

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – HIGH LEVEL  
2018 INSPECTION**



Site Number	Location	Name	Hwy	km
PH079-1	160 km east of High Level	West of Garden River	58:14	18-19.5
Legal Description		UTM Co-ordinates		
NW14-111-3-W5		11U E 651,925	N	6,502,976

	Date	PF	CF	Total
<b>Previous Inspection:</b>	25-Jul-2016 (Callout)	8	8	64
<b>Current Inspection:</b>	22-Jun-2018	8	8	64
<b>Road AADT:</b>	330		<b>Year:</b>	2018
<b>Inspected By:</b>	Roger Skirrow, TRANS Ed Szmata, TRANS Paul Catt, TRANS		Ken Froese, Thurber Raymond Juneau, Paradox	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs	<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance Items	

<b>Primary Site Issue:</b>	Soft subgrade leading to deep rutting	
<b>Dimensions:</b>	1.3 km length, up to 2.1 km with potential need for rebuilding	
<b>Date of Remediation:</b>	2009: Highway constructed	
<b>Maintenance:</b>	2012: 300m long subcut and replacement with compacted gravel 2016: 0.6 m to 0.9 m of gravel placed over entire length 2018: 0.6 m of Des 4-Class 20 crush placed over east section	
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Deep rutting occurring in spring exposing subgrade	<input checked="" type="checkbox"/>
<input type="checkbox"/> Slope Movement		<input type="checkbox"/>
<input type="checkbox"/> Erosion		<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Poor ditch drainage	<input type="checkbox"/>

**Instrumentation:**  
None.

**Assessment:**  
This gravel-surfaced road was built across a large muskeg deposit to replace a winding winter-only road which is located further north on higher ground. Based on construction methodology, history of distress, and observations of ground conditions, it is likely that the subgrade strength is insufficient for the vehicle loading experienced by this highway particularly during the spring thaw. Although a recent power line has reduced the amount of fuel being hauled to the east to the Little Red River Cree Nation settlement, there are still requirements to haul fuel for heating. In addition, in the early spring of 2018, the Contractor working on water and sewer upgrades at the Garden River settlement hauled in a significant amount of material which likely precipitated the failure this year. The Maintenance Contract Inspector has set a permanent 75 percent road ban on the highway to try to increase the durations between failure.

At the time of the 2018 inspection, the maintenance contractor was working on resurfacing the roadway. It was observed that the grader working the gravel was causing noticeable deflections of the highway surface and causing rutting with pumping of fine-grained subgrade to the surface through the ruts. Mr. Catt noted that some of the ruts and associated fines pumping had occurred that day in sections where grading the additional 0.6 m of gravel had been undertaken earlier. The material pumping up appeared to be saturated clayey silt. Rutting was up to 300 mm deep in freshly graded areas and over 500 mm in areas that had not yet been regraded.

Note that Thurber has completed test pitting and survey of this highway. Test pit logs and drawings (site plan and profile, Drawing 17288-1 and -2, respectively) are attached for information. The test pit program identified that the gravel fill was thinner than expected for the number of overlays that have been done and that the embankment fill consisted of clay shale over clay till in the western portion and clay till over silt in the eastern. The fill was underlain by organic soils, between 0.1 m and 0.5 m in thickness, which were not stripped prior to highway construction which overlies native clay. At the time of the investigation (June 2017), much of the peat soils and underlying clay were still frozen. The groundwater table appears to be at the top of the peat-to-fill contact.

### **Recommendations:**

#### Short-Term:

- Ongoing grading and gravel placement to maintain the travelling surface. Where possible, heavy loads should be permitted only during fully frozen conditions.
- Consideration should be given to constructing a muskeg ditch on the north side of the roadway draining toward the large bridge culvert at km 19.6 to locally lower the water table.

#### Long-Term remediation options:

It is understood that AT would like to use this stretch of Hwy 58:14 to trial a selection of geosynthetic products which could then be evaluated for future repairs and construction in similar ground conditions. One product group in particular to trial is cellular confinement such as Paradox Tough-Cell. This product consists of an accordion of cells of varying depth which can be infilled with marginal materials and topped with a driving surface. The Tough Cell provides horizontal confinement which allows better bridging of weak subgrades through distribution of the loading forces. The infill material does need to consist of non-cohesive material and Mr. Catt identified that there are landscape borrows within 20 km of the project site that could be developed. A sample of the fine-grained sand taken from one such pit will be analysed by Paradox for suitability.

Other products that may be considered individually or in combination are:

- a) Mirafi H2Ri which is a high-strength woven geotextile with horizontal wicking capabilities (would require an improvement of the overall drainage along the highway such as muskeg ditches);
- b) High-strength woven geotextiles to provide separation and reinforcement (operates as a replacement for the typical layer of non-woven geotextile and geogrid);
- c) Conventional geogrids; and
- d) Provision of insulation in combination with one of the above in a section where silty, frost-susceptible fill is present.



