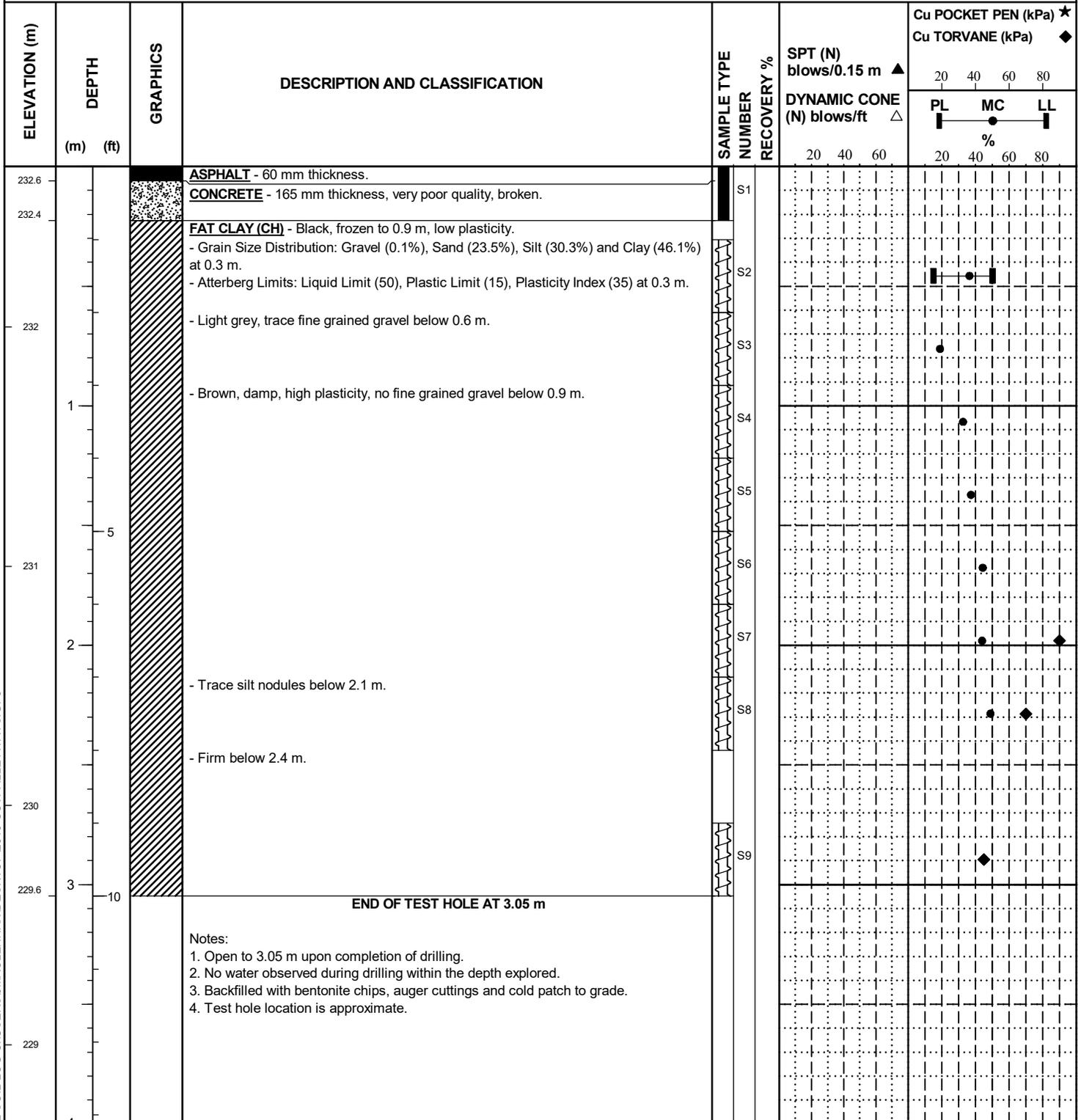
CONTRACTOR **Maple Leaf Drilling** INSPECTOR **C. FRIESEN** APPROVED **KWH** DATE **3/7/19**

GEO-TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ



**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 224 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.67  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/21/2019  
**UTM (m)** N 5,527,870  
 E 630,920



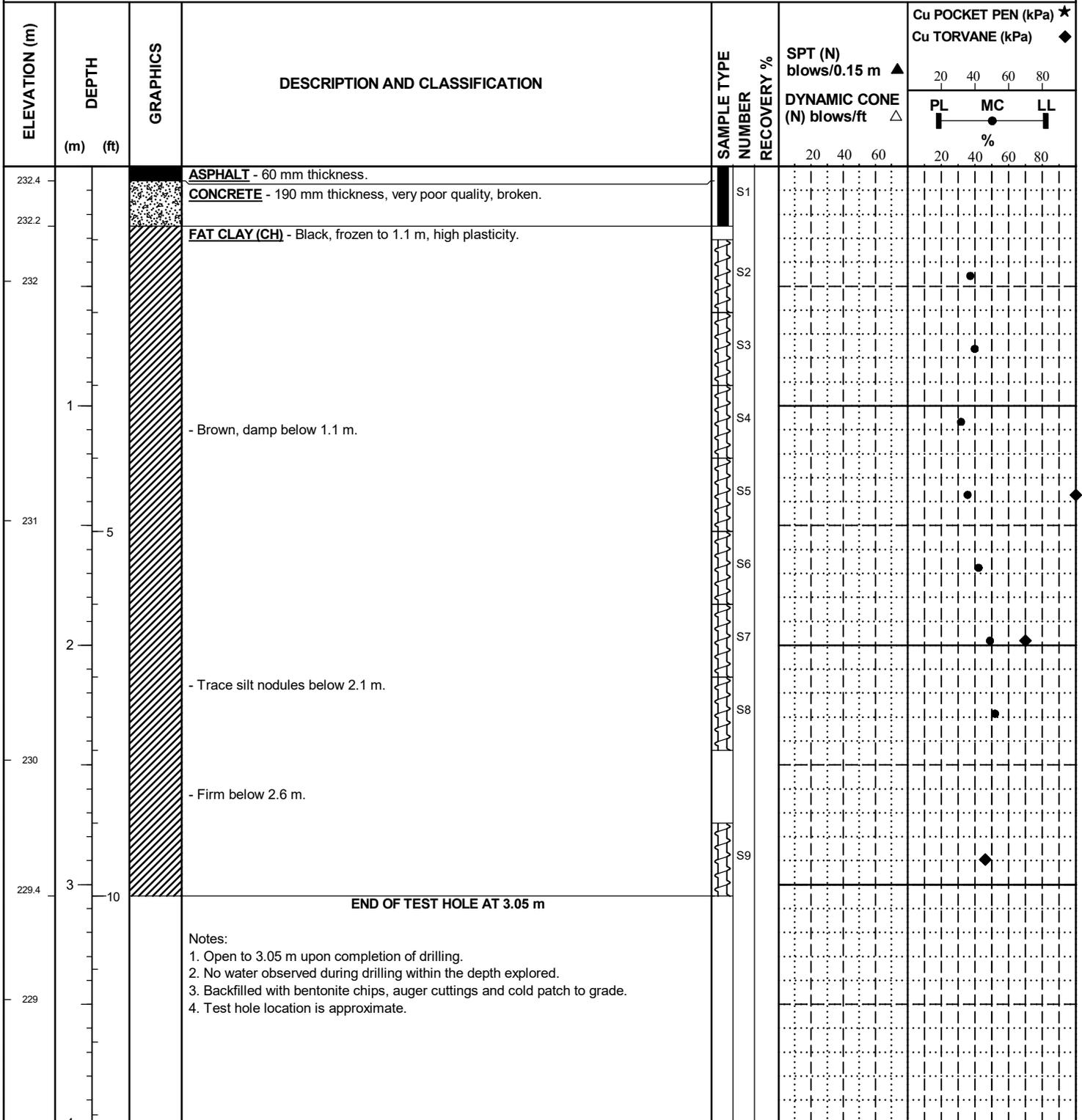
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR <b>Maple Leaf Drilling</b>	INSPECTOR <b>C. FRIESEN</b>	APPROVED <b>KWH</b>	DATE <b>3/7/19</b>
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 169 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.48  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,527,815  
 E 630,918



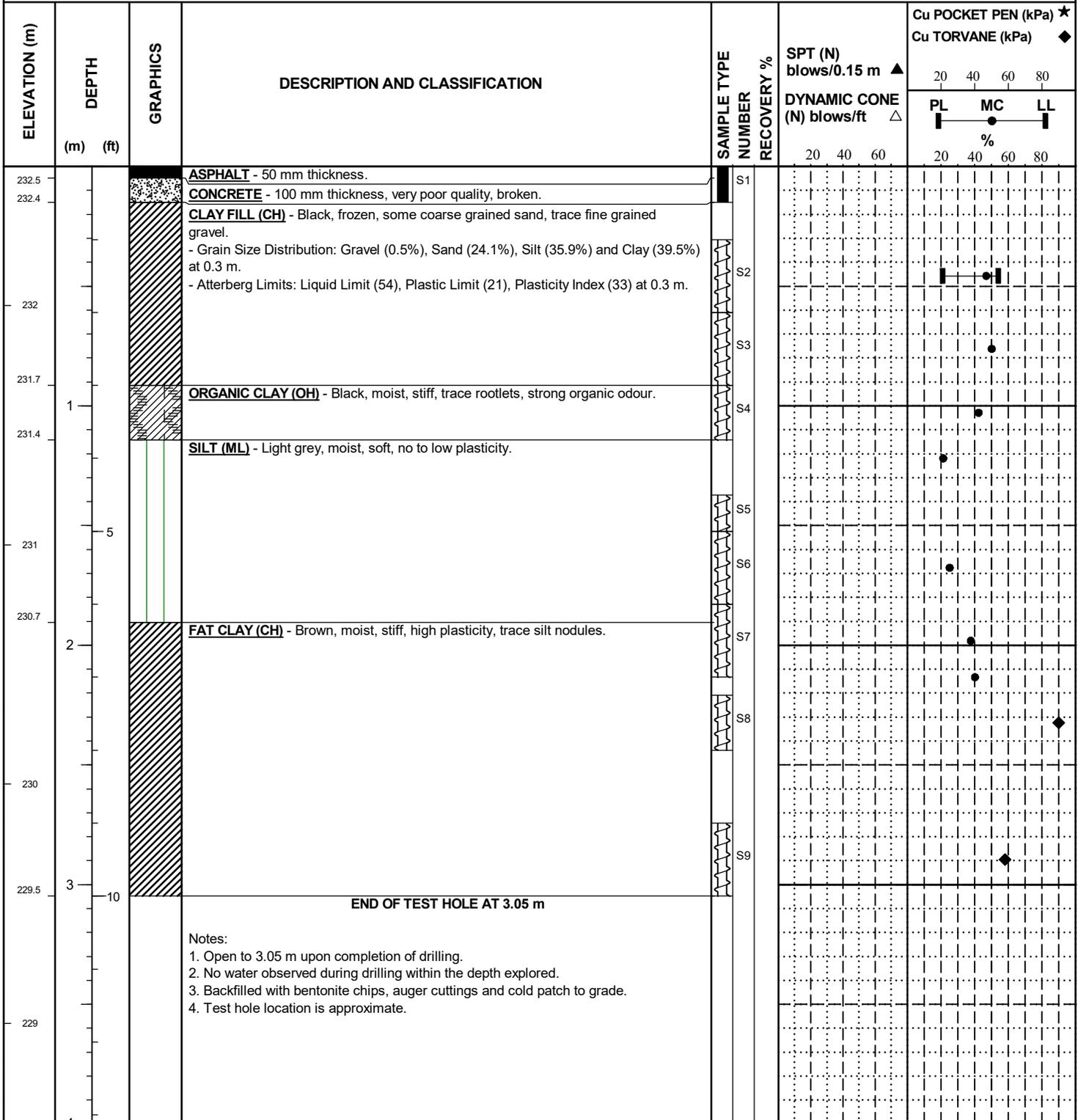
SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR **Maple Leaf Drilling** INSPECTOR **C. FRIESEN** APPROVED **KWH** DATE **3/7/19**

GEO-TECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 122 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.58  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,527,768  
 E 630,917



SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR  
**Maple Leaf Drilling**

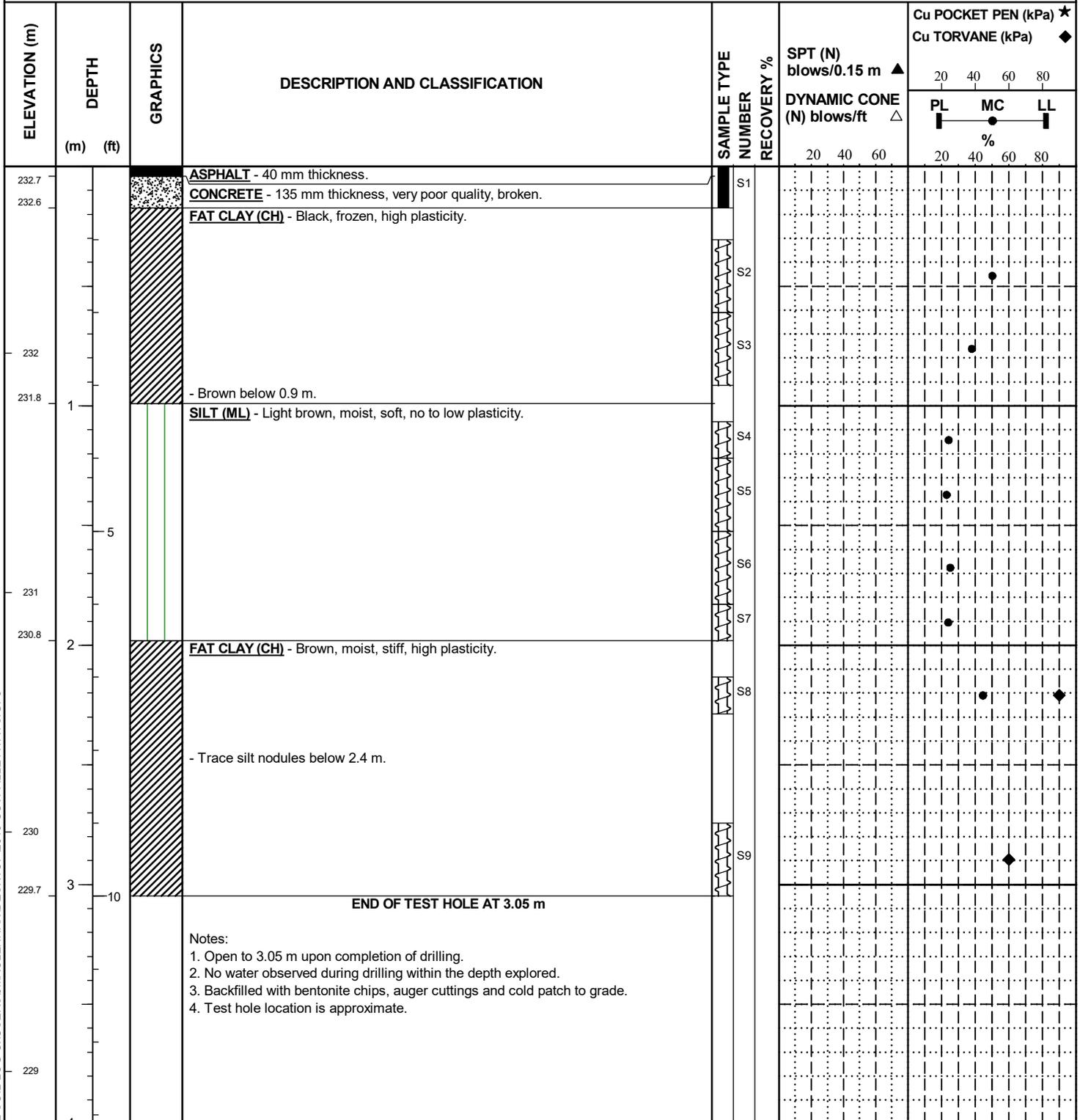
INSPECTOR  
**C. FRIESEN**

APPROVED  
**KWH**

DATE  
**3/7/19**

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 73 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.78  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,527,719  
 E 630,916