#### Ongoing Investigation:

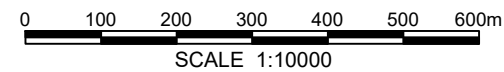
- It is recommended that the next GeoHazard inspection be undertaken as required.
- Prior to completion of the preliminary engineering report, it is suggested that the test hole logs and drawings be provided to several geosynthetic suppliers for input on potential products that could be trialed at this site.



BASE PLAN PROVIDED BY WSP, SURVEYED 2017-07-16;  
 SATELLITE IMAGERY FROM ESRI WORLD IMAGERY DOWNLOADED 2016-07-26

**LEGEND**

-  APPROXIMATE TEST PIT LOCATION
-  CULVERT



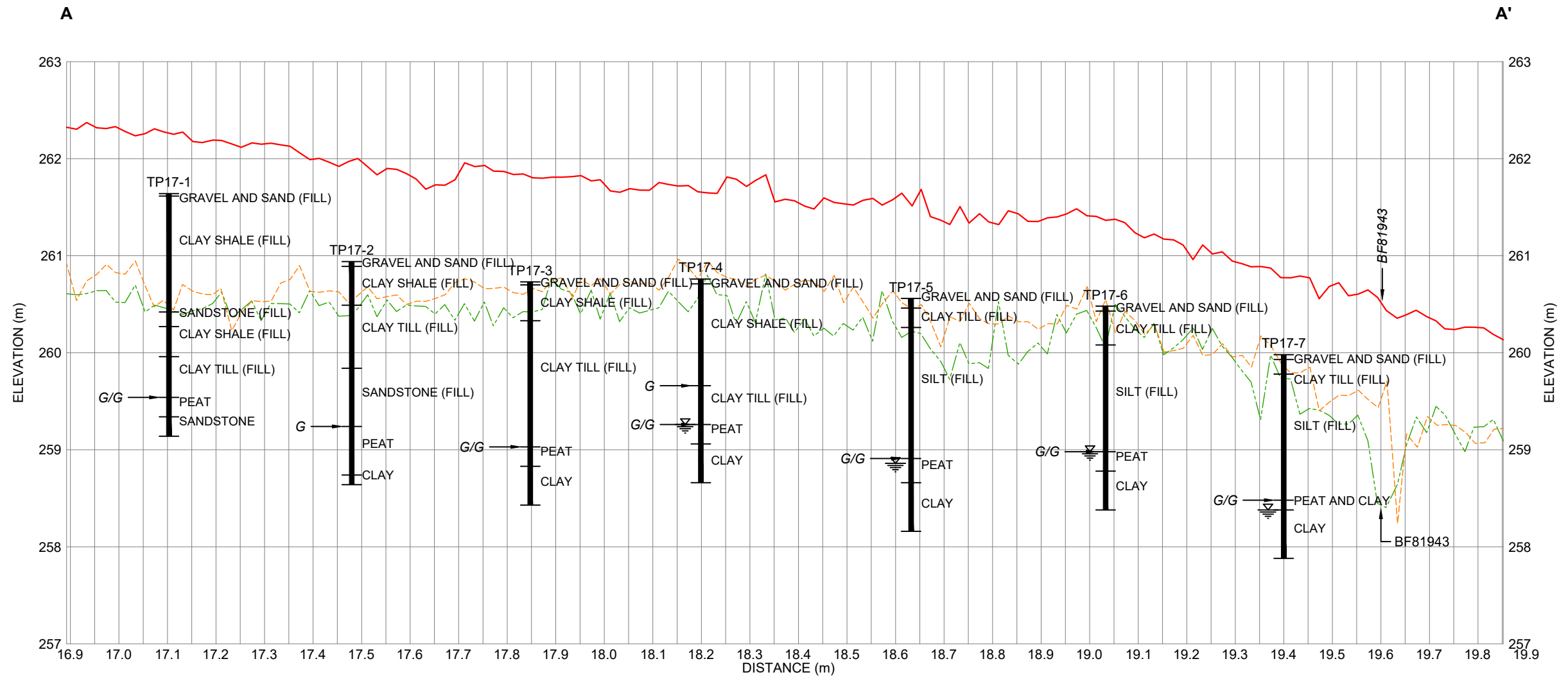
**PEACE REGION (PEACE RIVER / HIGH LEVEL)**

**PH079-1: HWY 58:14 WEST OF GARDEN RIVER  
 2018 GEOHAZARD ASSESSMENT**

**DWG No. 13351-PH079-1-1**

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:10 000
DATE	DECEMBER 2018
FILE No.	17288





**LEGEND**

- HIGHWAY CENTRELINE PROFILE
- - - RIGHT DITCH PROFILE
- - - LEFT DITCH PROFILE
- WATER LEVEL AT COMPLETION OF TEST PIT
- G** → DEPTH OF GEOGRID
- G/G** → DEPTH OF GEOGRID AND GEOTEXTILE

**NOTES**

1. VERTICAL SCALE EXAGGERATED x200
2. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.



**PEACE REGION (PEACE RIVER / HIGH LEVEL)**

**PH079-1: HWY 58:14 WEST OF GARDEN RIVER  
2018 GEOHAZARD ASSESSMENT**

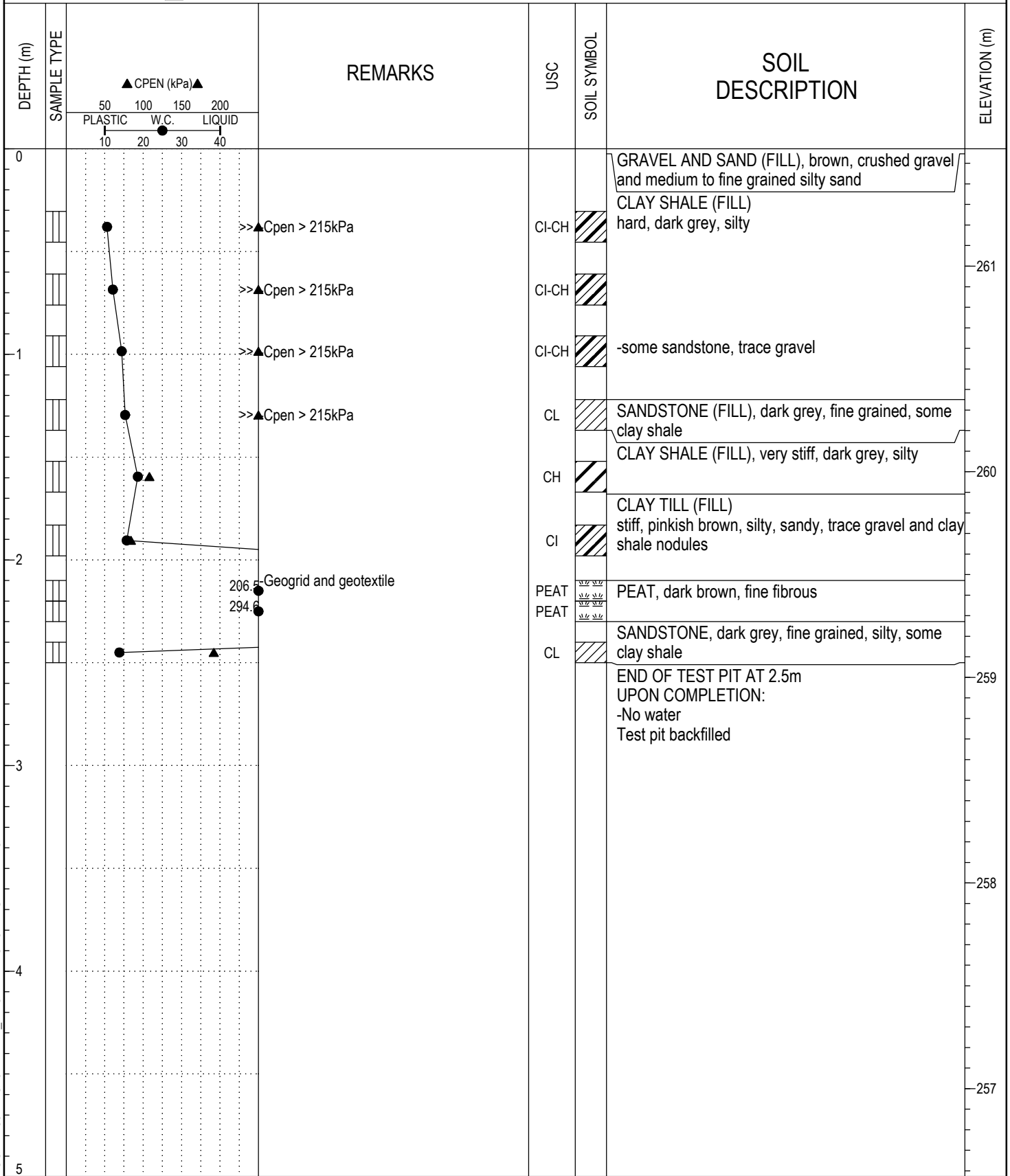
**DWG No. 13351-PH079-1-2**

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:10 000
DATE	DECEMBER 2018
FILE No.	17288



**THURBER ENGINEERING LTD.**

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-1</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6502365.431, E650345.553	ELEVATION: 261.57 (m)
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE		



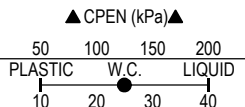
BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18-TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.5 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-2</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6502510.929, E650693.192	ELEVATION: 260.93 (m)
SAMPLE TYPE <input type="checkbox"/> GRAB SAMPLE		