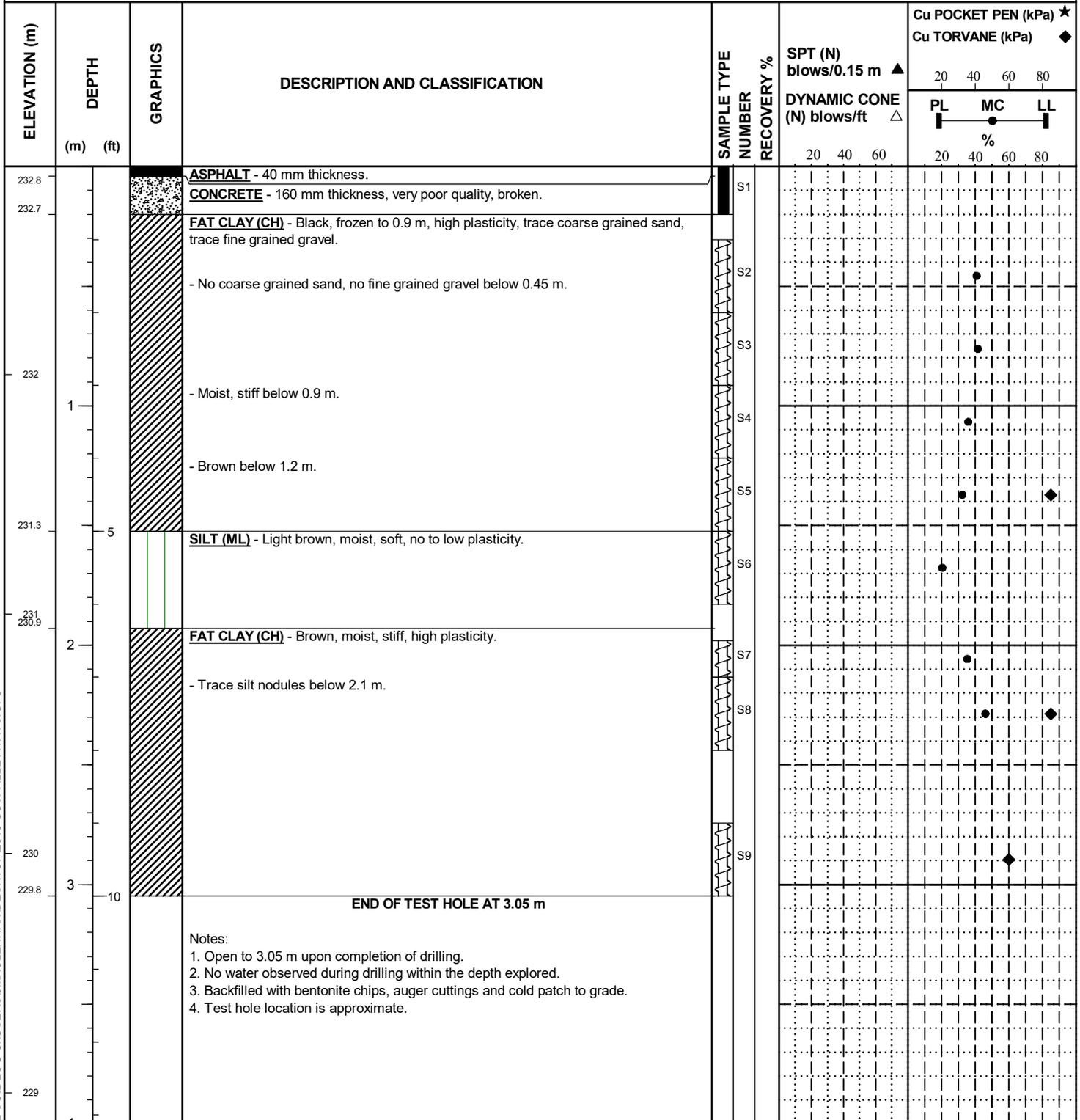
GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYWAYS.GPJ

SAMPLE TYPE  Core Barrel  Auger Grab

CONTRACTOR <b>Maple Leaf Drilling</b>	INSPECTOR <b>C. FRIESEN</b>	APPROVED <b>KWH</b>	DATE <b>3/7/19</b>
--	--------------------------------	------------------------	-----------------------

**CLIENT** KGS GROUP  
**PROJECT** 2019 City of Winnipeg Alleys Package  
**SITE** Garfield Alley, W of Gar. St. N, E of Dom. St., N of Wolever Ave. to St. Matthews Ave.  
**LOCATION** 35 m North of Wolever Avenue Centerline  
**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, Geoprobe Track Drill Rig

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.87  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 1/22/2019  
**UTM (m)** N 5,527,681  
 E 630,915



GEOTECHNICAL-SOIL LOG C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 KWH

**DATE**  
 3/7/19

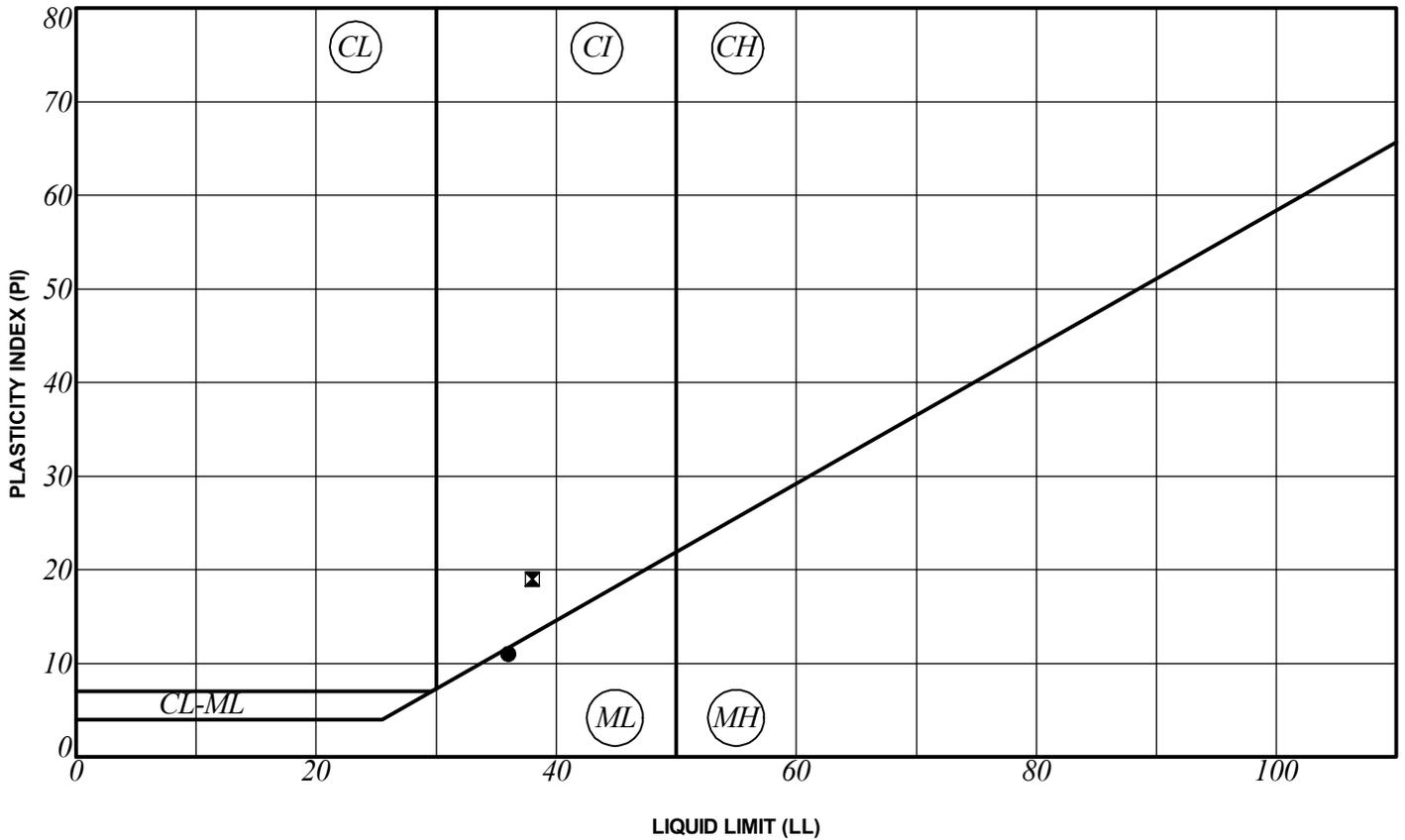
## **APPENDIX E**

### **Ingersoll Alley**

- Figure E1 – Test Hole Locations
- Figure E2 – A-Line Plot
- Figure E3 – Grain Size Analyses
- Summary Logs TH19-501 to TH19-508

**FIGURE E1**  
**INGERSOLL ALLEY – TEST HOLE LOCATIONS**





SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-505	0.3	S2	36	25	11	57.4	31.3	10.3	40.0	ML
⊠	TH19-507	0.9	S4	38	19	19	5.5	56.8	37.7	59.9	CI

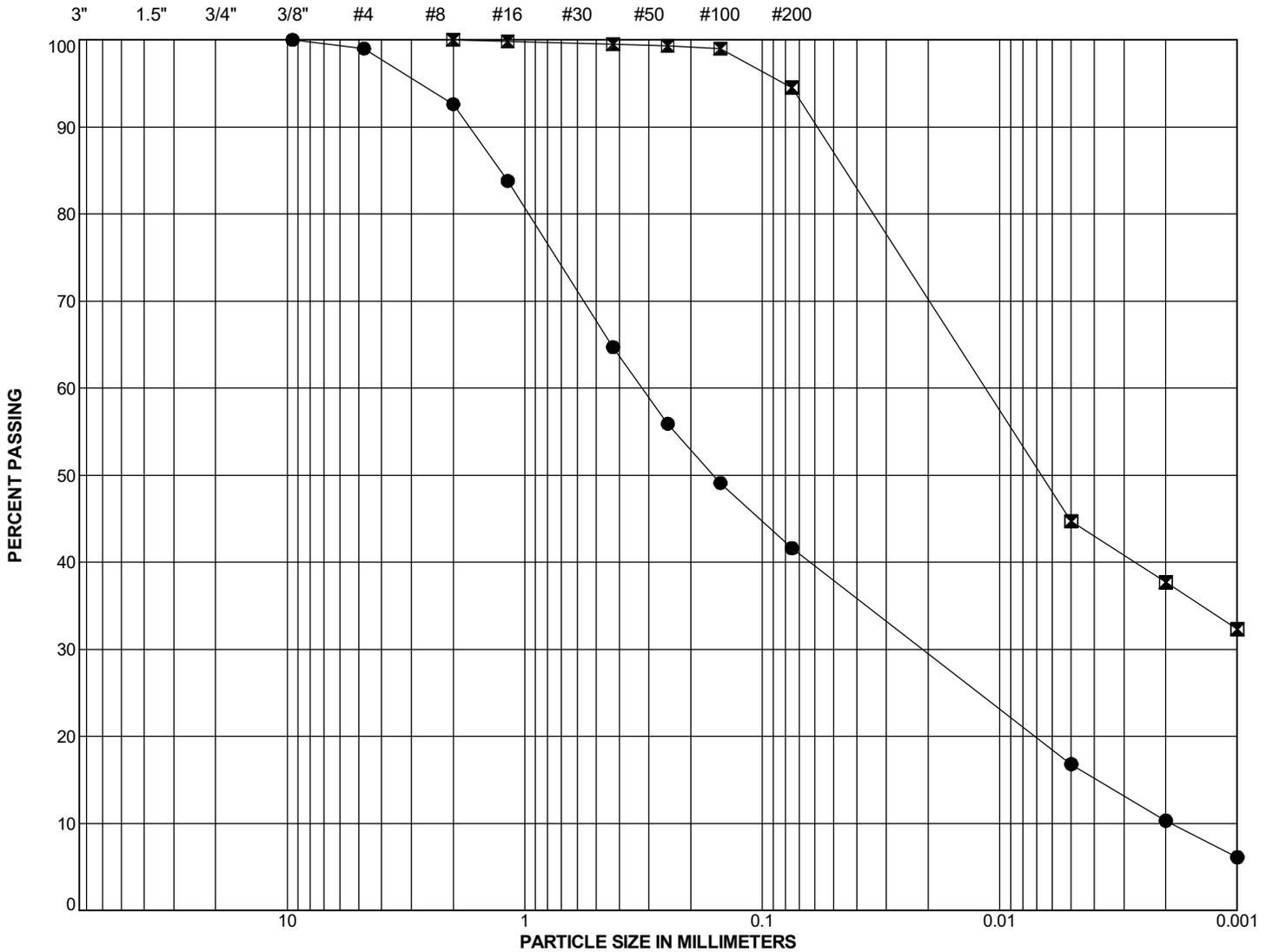
**Notes:**

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content
- NP - Non-Plastic

<b>KGS GROUP</b>	<b>KGS GROUP</b>	
2019 City of Winnipeg Alleys Package		
<b>A-LINE PLOT</b>		
March 2019	Figure E2	Page 1 of 1

SIEVE ANALYSIS

HYDROMETER ANALYSIS



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-505	0.3	S2	1.0	57.4	31.3	10.3	41.6	168.2	0.7	ML
⊠	TH19-507	0.9	S4	0.0	5.5	56.8	37.7	94.5			CI

SIEVE ANALYSIS C:\USERS\JMACLENNAN\DESKTOP\2019\_COW ALLEYS.GPJ

	<b>KGS GROUP</b>	
	2019 City of Winnipeg Alleys Package	
<b>GRAIN SIZE ANALYSES</b>		
March 2019	Figure E3	Page 1 of 1

**CLIENT**  
**PROJECT** 2019 City of Winnipeg Alleys Package

**JOB NO.** 19-0535-002  
**GROUND ELEV.** 232.88  
**TOP OF PVC ELEV.**

**SITE** Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

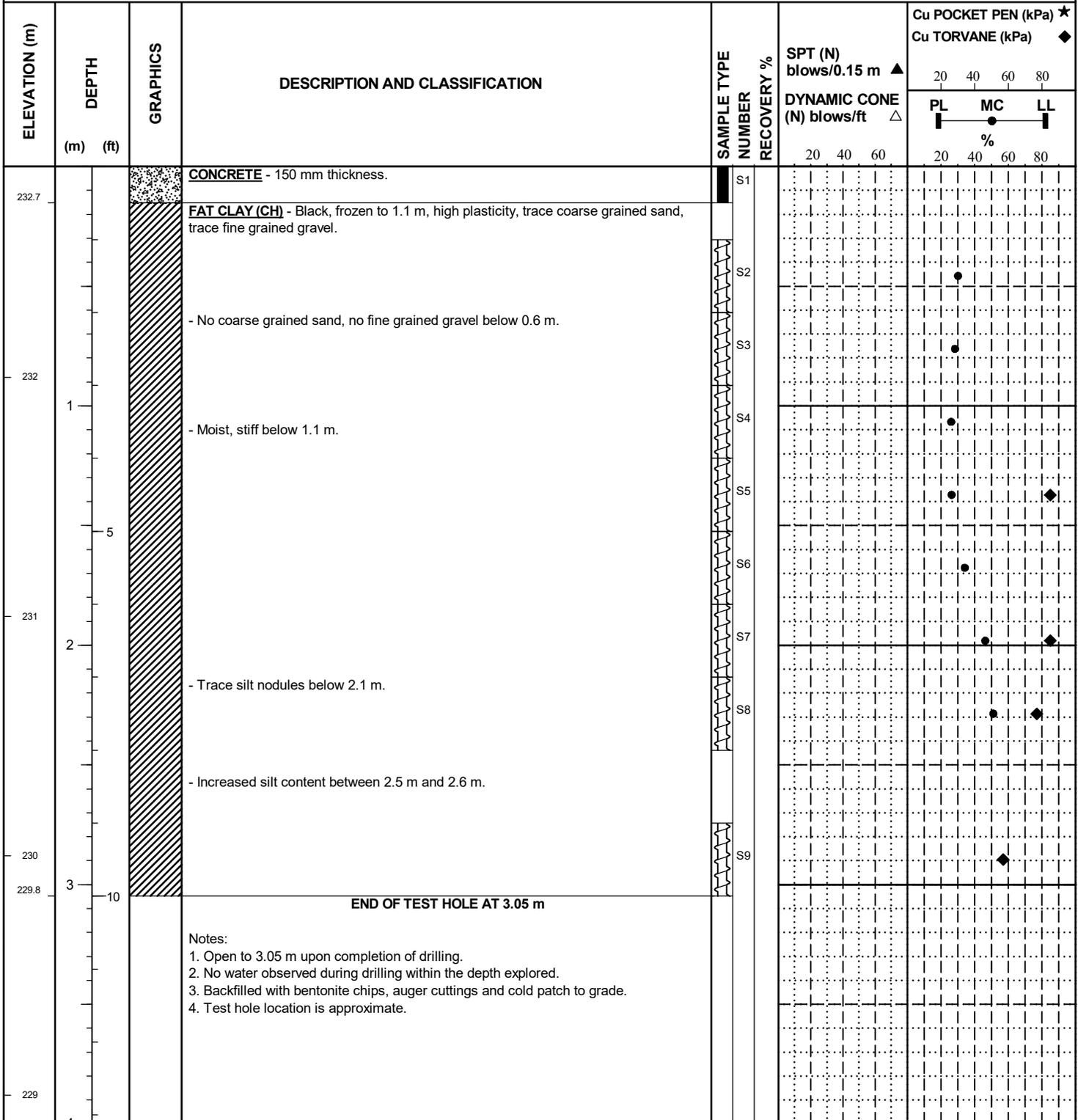
**WATER ELEV.**

**LOCATION** 378 m North of Ellice Avenue Centerline

**DATE DRILLED** 1/23/2019

**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Drill Rig

**UTM (m)** N 5,528,757  
 E 631,103



GEO-TECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR  
**Maple Leaf Drilling**