DEPTH (m)	SAMPLE TYPE	REMARKS	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
0					GRAVEL AND SAND (FILL), brown, crushed gravel and medium to fine grained silty sand	
			CI-CH		CLAY SHALE (FILL), very stiff, dark grey, silty, some sandstone	
			CI		CLAY TILL (FILL) very stiff, brown, silty, sandy, trace pebbles, coal, and clay shale nodules	
1			CI		-pinkish brown	260
			CL		SANDSTONE (FILL) dark grey, fine grained, silty, trace clay shale	
		Geogrid	CL			
2		308	PEAT		PEAT dark brown, fine fibrous, frozen	259
		282	PEAT			
			CH		CLAY, grey - brown, silty, frozen	
					END OF TEST PIT AT 2.3m UPON COMPLETION: Test pit backfilled	
3						258
4						257
5						256



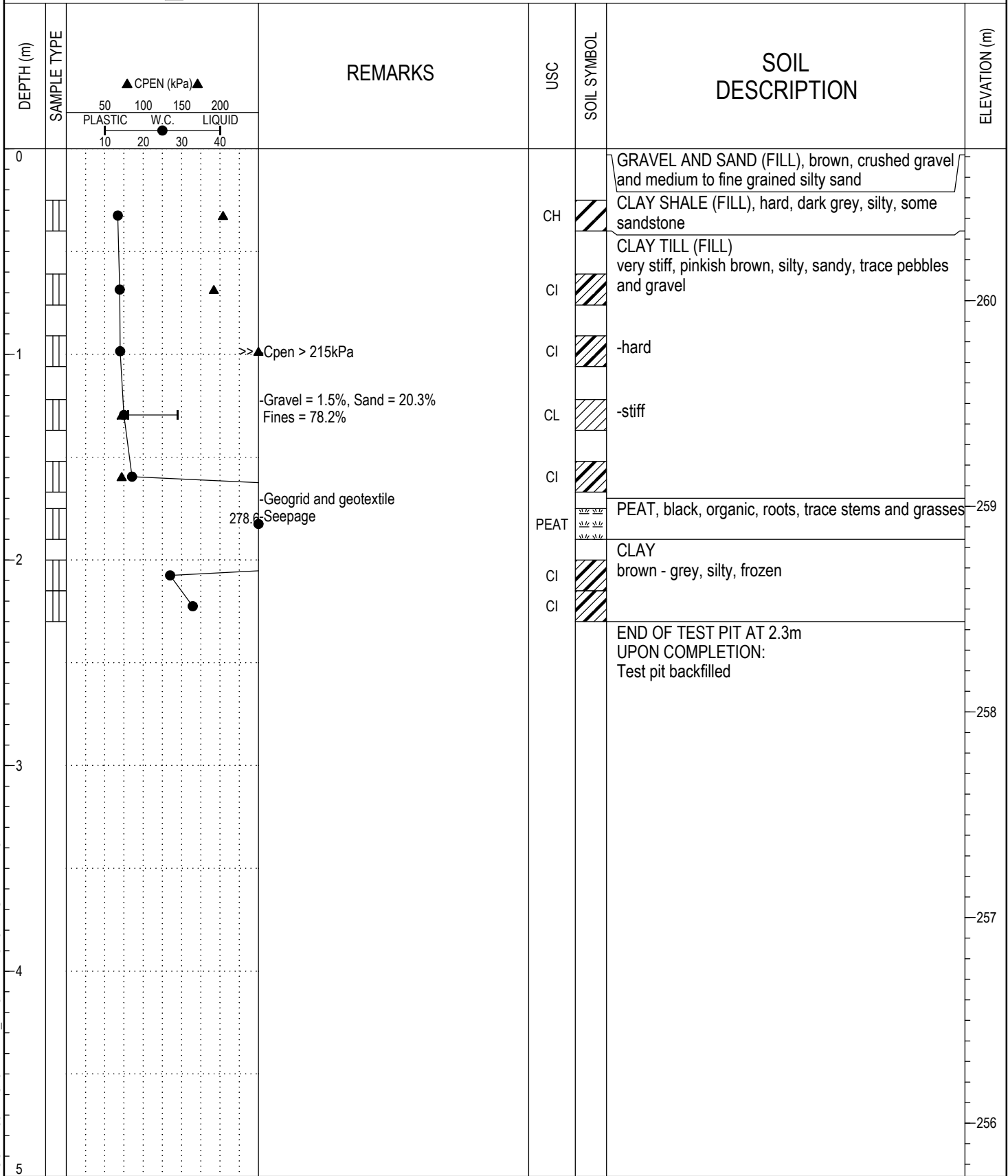
BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18--TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.3 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-3</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6502626.079, E651042.646	ELEVATION: 260.74 (m)

SAMPLE TYPE  GRAB SAMPLE



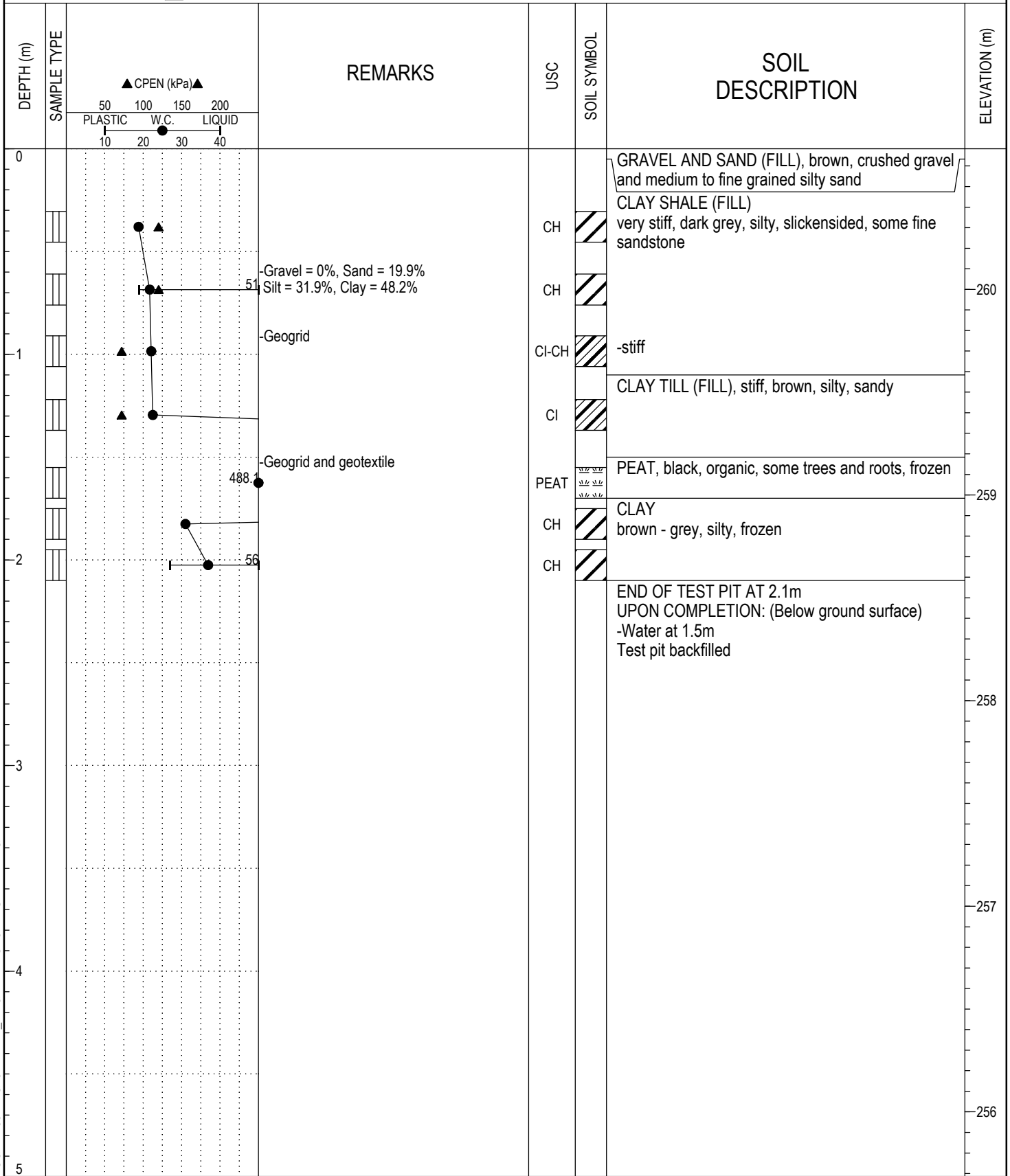
BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18-TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.3 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-4</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6502750.701, E651371.166	ELEVATION: 260.68 (m)