INSPECTOR  
**C. FRIESEN**

APPROVED  
 KWH

DATE  
 3/7/19

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE**

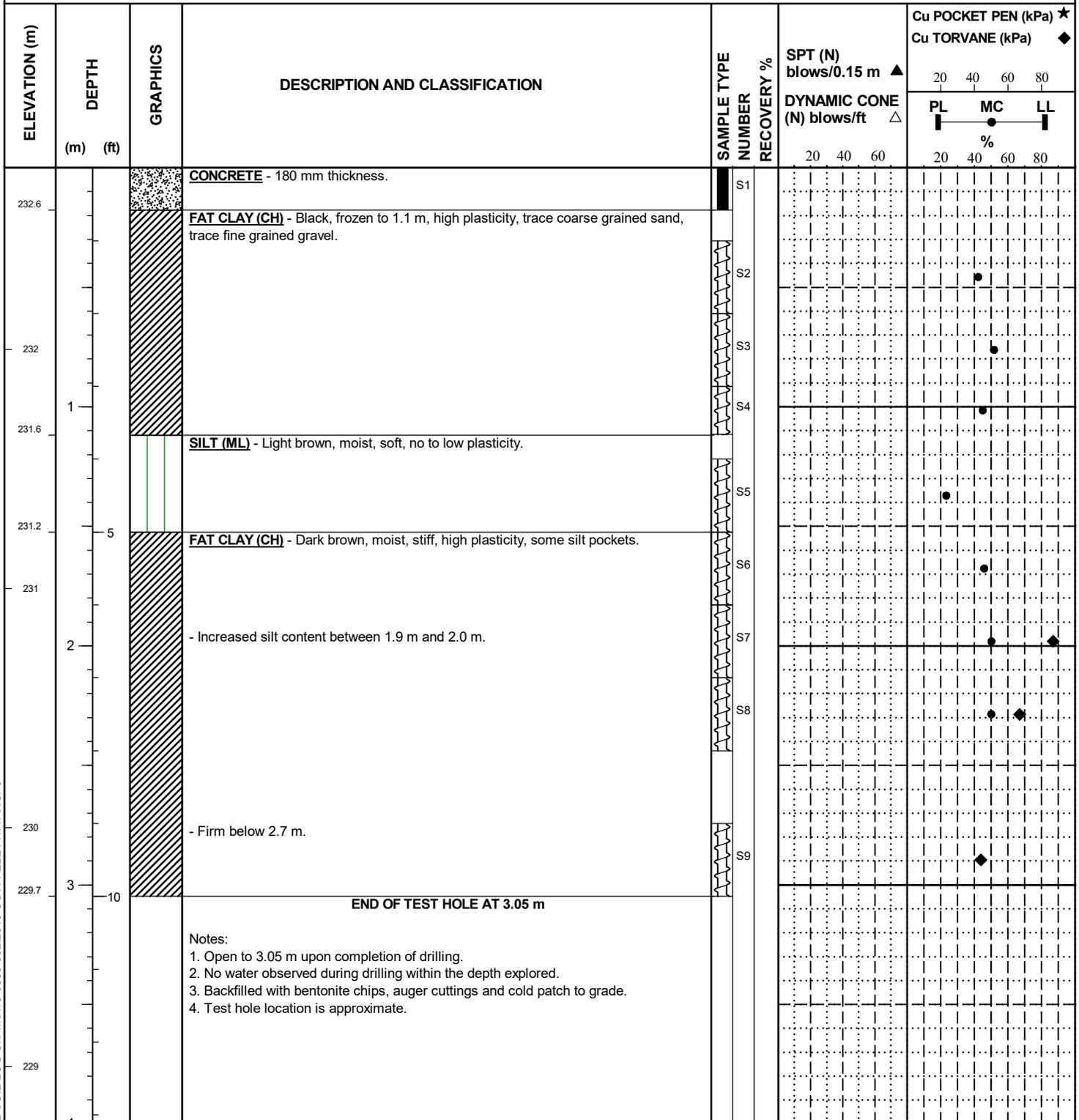
Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION**

331 m North of Ellice Avenue Centerline

**DRILLING METHOD**

 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, B40 Truck Mounted Drill Rig

**JOB NO.**
**19-0535-002**
**GROUND ELEV.**
**232.76**
**TOP OF PVC ELEV.**
**WATER ELEV.**
**DATE DRILLED**
**1/23/2019**
**UTM (m)**
**N 5,528,710**
**E 631,102**


SAMPLE TYPE Core Barrel Auger Grab

 CONTRACTOR  
**Maple Leaf Drilling**

 INSPECTOR  
**C. FRIESEN**

 APPROVED  
 KWH

 DATE  
 3/7/19

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE**

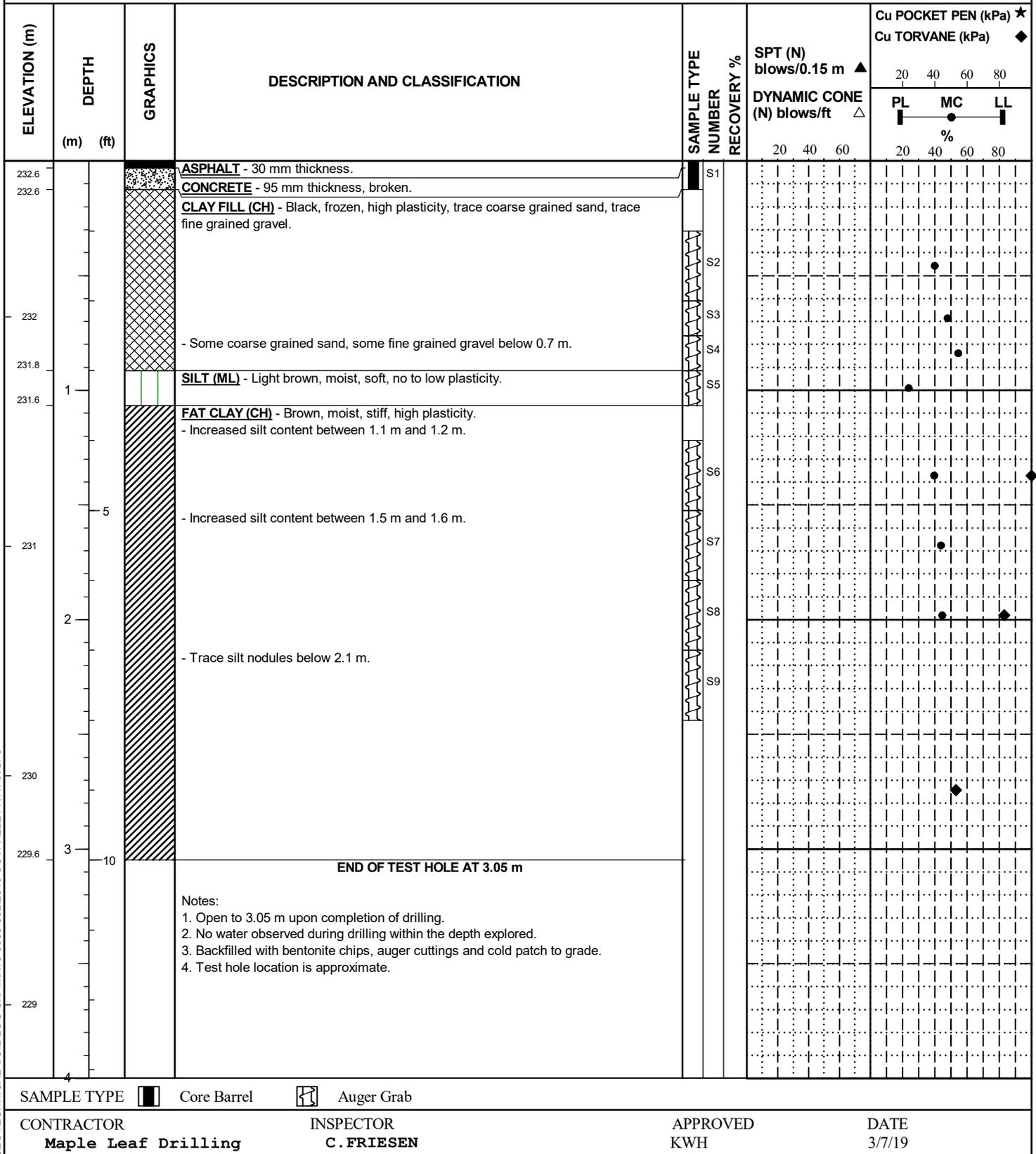
Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION**

280 m North of Ellice Avenue Centerline

**DRILLING METHOD**

 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, B40 Truck Mounted Drill Rig

**JOB NO.**
**19-0535-002**
**GROUND ELEV.**
**232.68**
**TOP OF PVC ELEV.**
**WATER ELEV.**
**DATE DRILLED**
**1/23/2019**
**UTM (m)**
**N 5,528,659**
**E 631,101**


GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

 CONTRACTOR **Maple Leaf Drilling**

 INSPECTOR **C. FRIESEN**

 APPROVED **KWH**

 DATE **3/7/19**

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE**

Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION**

231 m North of Ellice Avenue Centerline

**DRILLING METHOD**

150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Drill Rig

JOB NO.

**19-0535-002**

GROUND ELEV.

**232.80**

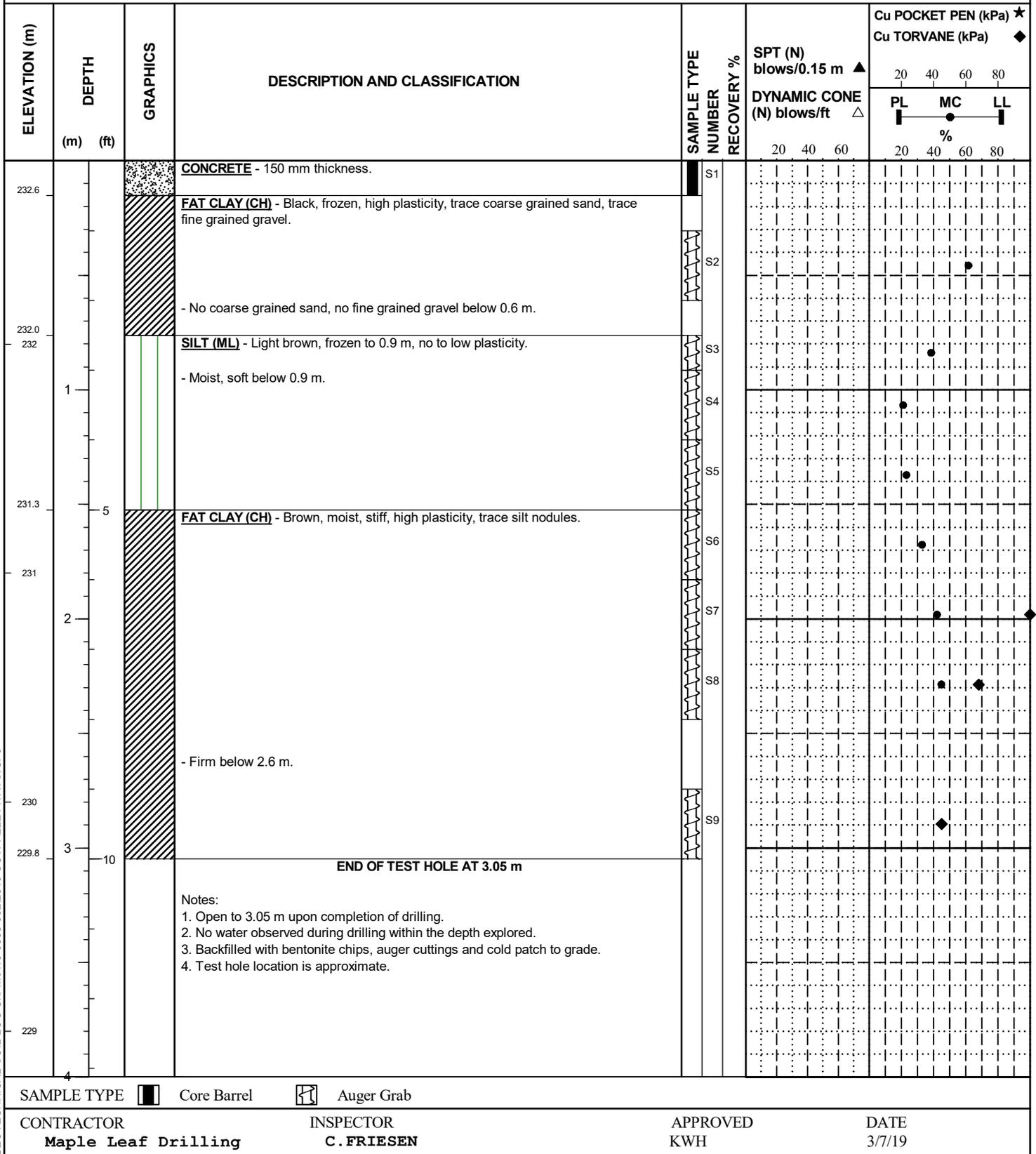
TOP OF PVC ELEV.

WATER ELEV.

DATE DRILLED

**1/23/2019**

UTM (m)

**N 5,528,610**
**E 631,099**


GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

 CONTRACTOR **Maple Leaf Drilling**

 INSPECTOR **C. FRIESEN**

 APPROVED **KWH**

 DATE **3/7/19**

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE**

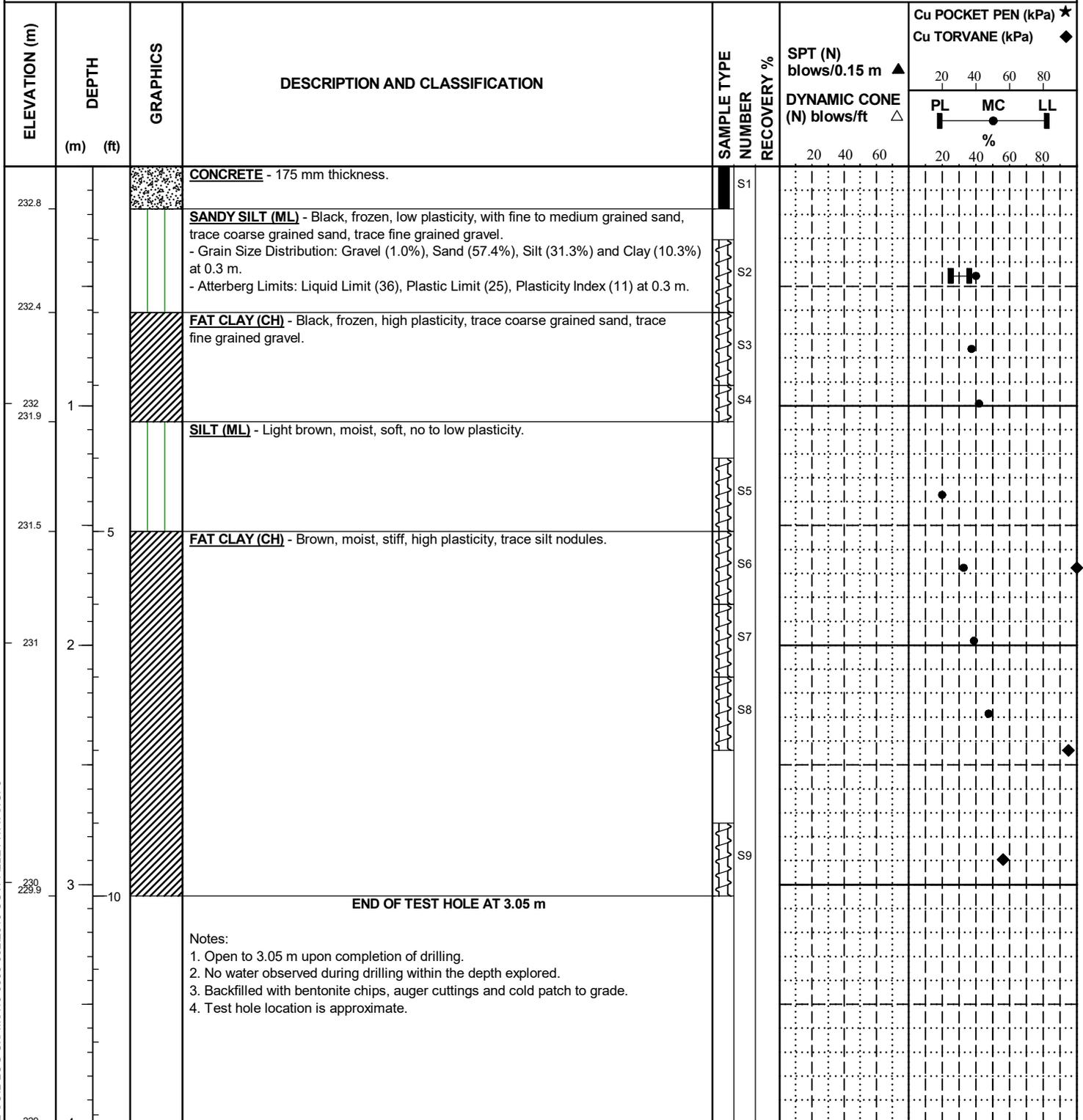
Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION**