SAMPLE TYPE  GRAB SAMPLE



BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18-TEST PIT N.E.GLB

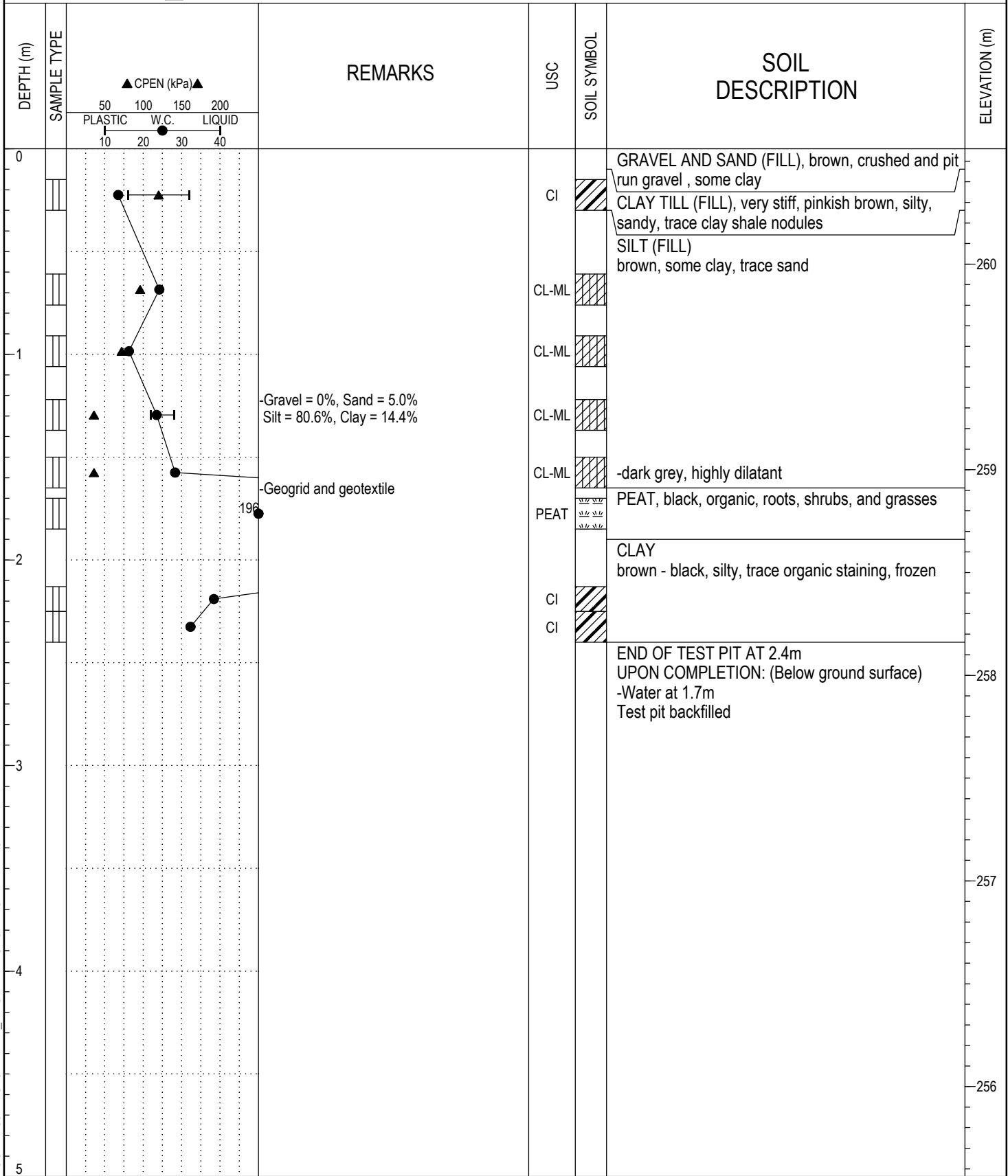


FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.1 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	



CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-5</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6502904.179, E651776.216	ELEVATION: 260.56 (m)