173 m North of Ellice Avenue Centerline

**DRILLING METHOD**

 150 mm  $\varnothing$  Core Barrel, 125 mm  $\varnothing$  Solid Stem Auger, B40 Truck Mounted Drill Rig

**JOB NO.**
**19-0535-002**
**GROUND ELEV.**
**232.99**
**TOP OF PVC ELEV.**
**WATER ELEV.**
**DATE DRILLED**
**1/23/2019**
**UTM (m)**
**N 5,528,552**
**E 631,098**


GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYWAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

 CONTRACTOR  
**Maple Leaf Drilling**

 INSPECTOR  
**C. FRIESEN**

 APPROVED  
 KWH

 DATE  
 3/7/19

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE** Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION** 131 m North of Ellice Avenue Centerline

**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Drill Rig

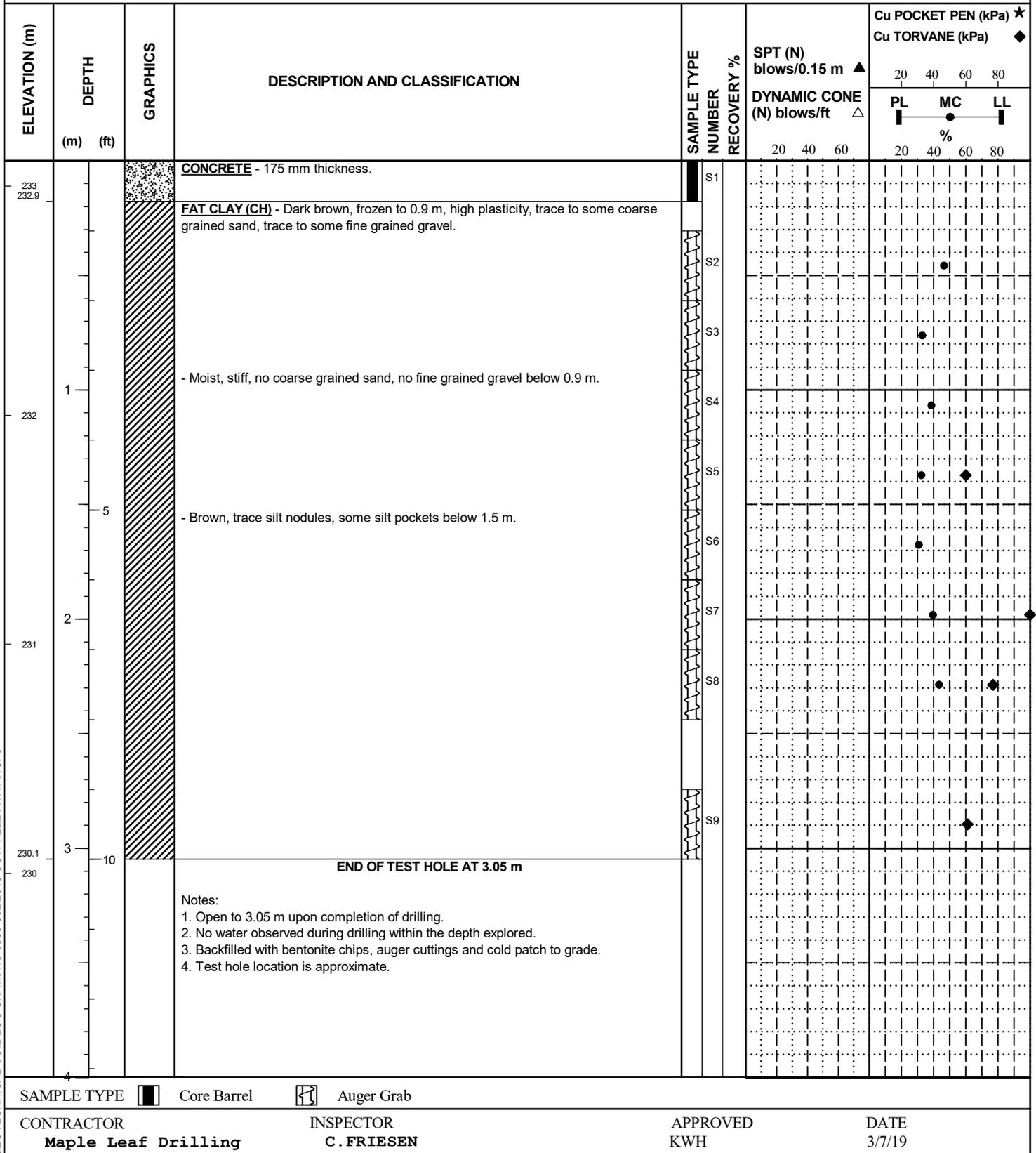
**JOB NO.** 19-0535-002

**GROUND ELEV.** 233.11

**TOP OF PVC ELEV.**
**WATER ELEV.**
**DATE DRILLED** 1/23/2019

**UTM (m)** N 5,528,510

E 631,097



GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYWAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

 CONTRACTOR **Maple Leaf Drilling**

 INSPECTOR **C. FRIESEN**

 APPROVED **KWH**

 DATE **3/7/19**

**CLIENT**

**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE** Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION** 86 m North of Ellice Avenue Centerline

**DRILLING METHOD** 150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Drill Rig

**JOB NO.** 19-0535-002

**GROUND ELEV.** 233.22

**TOP OF PVC ELEV.**

**WATER ELEV.**

**DATE DRILLED** 1/23/2019

**UTM (m)** N 5,528,465

E 631,096

ELEVATION (m)	DEPTH		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) ◆	
	(m)	(ft)								20	40	60	80
233.2				<b>ASPHALT</b> - 20 mm thickness.	S1								
233.0				<b>CONCRETE</b> - 155 mm thickness, very poor quality, broken.									
233				<b>FAT CLAY (CH)</b> - Black, frozen, high plasticity, trace coarse grained sand, trace fine grained gravel.									
232.6				<b>INTERMEDIATE CLAY (CI)</b> - Light brown, frozen to 0.9 m, intermediate plasticity, trace fine grained sand.	S2								
1				- Moist, soft below 0.9 m. - Grain Size Distribution: Gravel (0.0%), Sand (5.5%), Silt (56.8%) and Clay (37.7%) at 0.9 m. - Atterberg Limits: Liquid Limit (38), Plastic Limit (19), Plasticity Index (19) at 0.9 m.	S3								
232					S4								
231.6				<b>FAT CLAY (CH)</b> - Brown, moist, stiff, high plasticity.	S5								
5					S6								
231				- Trace silt nodules below 2.1 m.	S7								
2					S8								
230.2					S9								
3				<b>END OF TEST HOLE AT 3.05 m</b>									
230				Notes: 1. Open to 3.05 m upon completion of drilling. 2. No water observed during drilling within the depth explored. 3. Backfilled with bentonite chips, auger cuttings and cold patch to grade. 4. Test hole location is approximate.									

GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

CONTRACTOR  
**Maple Leaf Drilling**

INSPECTOR  
**C. FRIESEN**

APPROVED  
**KWH**

DATE  
**3/7/19**

**CLIENT**
**PROJECT** 2019 City of Winnipeg Alleys Package

**SITE**

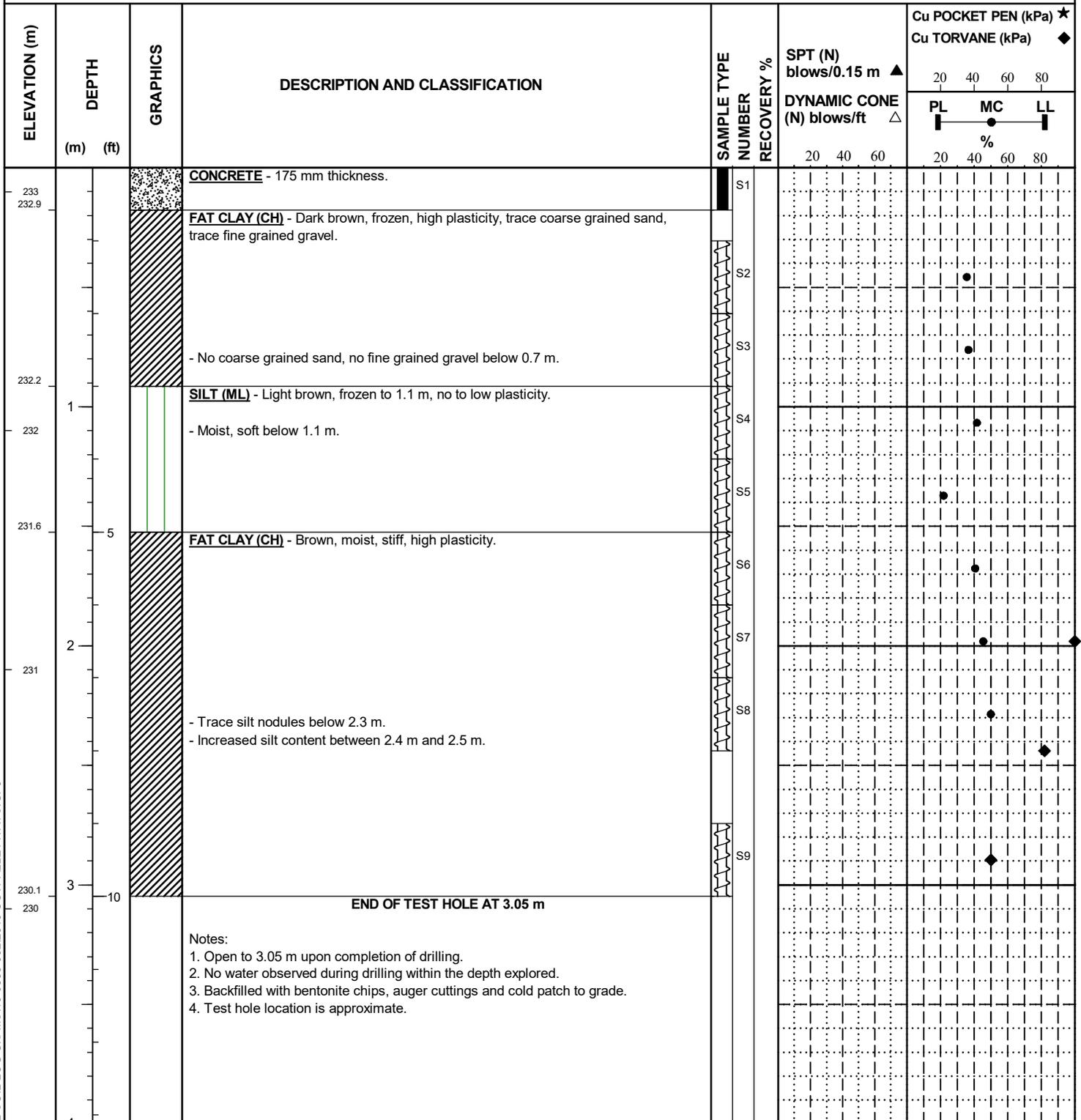
Ingersoll Alley, W of Ingersoll St., E of Sherburn St., N of Ellice Ave. to Sargent Ave.

**LOCATION**

37 m North of Ellice Avenue Centerline

**DRILLING METHOD**

150 mm ø Core Barrel, 125 mm ø Solid Stem Auger, B40 Truck Mounted Drill Rig

**JOB NO.**
**19-0535-002**
**GROUND ELEV.**
**233.10**
**TOP OF PVC ELEV.**
**WATER ELEV.**
**DATE DRILLED**
**1/23/2019**
**UTM (m)**
**N 5,528,416**
**E 631,095**


GEOTECHNICAL-SOIL LOG U:\FMS\19-0535-002\2019 COW ALLEYS\WAYS.GPJ

SAMPLE TYPE Core Barrel Auger Grab

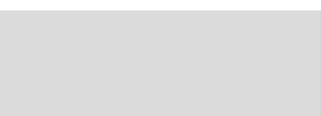
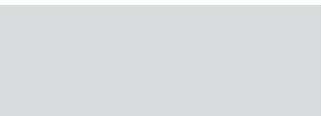
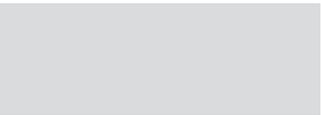
 CONTRACTOR **Maple Leaf Drilling**

 INSPECTOR **C. FRIESEN**

 APPROVED **KWH**

 DATE **3/7/19**

**KGS**  
GROUP  
CONSULTING  
ENGINEERS



January 15, 2020

KGS Group  
3<sup>rd</sup> Floor - 865 Waverley  
Winnipeg, Manitoba R3T 5P4

Attention: Mr. Craig Rowbotham B.Sc., P.Eng.  
Municipal Assistant Department Head

**Re: 2020 City of Winnipeg Improvement Alleys – St. Boniface  
Geotechnical Investigation – Final**

Dear Mr. Rowbotham:

This letter report summarizes KGS Group's geotechnical investigation for the St. Boniface Alleys that was required as part of the 2020 City of Winnipeg Improvement Alleys package in Winnipeg, Manitoba.

## 1.0 INTRODUCTION

KGS Group completed a geotechnical investigation consisting of eleven (11) test holes for the design of the alley pavement structures. The 2020 City of Winnipeg Improvement Alleys package includes the following:

- 180 m section of the Birchdale/Lawndale Avenue Alley located between Highfield and Kirkdale Streets.
- 180 m section of the Claremont/Ferndale Avenue Alley located between Kirkdale and Walmer Streets.
- 100 m section of the Rue Des Meurons East Alley located between Horace and Marion Streets.

This report details the results of the geotechnical investigation completed by KGS Group in November and December 2019.

## 2.0 GEOTECHNICAL INVESTIGATION SERVICES

The scope of this assignment included the following:

- **Utility Clearances** – Prior to undertaking any drilling activities KGS Group obtained necessary underground utility clearances. At the Des Meurons Alley, high pressure gas lines and other underground utilities owned

by Manitoba Hydro necessitated a later drilling date than the other two (2) alleys to ensure the utilities had sufficient clearance from the test hole locations.

- **Geotechnical Investigation** – A geotechnical investigation was completed to investigate the subsurface conditions in accordance with City of Winnipeg geotechnical requirements for public works projects. The breakdown of the requested number of test holes by alley is in the table below. All test holes were completed to a total depth of 3.1 m.

**TABLE 1: TEST HOLE LOCATION SUMMARY**

Alley Name	Number of Test Holes
Birchdale/Lawndale	4
Claremont/Ferndale	4
Des Meurons East	3
<b>Total</b>	<b>11</b>

- **Laboratory Testing** – Laboratory testing including grain size analyses, Atterberg limits and moisture contents were performed on select soil samples for correlation to relevant engineering properties.

## 3.0 GEOTECHNICAL INVESTIGATION

### 3.1 Test Hole Drilling and Soil Sampling Program

A drilling and sampling program consisting of eleven (11) test holes was completed on November 15, 2019 and December 4, 2019. Drilling services were provided by Maple Leaf Drilling Ltd. of Winnipeg, Manitoba with KGS Group supervision. All test holes were advanced to a depth of 3.1 m using 125 mm diameter solid stem continuous flight augers using a CME 55 truck mounted drill rig. The locations of the test holes are shown on Figures A-1, A-2 and A-3 in Appendix A and approximate UTM coordinates (Zone 14) are listed in Table 2, Table 3 and Table 4.

The first sample in each test hole was obtained no deeper than 0.1 m below the existing surface, with subsequent soil samples recovered at 0.3 m intervals to a total depth of 3.1 m. Soil samples were collected directly off the auger flights and visually classified in the field in general accordance with the modified Unified Soil Classification System (USCS). Field Torvane's were complete on the clay soils to estimate the undrained shear strength.

Upon completion of drilling, the test holes were examined for indications of sloughing and seepage, and then backfilled with bentonite chips, and auger cuttings to the existing surface. Summary soil logs incorporating all field observations details are attached in Appendix B.

**TABLE 2: BIRCHDALE / LAWNDALE ALLEY – TEST HOLE COORDINATES**

Test Hole ID	Approximate UTM Coordinates		Ground Elevations [m]
	Northing [m]	Easting [m]	
<b>TH19-10</b>	5,526,619	634,408	230.012
<b>TH19-11</b>	5,526,585	634,408	230.216
<b>TH19-12</b>	5,526,543	634,407	230.196
<b>TH19-13</b>	5,526,478	634,406	230.456

**TABLE 3: CLAREMONT / FERNDALE ALLEY – TEST HOLE COORDINATES**

Test Hole ID	Approximate UTM Coordinates		Ground Elevations [m]
	Northing [m]	Easting [m]	
<b>TH19-20</b>	5,526,803	634,612	228.723
<b>TH19-21</b>	5,526,752	634,610	228.128
<b>TH19-22</b>	5,526,712	634,609	229.398
<b>TH19-23</b>	5,526,673	634,609	229.358

**TABLE 4: DES MEURONS EAST ALLEY – TEST HOLE COORDINATES**

Test Hole ID	Approximate UTM Coordinates		Ground Elevations [m]
	Northing [m]	Easting [m]	
<b>TH19-30</b>	5,527,196	635,763	230.885
<b>TH19-31</b>	5,527,167	635,767	231.069
<b>TH19-32</b>	5,527,137	635,770	230.995

**Note:** Test hole UTM coordinates were surveyed using a handheld GPS unit (5 m±) with ground elevations selected based on KGS Group's topographic survey.