SAMPLE TYPE  GRAB SAMPLE



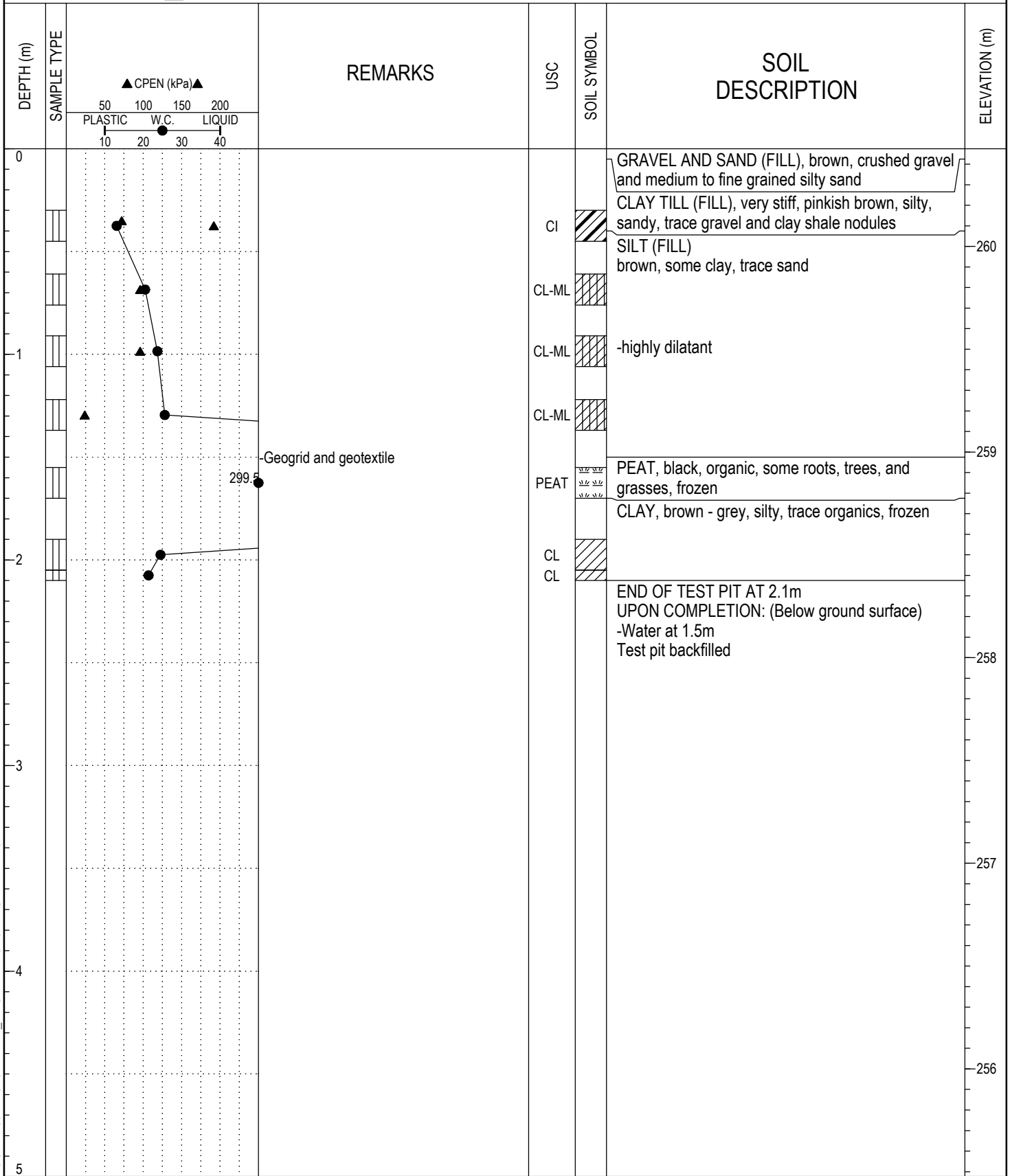
BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18- TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.4 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: <b>TP17-6</b>
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6503060.854, E652145.327	ELEVATION: 260.48 (m)

SAMPLE TYPE  GRAB SAMPLE



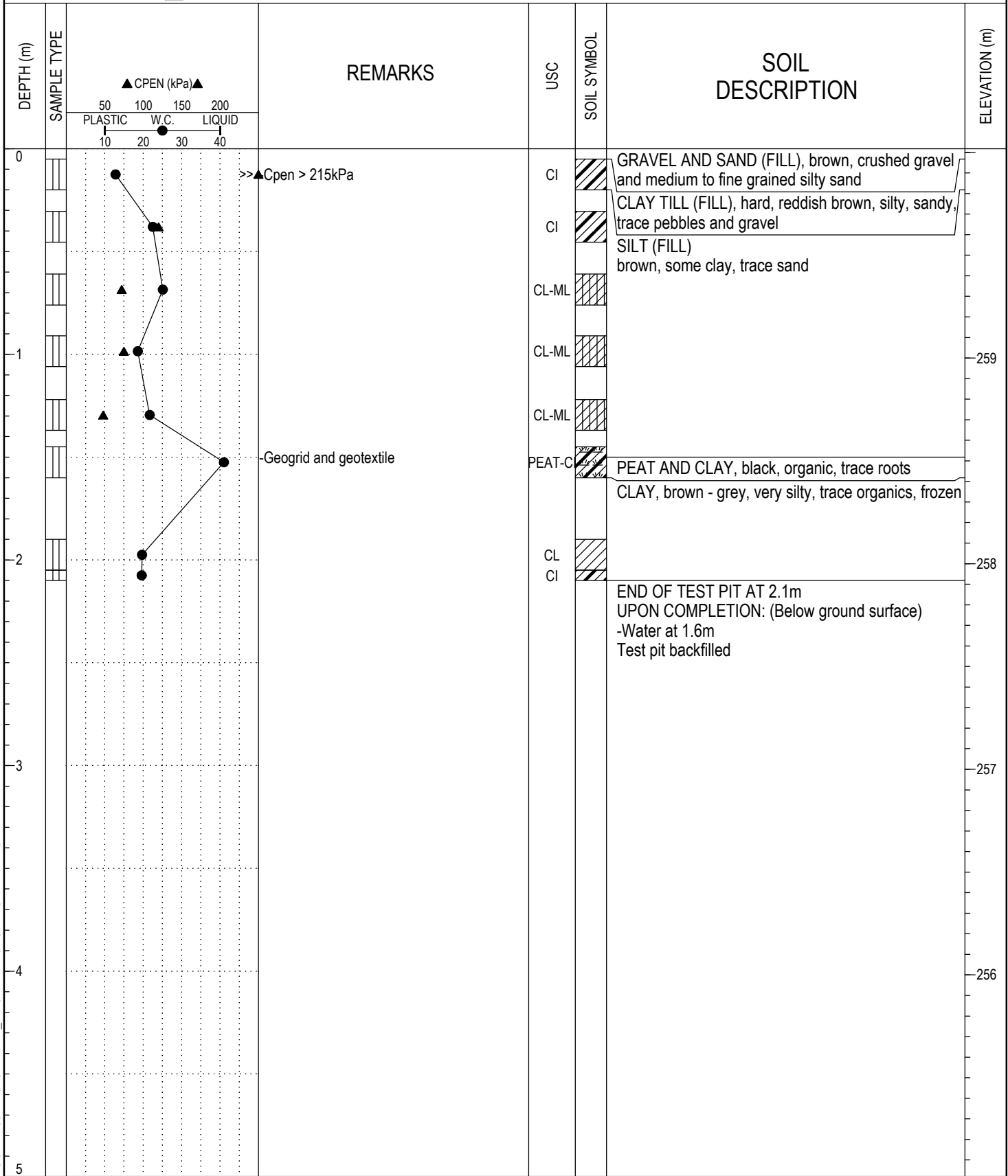
BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18--TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.1 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	