## 3.2 Laboratory Testing

Laboratory testing was completed on select representative soil samples for correlation to relevant engineering properties of the subsurface soils. Laboratory testing included six (6) particle size analyses, six (6) Atterberg limits and eighty-eight (88) moisture contents. Laboratory testing was completed at a Canadian Council of Independent Laboratories (CCIL) certified soil testing laboratory in Winnipeg, Manitoba in general accordance with ASTM Standards. A summary of Atterberg limits and grain size analysis test results are presented in Figures C-1 and C-2 in Appendix C as well as on the test holes logs in Appendix B.

## 3.3 Stratigraphy

### 3.3.1 BIRCHDALE / LAWNSDALE ALLEY

Four (4) test holes were drilled in Birchdale / Lawnsdale Alley located between Highfield and Kirkdale Streets. In general, the stratigraphy at the site was interpreted by KGS Group to consist of sand and gravel fill overlying clay fill or sandy clay fill and clay.

#### **Sand and Gravel Fill**

The existing gravel surfacing at the test hole locations consisted of 0.1 to 0.15 m (4 to 6 in) of sand and gravel fill. The sand and gravel was brown in colour, frozen, contained medium to coarse grained sand, fine grained gravel, and trace coarse grained gravel with a maximum aggregate size of 25 mm. The moisture content of the sand and gravel fill ranged from 6 to 7%.

#### **Clay Fill**

Clay fill was encountered in below the sand and gravel fill TH19-12 and TH19-13 in the northern half of the alley that varied in thickness from 0.23 to 0.36 m. The clay fill was dark brown in colour, frozen then moist, stiff in consistency, of intermediate to high plasticity, and contained some medium to coarse grained sand and trace fine grained gravel. The moisture content of the clay fill ranged from 27 to 30%. At the time of the investigation the fill was frozen to a depth of 0.3 to 0.4 m.

#### **Sandy Clay Fill**

A 0.28 m thick layer of sandy clay fill was encountered below the sand and gravel fill in TH19-11. The sandy clay fill was black in colour, frozen, contained some medium to coarse grained sand and trace fine grained gravel. The moisture content of the sandy clay fill was 24% as measured from one (1) sample.

#### **Clay (CH)**

High plasticity clay was encountered below the fill in all test holes and extended to the end of each test hole at depth of 3.1 m. The clay was generally brown to dark brown in colour, moist, stiff in consistency, of high plasticity and contained trace coarse grained sand.

The moisture content of the silt clay generally ranged from 27 to 36%, as measured from twenty-four (24) samples. Atterberg limits completed on two (2) samples from depths of 0.6 m and 0.9 m measured liquid limits ranging from 83 to 85, plastic limits ranging from 27 to 29, and plasticity indices ranging from 54 to 58, classifying the material as a high plasticity clay (CH). Grain size analysis completed on the same samples measured no gravel sized particles, 1 to 4% sand sized particles, 38 to 47% silt sized particles, and 49 to 61% clay sized particles.

### **3.3.2 CLAREMONT / FERNDAL ALLEY**

Four (4) test holes were drilled on the Claremont / Ferndale Alley located between Walmer and Highfield Streets. In general, the stratigraphy at the site was interpreted by KGS Group to consist of sand and gravel fill overlying clay fill (clay, sandy clay, or clayey sand fill) and clay.

#### **Sand and Gravel Fill**

The existing gravel surface at the test hole locations consisted of 0.08 to 0.13 m (3 to 5 in) of sand and gravel fill. The sand and gravel fill was brown in colour, frozen, contained medium to coarse grained sand, fine grained gravel, and trace coarse grained gravel with a maximum aggregate size of 20 mm. The moisture content of the sand and gravel fill ranged from 7 to 34%. The higher moisture contents measured in the granular base is most likely due to contamination of the samples with the underlying clay.

#### **Clay Fill**

A 0.3 m thick clay fill layer was encountered below the sand and gravel fill in TH19-20 in the north end of the alley. The clay fill was dark brown in colour, frozen, and also contained some medium grained sand. The moisture content of the clay fill was 34% as measured from one (1) sample.

#### **Clayey Sand Fill**

Clayey sand fill was encountered in TH19-21 and TH19-23 below the sand and gravel fill. Thickness varied between 0.48 and 0.69 m. The sandy clay fill was black in colour, frozen then moist, compact, contained fine to coarse grained sand with clay. The moisture content of the clayey sand fill ranged from 18 to 25%. At the time of the investigation the fill was frozen to a depth of 0.3 to 0.4 m.

#### **Sandy Clay Fill**

A 0.3 m thick sandy clay fill layer was encountered below the sand and gravel fill in TH19-22. The sandy clay fill was dark brown in colour, frozen then moist, stiff, of intermediate plasticity. The moisture content of the sandy clay fill was 31% as measured from one (1) sample. At the time of the investigation the fill was frozen to a depth of 0.4 m.

#### **Clay (CH)**

High plasticity clay was encountered below the fill in all test holes and extended to the end of each test hole at a depth of 3.1 m. The clay was generally brown to dark brown in colour, moist, stiff in consistency, of high plasticity, and contained trace coarse grained sand.

The moisture content of the silt clay generally ranged from 28 to 38%, as measured from twenty-four (24) samples. Atterberg limits completed on two (2) samples from depths of 0.6 m and 0.9 m measured liquid limits ranging from 75 to 90, plastic limits ranging from 26 to 27, and plasticity indices ranging from 49 to 63, classifying the material as a high plasticity clay (CH). Grain size analysis completed on the same samples measured no gravel sized particles, 2 to 13% sand sized particles, 35 to 39% silt sized particles, and 52 to 59% clay sized particles.

### **3.3.3 DES MEURONS EAST ALLEY**

Three (3) test holes were drilled in the alley located east of Rue Des Meurons between Horace and Marion Streets. In general, the stratigraphy at the site was interpreted by KGS Group to consist of sand and gravel fill, an asphalt overlay at one (1) test hole location, overlying sandy clay or clayey sand fill and clay.

#### **Sand and Gravel Fill**

The existing gravel surface at the test hole locations consisted of 0.3 to 0.76 m (4 to 6 in) of sand and gravel fill. A 76 mm asphalt overlay existed at TH19-30. The sand and gravel fill was light brown in colour, frozen, contained medium to coarse grained sand, and fine grained gravel with a maximum aggregate size of 25 mm. The moisture content of the sand and gravel fill ranged from 2 to 39%. The higher moisture contents measured in the granular base is most likely due to contamination of the samples with the underlying clay.

#### **Sandy Clay Fill**

A 0.3 m thick layer of sandy clay fill was encountered below the sand and gravel fill in TH19-30 and TH19-31. The sandy clay fill was black in colour, frozen then moist and contained some medium grained sand and trace organics. The moisture content of the sandy clay was 47%. At the time of the investigation the fill was frozen to a depth of 0.6 m.

#### **Clay (CH)**

A high plasticity clay layer was encountered below the fill in all test holes and varied in thickness from 0.91 to 1.07 m. The clay was generally grey in colour, moist, stiff in consistency, and of intermediate to high plasticity. At the time of the investigation the fill was frozen to a depth of 0.6 to 0.9 m.

The moisture content of the clay generally ranged from 32 to 39%, as measured from nine (9) samples. Atterberg limits completed on a sample from a depth of 0.9 m measured a liquid limit of 87, a plastic limit of 25, and a plasticity index 62, classifying the material as a high plasticity clay (CH). Grain size analysis completed on the same sample measured no gravel sized particles, 1% sand sized particles, 48% silt sized particles, and 51% clay sized particles.

#### **Clay (CL)**

A low plasticity clay layer was encountered within the high plasticity clay in all test holes and varied in thickness from 0.91 to 1.07 m. The clay was generally light brown in colour, moist, stiff in consistency and of low plasticity.

The moisture content of the clay generally ranged from 23 to 32%, as measured from six (6) samples. Atterberg limits completed on a sample from a depth of 1.68 m measured a liquid limit of 30, a plastic limit of 17, and a plasticity index 13, classifying the material as a low plasticity clay (CL). Grain size analysis completed on the same sample measured no gravel sized particles, 3% sand sized particles, 65% silt sized particles, and 32% clay sized particles.

#### Clay (CH)

High plasticity clay was encountered again below the low plasticity clay layer in all test holes at a depth of 2.6 m extending to the end of each test hole at depth of 3.1 m. The clay was generally brown or mottled brown and grey in colour, moist, stiff in consistency, of high plasticity and contained trace silt inclusions. The moisture content of the clay ranged between 35 and 39%.

### 3.4 Groundwater Conditions

Upon completion of drilling the test holes were left open to observe potential groundwater inflow for five (5) minutes. All test holes were open and remained dry within the exploration depths of 3.1 m.

Groundwater levels should be expected to fluctuate seasonally and following precipitation events; hence, the actual water level at the time of construction could differ from those reported in this report.

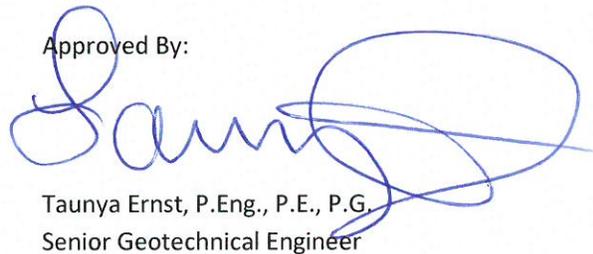
Prepared By:



David Flynn, M.Sc., P.Eng.  
Geotechnical Engineer

DF/jkb  
Attached

Approved By:



Taunya Ernst, P.Eng., P.E., P.G.  
Senior Geotechnical Engineer

## STATEMENT OF LIMITATIONS AND CONDITIONS

### Limitations

This report has been prepared for KGS Group in accordance with the agreement between KGS Group and KGS Group (the "Agreement"). This report represents KGS Group's professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole and sections or parts should not be read out of context.

This report is based on information made available to KGS Group by KGS Group and unless stated otherwise, KGS Group has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group's work.

### Third Party Use of Report

Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

### Geotechnical Investigation Statement of Limitations

The geotechnical investigation findings and recommendations of this report were prepared in accordance with generally accepted professional engineering principles and practice. The findings and recommendations are based on the results of field and laboratory investigations, combined with an interpolation of soil and groundwater conditions found at and within the depth of the test holes drilled by KGS Group at the site at the time of drilling. If conditions encountered during construction appear to be different from those shown by the test holes drilled by KGS Group or if the assumptions stated herein are not in keeping with the design, KGS Group should be notified in order that the recommendations can be reviewed and modified if necessary.

# APPENDIX A

---

Test Hole Locations

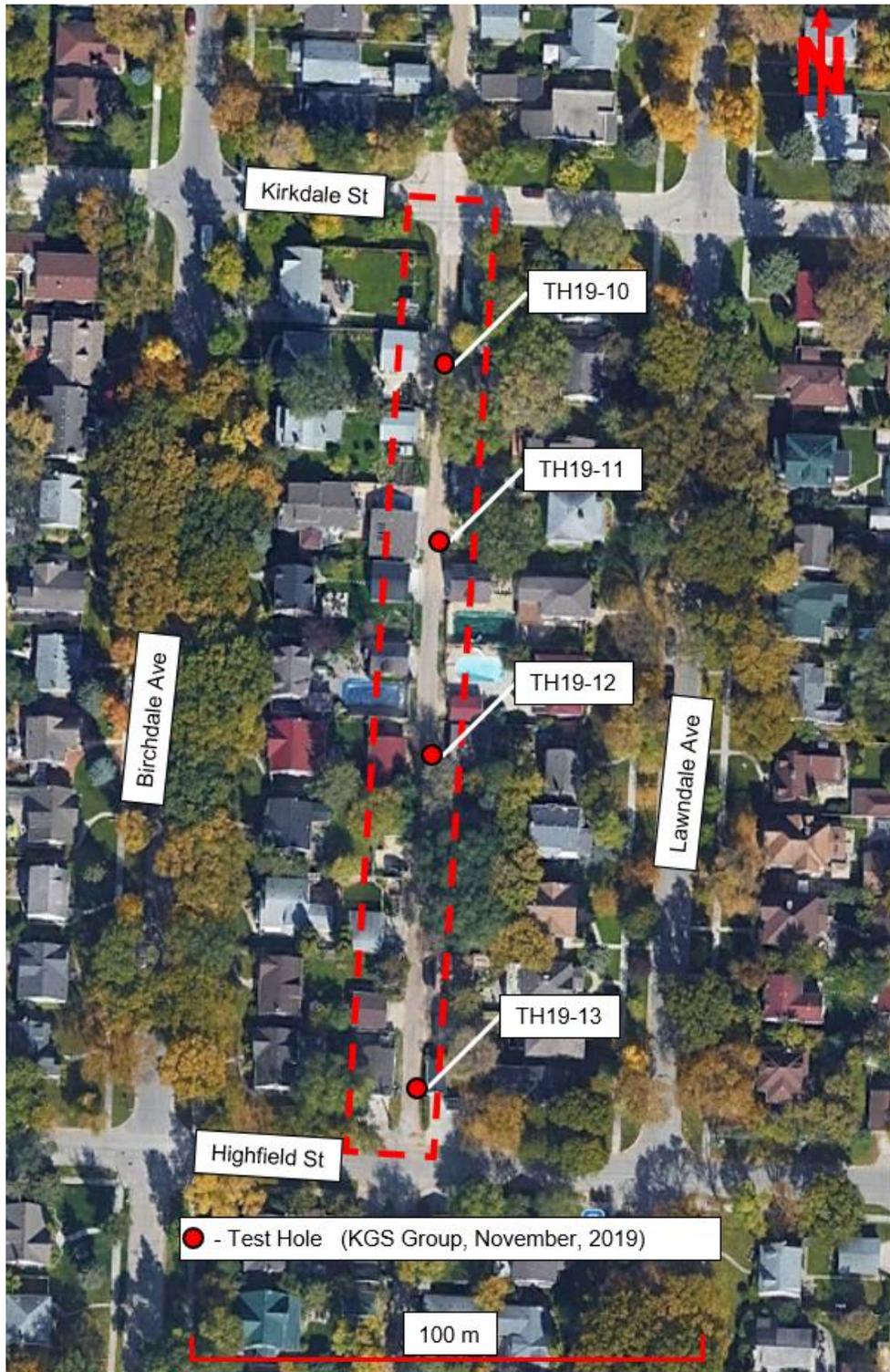


Figure A-1: Birchdale/Lawndale Avenue Alley Test Hole Locations



Figure A-2: Claremont/Ferndale Avenue Alley Test Hole Locations

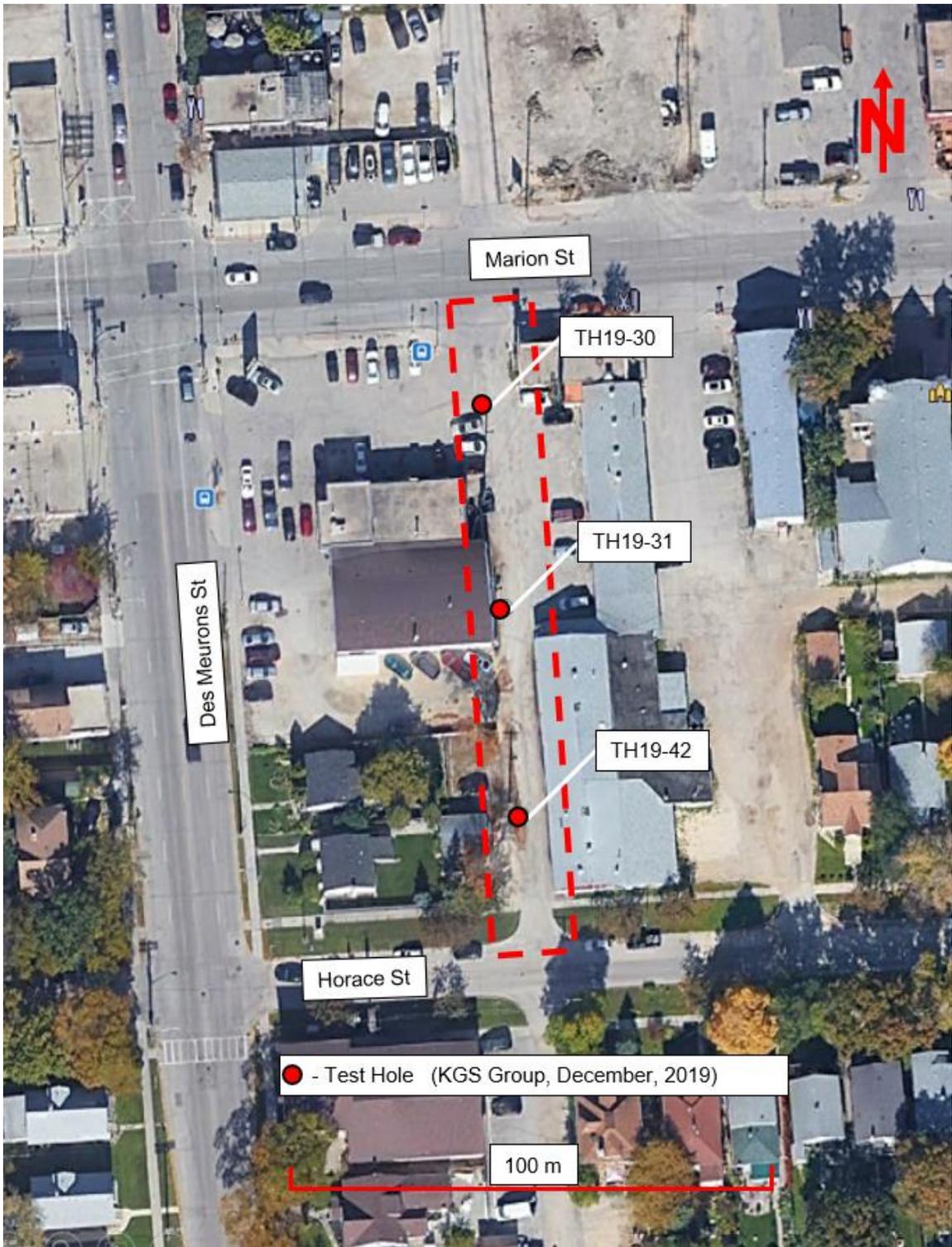


Figure A-3: Rue Des Meurons East Alley Test Hole Locations

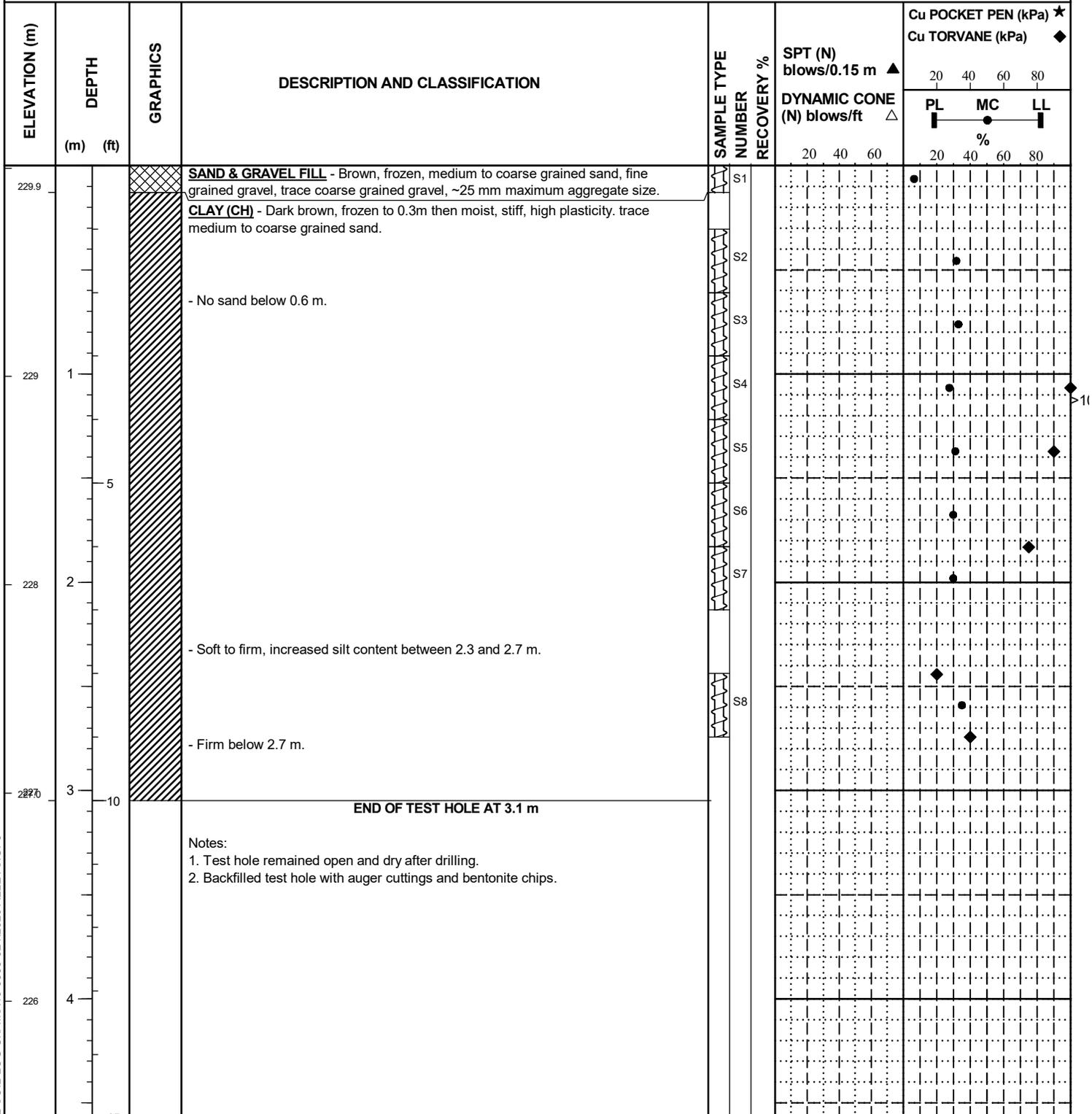
# APPENDIX B

---

Test Hole Logs

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Birchdale / Lawndale Alley  
**LOCATION** ~28m South of Kirkdale Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.01  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,619  
 E 634,408



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

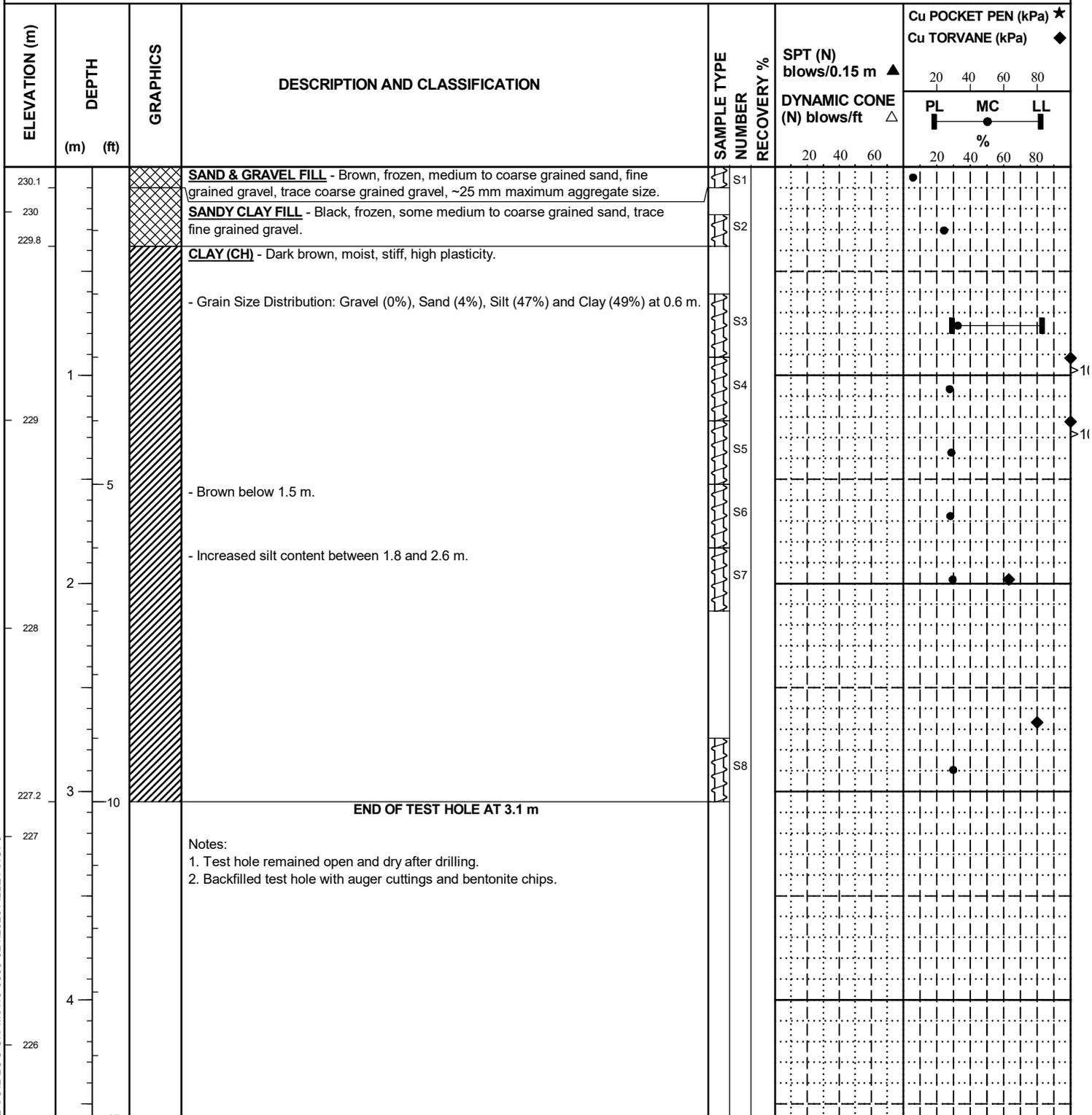
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Birchdale / Lawndale Alley  
**LOCATION** ~62m South of Kirkdale Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.22  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,585  
 E 634,408



SAMPLE TYPE  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

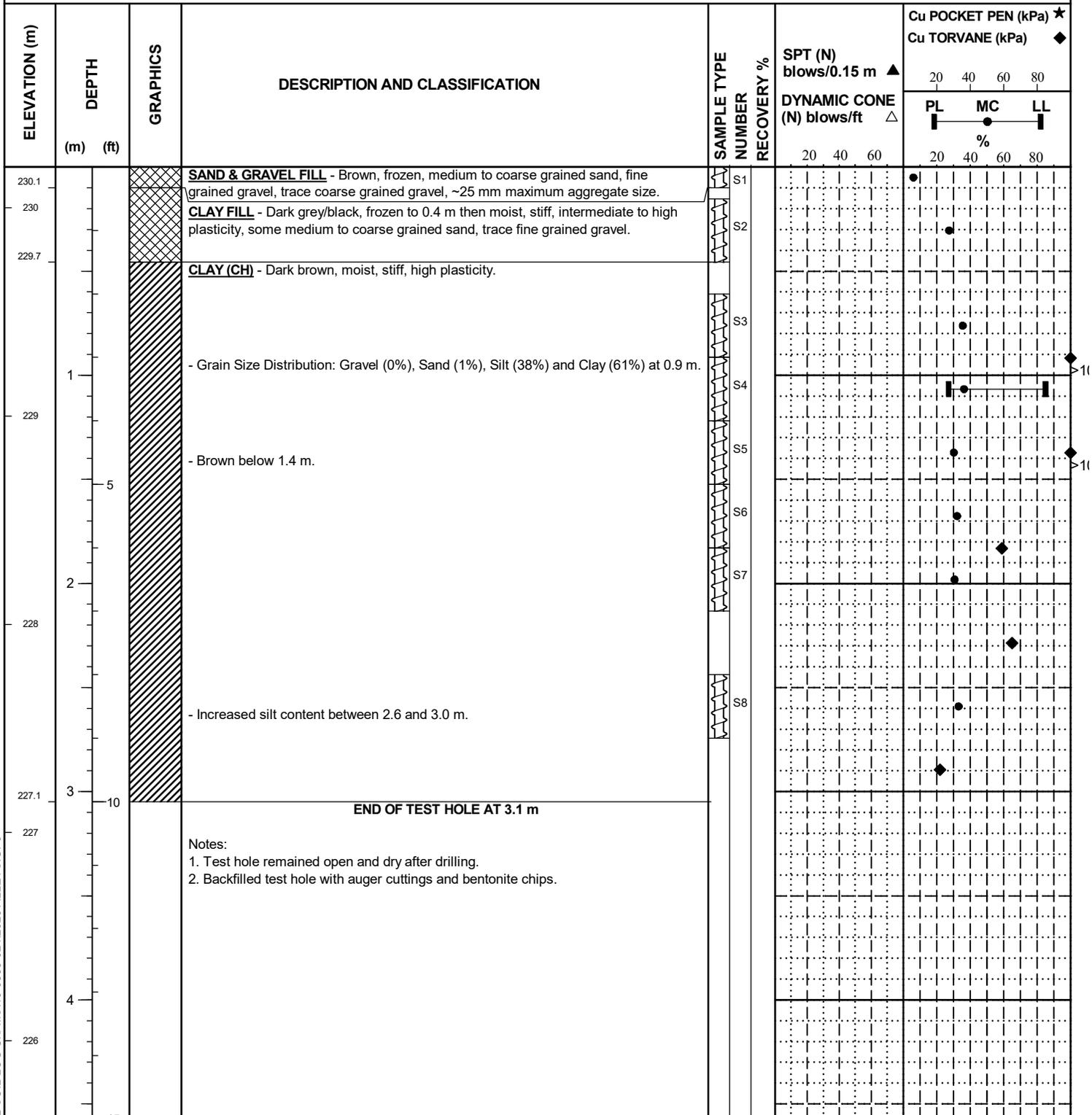
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Birchdale / Lawndale Alley  
**LOCATION** ~79m North of Highfield Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.20  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,543  
 E 634,407



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

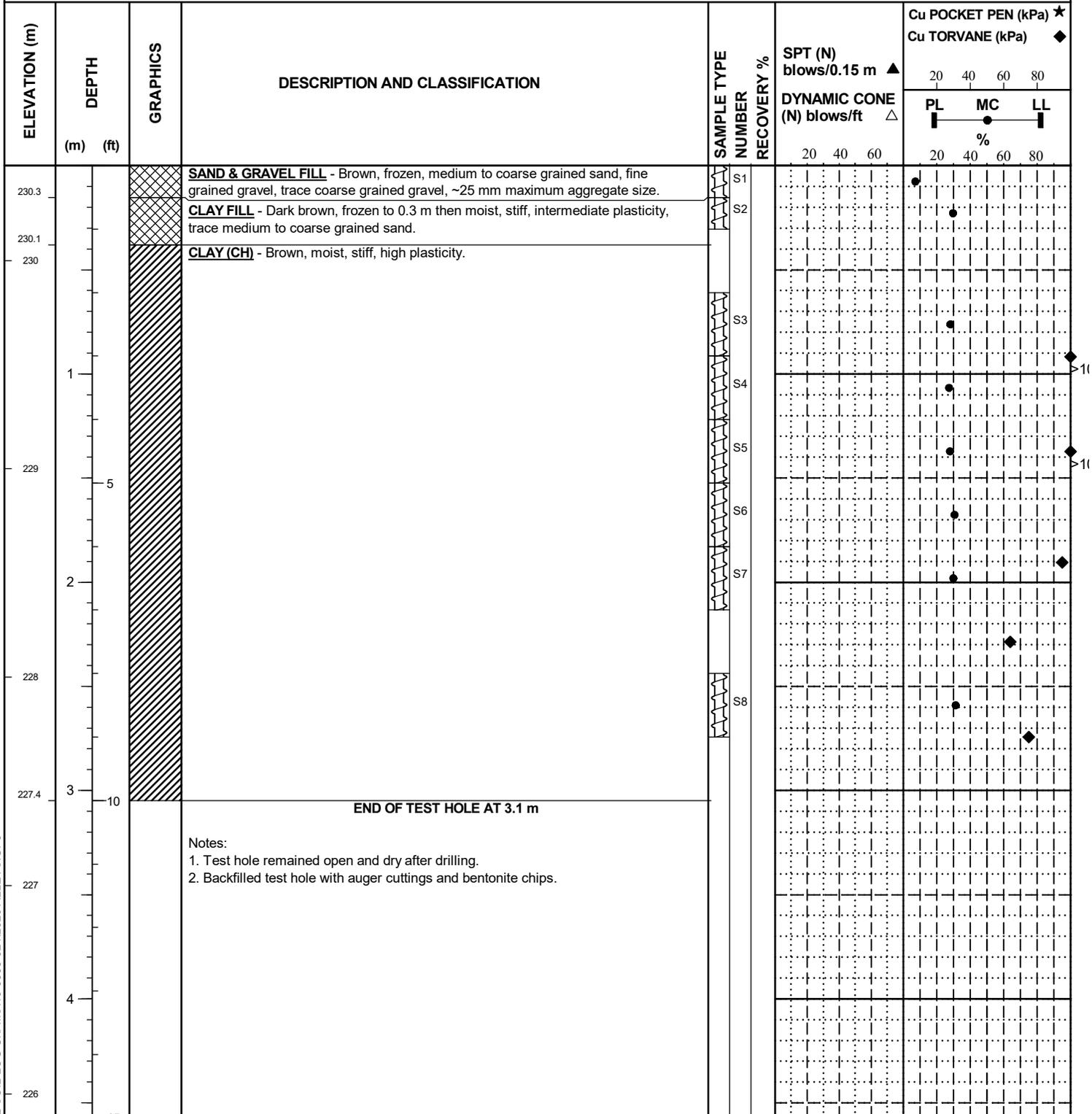
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Birchdale / Lawndale Alley  
**LOCATION** ~14m North of Highfield Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.46  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,478  
 E 634,406