CLIENT: Alberta Transportation	PROJECT: Hwy 58:14 PH79 Embankment Reconstruction	TEST PIT NO: TP17-7
EXCAVATING COMPANY: LA PRAIRIE	DATE EXCAVATED: June 26, 2017	PROJECT NO: 17288
DRILL/METHOD: Brandt 410L / Test Pit	LOCATION: N6503175.902, E652493.69	ELEVATION: 260.02 (m)

SAMPLE TYPE  GRAB SAMPLE



BOREHOLE LOG 17288-TP.GPJ\_THRBR\_AB.GDT\_12/13/18-TEST PIT N.E.GLB



FIELD LOGGED BY: TDC	COMPLETION DEPTH: 2.1 m
PREPARED BY: KEF	COMPLETION DATE: 6/26/17
REVIEWED BY: DWP	



Photo 1 – Looking east at rutting on May 27, 2018 (AT photo)

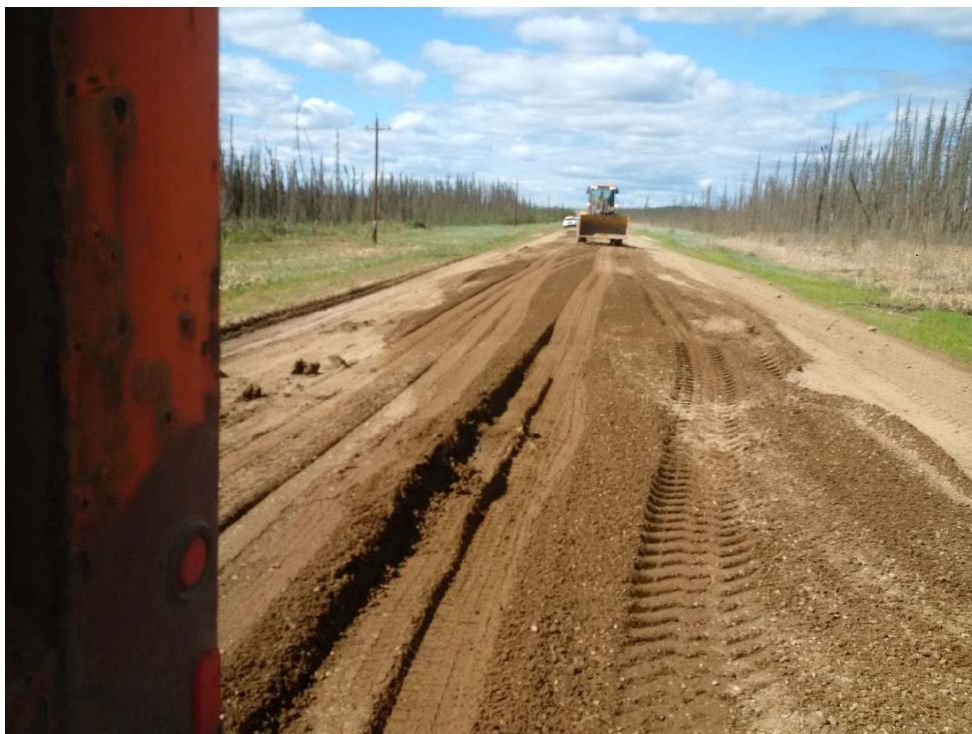


Photo 2 – Looking west at rutting during gravel placement on May 30, 2018 (AT photo)



Photo 3 – Looking east at rutting during gravel placement on May 30, 2018 (AT photo).



Photo 4 – Looking west at grading underway. Ruts were produced by grader working the highway surface.



Photo 5 – Looking east at grading work. Note that shoulder (left side of photo) has been scraped back onto highway surface and rutting on the other shoulder (right side)



Photo 6 – Looking north from new powerline ROW at low height of highway embankment.



Photo 7 – Saturated silty material pushed up through rut by grader traffic.