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

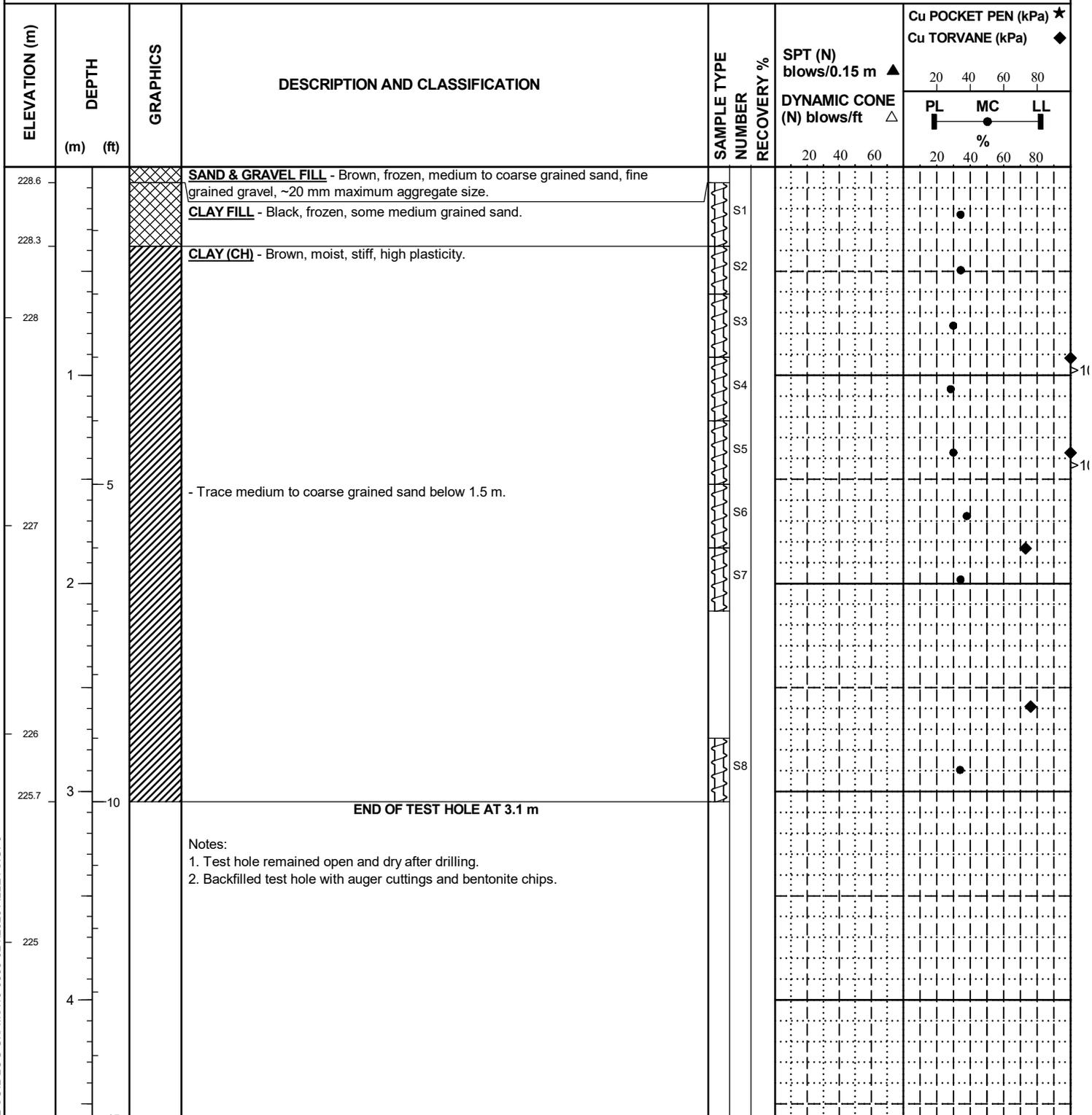
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Claremont / Ferndale Alley  
**LOCATION** ~28m South of Walmer Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 228.72  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,803  
 E 634,612



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

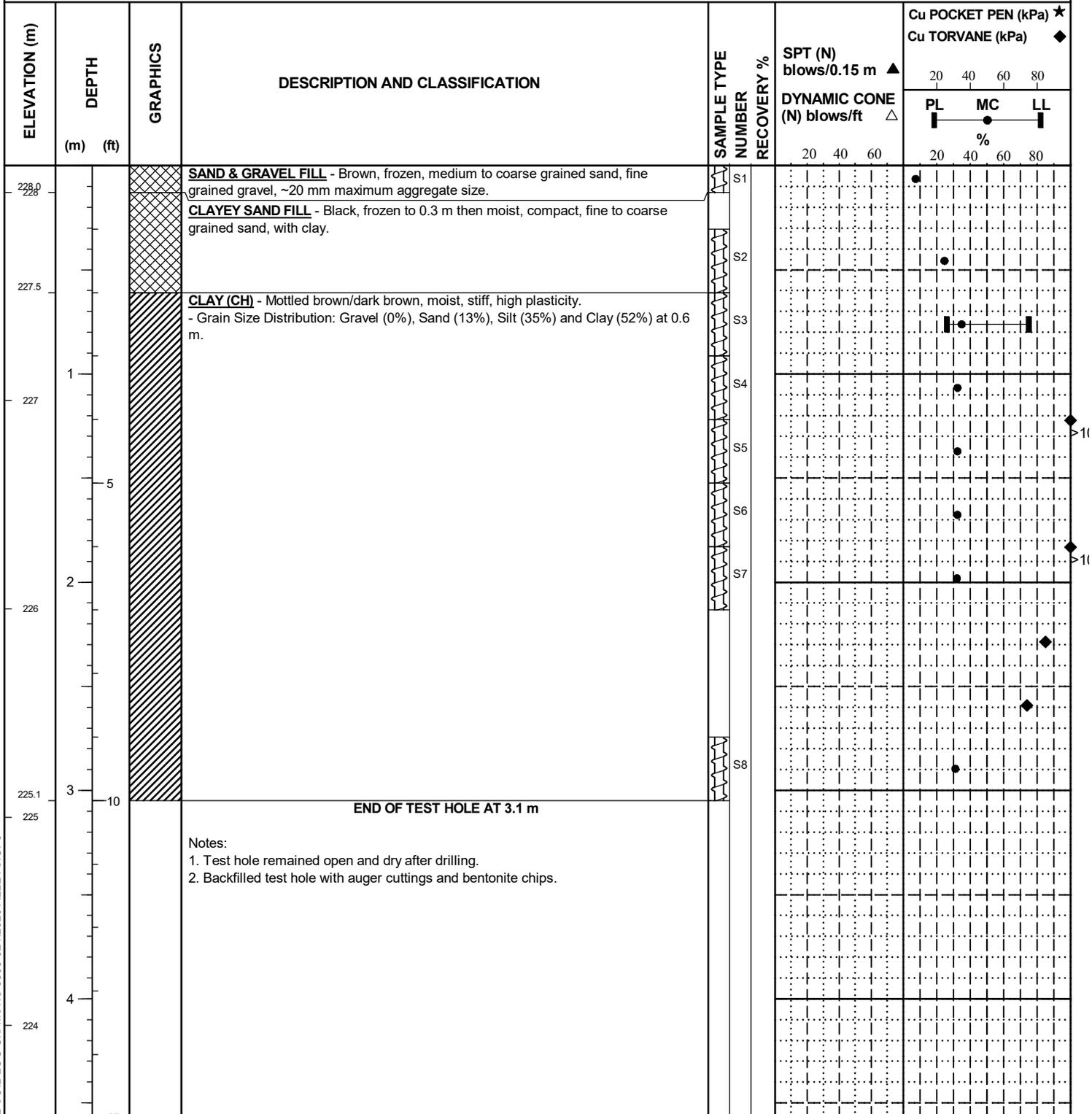
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Claremont / Ferndale Alley  
**LOCATION** ~79m South of Walmer Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 228.13  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,752  
 E 634,610



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

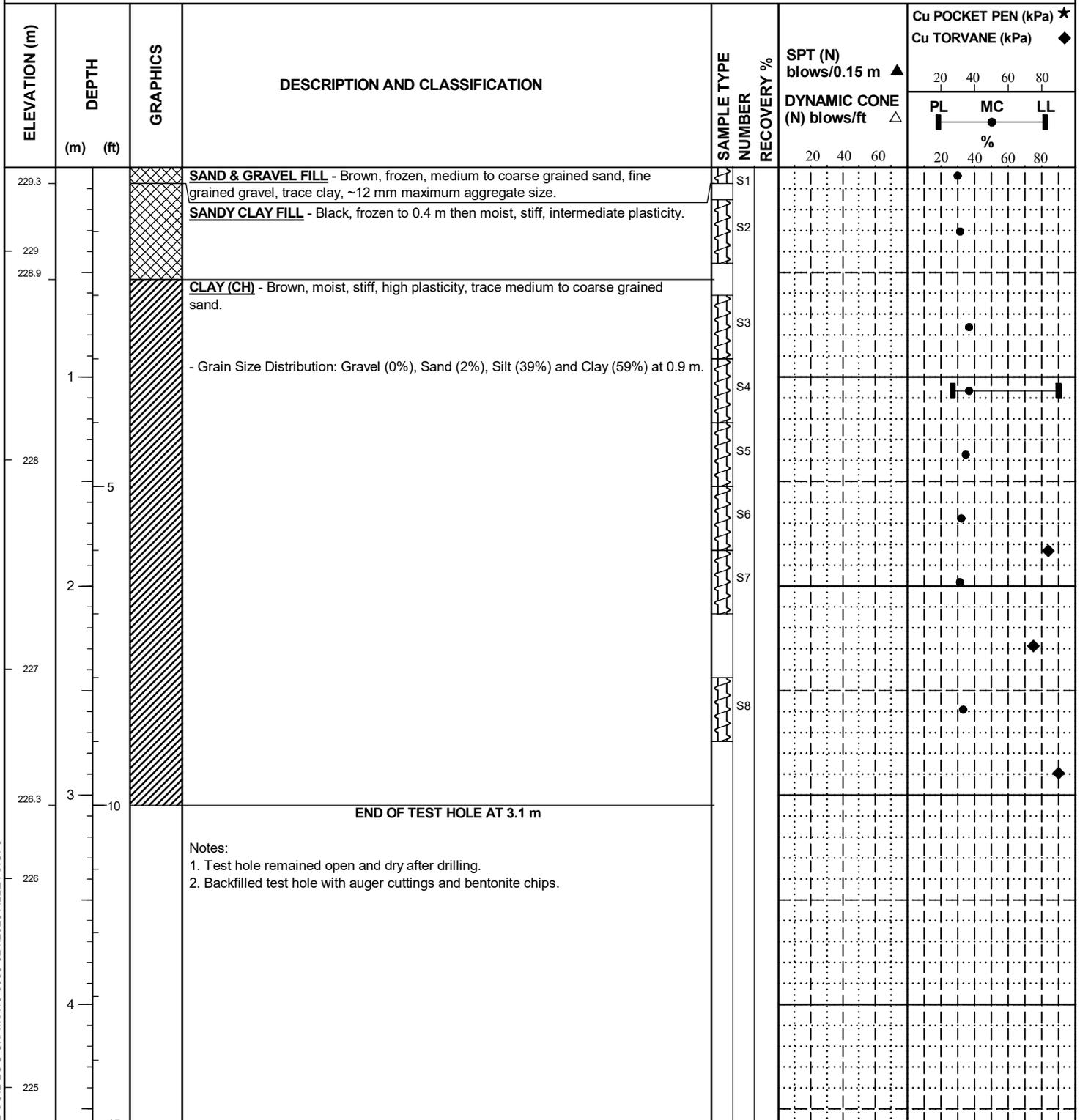
**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Claremont / Ferndale Alley  
**LOCATION** ~63m North of Kirkdale Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 229.40  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,712  
 E 634,609



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 C. FRIESEN

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Claremont / Ferndale Alley  
**LOCATION** ~25m North of Kirkdale Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 229.36  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-11-15  
**UTM (m)** N 5,526,673  
 E 634,609

ELEVATION (m)	DEPTH		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) ◆		
	(m)	(ft)							20	40	60	80	20	40
229.3				<b>SAND &amp; GRAVEL FILL</b> - Brown, frozen, medium to coarse grained sand, fine grained gravel, ~20 mm maximum aggregate size. <b>CLAYEY SAND FILL</b> - Black, frozen to 0.4 m then moist, compact, medium to coarse grained sand, with clay.	S1									
229						S2								
228.6				<b>CLAY (CH)</b> - Blackish brown, moist, stiff, high plasticity.	S3									
1						S4								
228				- Brown below 1.4 m.	S5									
5						S6								
2						S7								
227						S8								
226.3														
226.3	3	10		<b>END OF TEST HOLE AT 3.1 m</b>										
226				Notes: 1. Test hole remained open and dry after drilling. 2. Backfilled test hole with auger cuttings and bentonite chips.										
225														

SAMPLE TYPE Auger Grab

 CONTRACTOR  
**Maple Leaf Drilling**

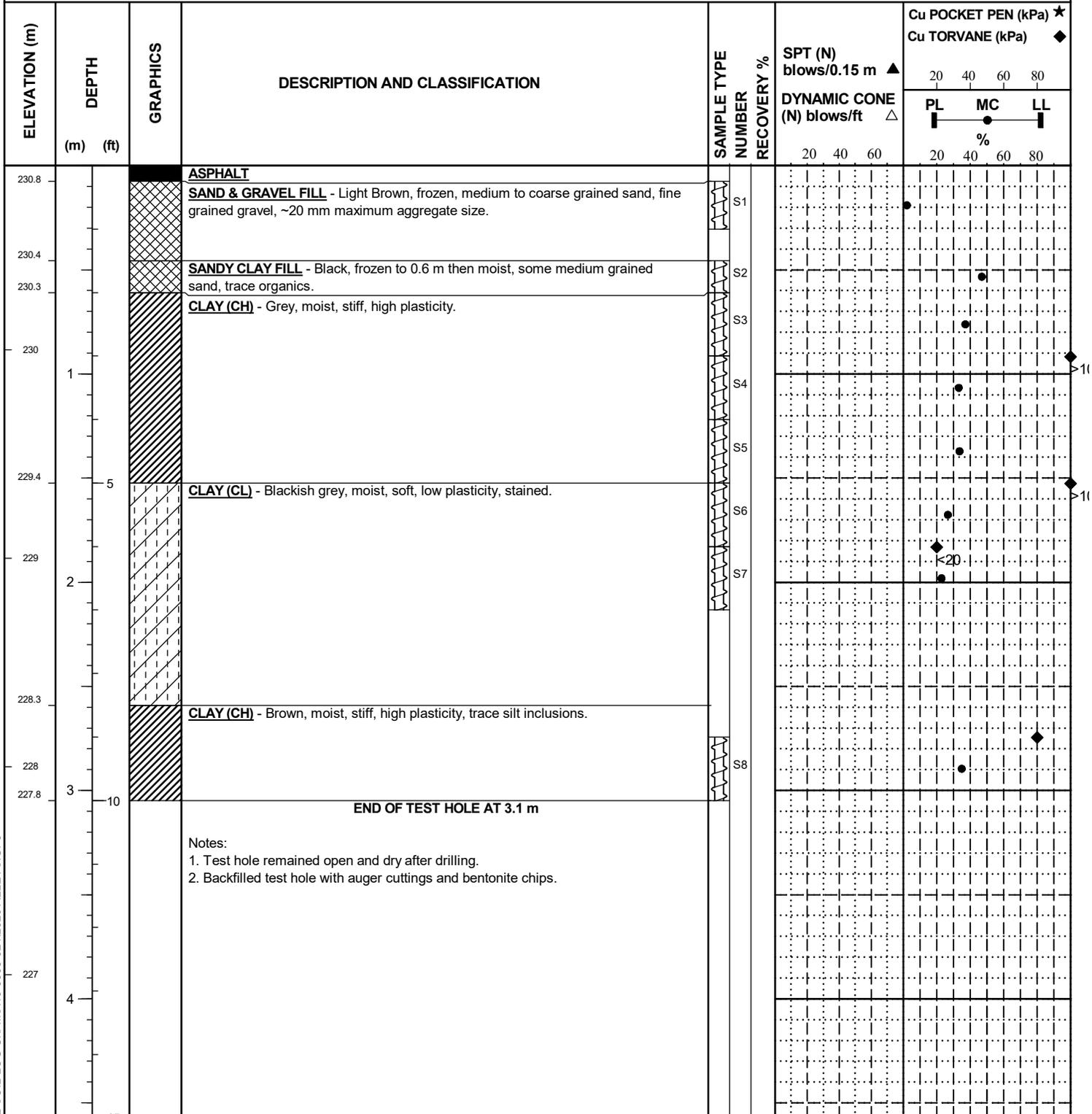
 INSPECTOR  
**C. FRIESEN**

 APPROVED  
**T. ERNST**

 DATE  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Des Meurons East Alley  
**LOCATION** ~12m South of Marion Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.89  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-12-04  
**UTM (m)** N 5,527,196  
 E 635,763



SAMPLE TYPE  Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

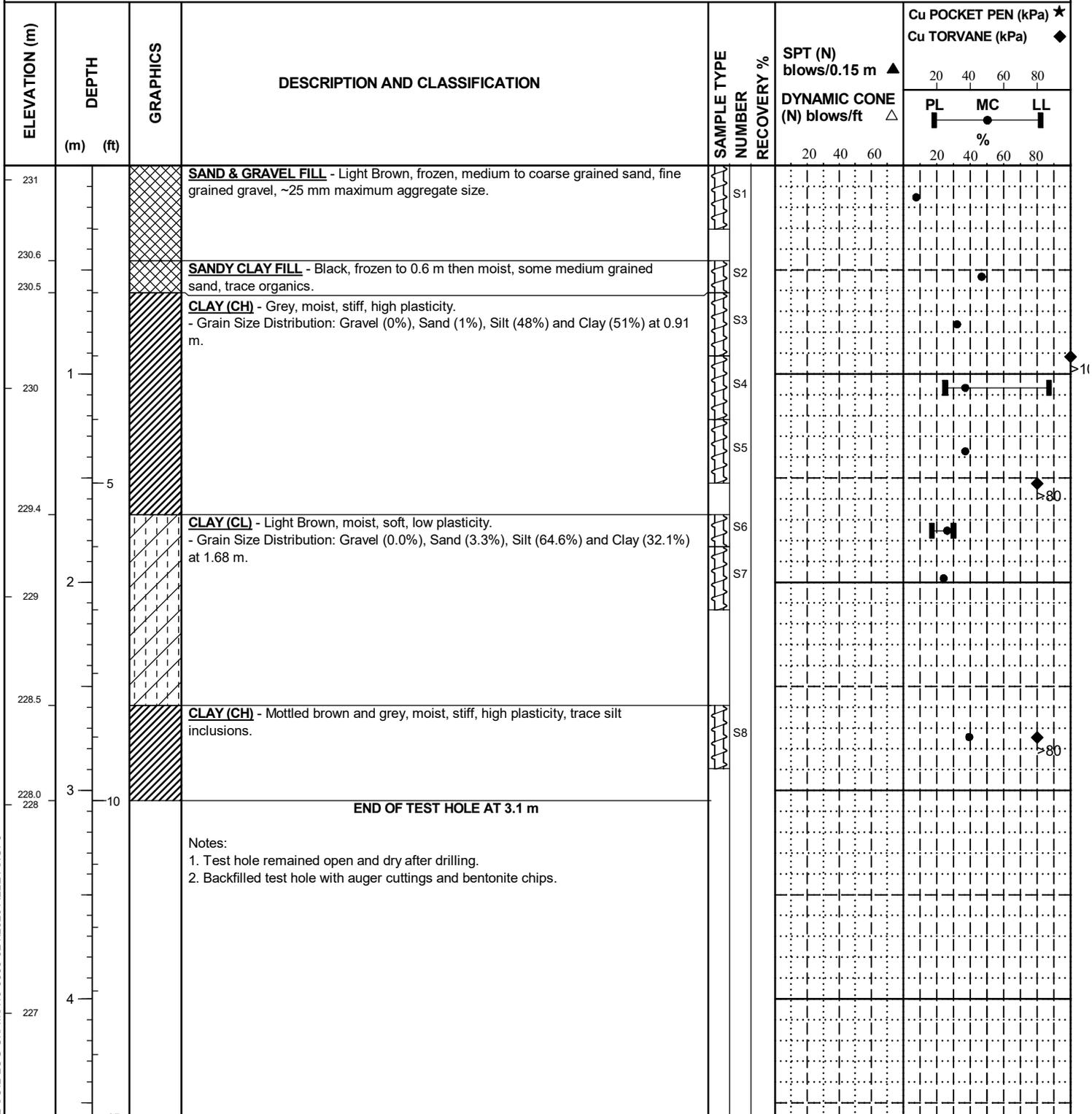
**INSPECTOR**  
 N. BRAY

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Des Meurons East Alley  
**LOCATION** ~42m South of Marion Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 231.07  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-12-04  
**UTM (m)** N 5,527,167  
 E 635,767



SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 N. BRAY

**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

**CLIENT** KGS GROUP  
**PROJECT** 2020 City of Winnipeg Improvement Alleys  
**SITE** Des Meurons East Alley  
**LOCATION** ~20m North of Horace Street  
**DRILLING METHOD** 125 mm ø Solid Stem Auger, CME 55 Truck Mounted Drill Rig

**JOB NO.** 19-0535-024  
**GROUND ELEV.** 230.99  
**TOP OF PVC ELEV.**  
**WATER ELEV.**  
**DATE DRILLED** 2019-12-04  
**UTM (m)** N 5,527,137  
 E 635,770

ELEVATION (m)	DEPTH		GRAPHICS	DESCRIPTION AND CLASSIFICATION	SAMPLE TYPE	RECOVERY %	SPT (N) blows/0.15 m ▲	DYNAMIC CONE (N) blows/ft △	Cu POCKET PEN (kPa) ★			Cu TORVANE (kPa) ◆		
	(m)	(ft)							20	40	60	80	20	40
				<b>SAND &amp; GRAVEL FILL</b> - Light Brown, frozen, medium to coarse grained sand, fine grained gravel, ~25 mm maximum aggregate size.  - Difficult drilling, possibly old concrete slab at 0.6 m.	S1									
230.2				<b>CLAY (CH)</b> - Grey, frozen to 0.9 m then moist, stiff, high plasticity.	S3									
230	1				S4									
		5			S5									
229.3				<b>CLAY (CL)</b> - Light brown, moist, soft, low plasticity.	S6									
229	2				S7									
228.4				<b>CLAY (CH)</b> - Mottled brown and grey, moist, stiff, high plasticity, trace silt inclusions.	S8									
227.9	3	10		<b>END OF TEST HOLE AT 3.1 m</b>										
				Notes: 1. Test hole remained open and dry after drilling. 2. Backfilled test hole with auger cuttings and bentonite chips.										
227	4													

SAMPLE TYPE Auger Grab

**CONTRACTOR**  
 Maple Leaf Drilling

**INSPECTOR**  
 N. BRAY

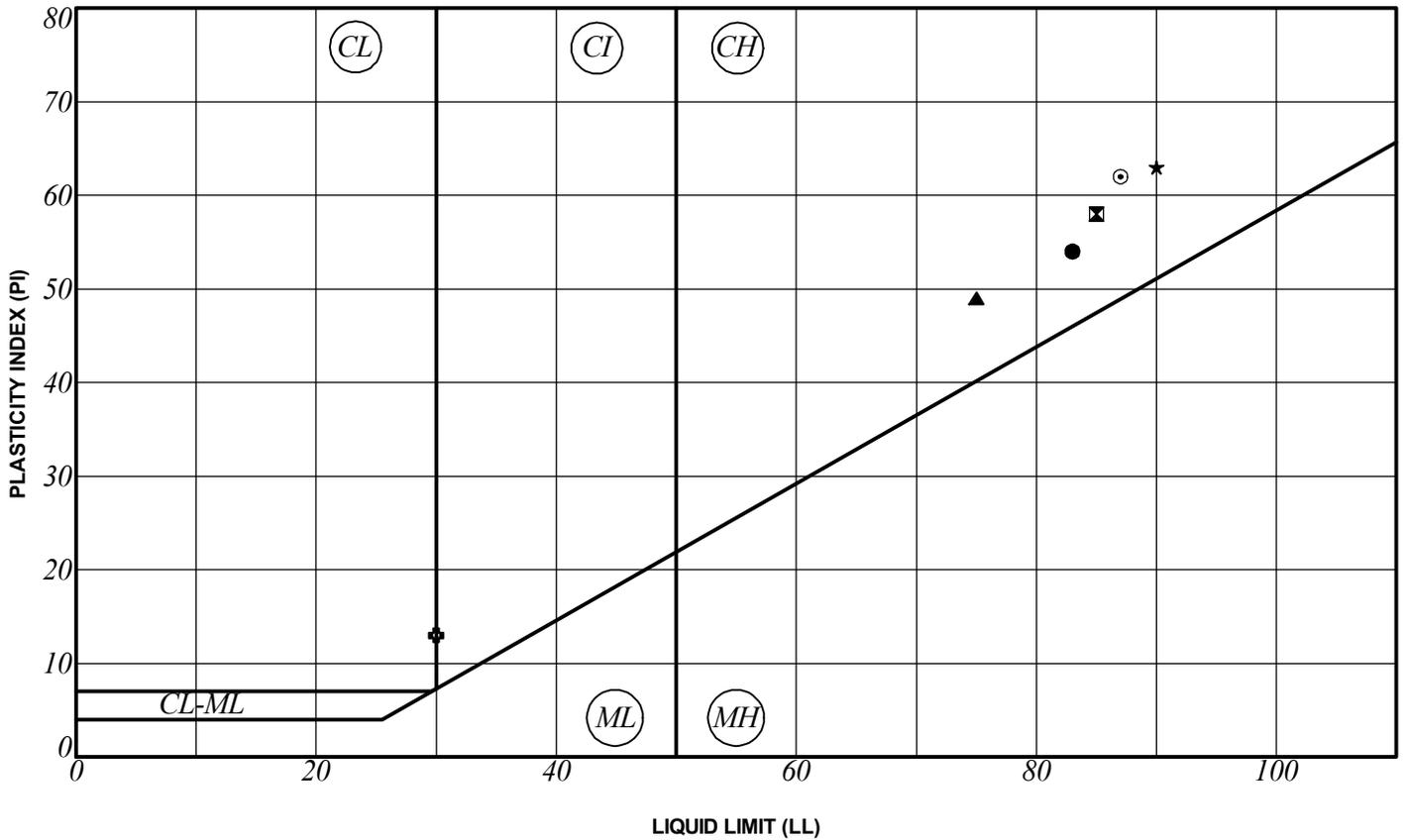
**APPROVED**  
 T. ERNST

**DATE**  
 20-1-15

# APPENDIX C

---

Laboratory Test Results



SYMBOL	HOLE	DEPTH (m)	SAMPLE #	LL	PL	PI	% SAND	% SILT	% CLAY	% MC	CLASSIFICATION
●	TH19-11	0.6	S3	83	29	54	4.0	47.2	48.8	32.5	CH
■	TH19-12	0.9	S4	85	27	58	1.4	37.6	61.0	36.3	CH
▲	TH19-21	0.6	S3	75	26	49	13.1	34.6	52.3	34.8	CH
★	TH19-22	0.9	S4	90	27	63	1.9	38.9	59.2	36.7	CH
⊙	TH19-31	0.9	S4	87	25	62	1.5	47.6	50.9	37.0	CH
⊕	TH19-31	1.7	S6	30	17	13	3.3	64.6	32.1	26.2	CL

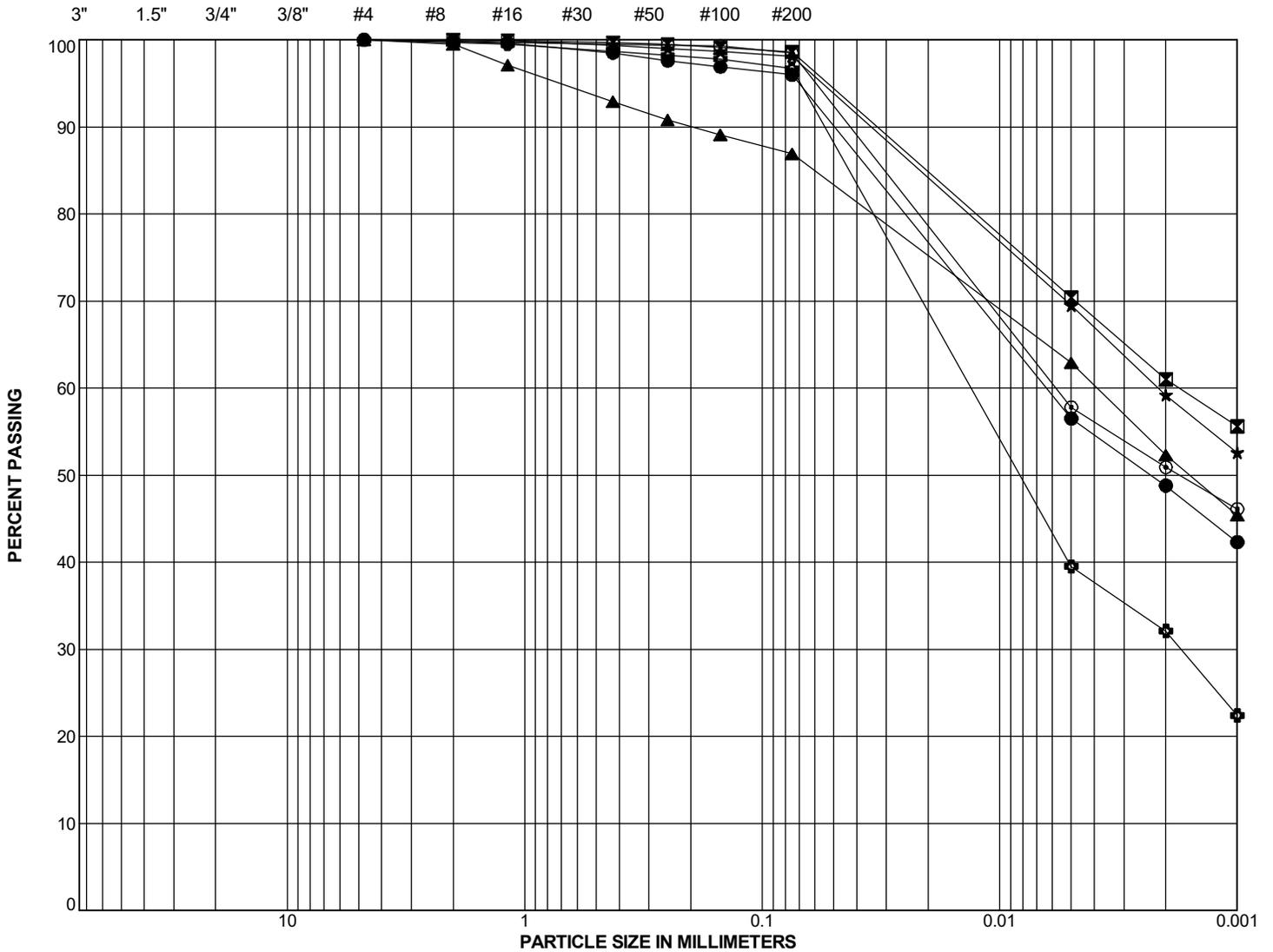
**Notes:**

- ML - Low Plasticity Silt
- MH - High Plasticity Silt
- CL-ML - Silty Clay
- CL - Low Plasticity Clay
- CI - Intermediate Plasticity Clay
- CH - High Plasticity Clay
- LL - Liquid Limit
- PL - Plastic Limit
- PI - Plasticity Index
- MC - Moisture Content
- NP - Non-Plastic

<b>KGS</b> GROUP	<b>KGS GROUP</b>	
	2020 City of Winnipeg Improvement Alleys	
<b>A-LINE PLOT</b>		
January 2020	Figure C.1	Page 1 of 1

**SIEVE ANALYSIS**

**HYDROMETER ANALYSIS**



GRAVEL		SAND			SILT	CLAY
coarse	fine	coarse	medium	fine		

SYMBOL	HOLE	DEPTH (m)	SAMPLE #	% GRAVEL	% SAND	% SILT	% CLAY	% SILT & CLAY	Cu	Cc	CLASSIFICATION
●	TH19-11	0.6	S3	0.0	4.0	47.2	48.8	96.0			CH
■	TH19-12	0.9	S4	0.0	1.4	37.6	61.0	98.6			CH
▲	TH19-21	0.6	S3	0.0	13.1	34.6	52.3	86.9			CH
★	TH19-22	0.9	S4	0.0	1.9	38.9	59.2	98.1			CH
⊙	TH19-31	0.9	S4	0.0	1.5	47.6	50.9	98.5			CH
⊕	TH19-31	1.7	S6	0.0	3.3	64.6	32.1	96.7			CL

SIEVE ANALYSIS U:\FMS\19-0535-024\2020 ALLEYS.GPJ

	<b>KGS GROUP</b>	
	2020 City of Winnipeg Improvement Alleys	
<b>GRAIN SIZE ANALYSES</b>		
January 2020	Figure C.2	Page 1 of 1