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	1	UTM Co-ordinates		
NW14-111-3-W5		11U E 651,925	N 6,	502,976

	Date	PF		CF	Total
Previous Inspection:	25-Jul-2016 (Callout)	8		8	64
Current Inspection:	22-Jun-2018	8		8	64
Road AADT:	330)	Yea	ar:	2018
Inspected By:	Roger Skirrow, TF Ed Szmata, TRAN Paul Catt, TRANS	NS		n Froese, Thurbo n/mond Juneau, I	
Report Attachments:	Photographs Photo	☑ Plans		☐ Maintenance	

Primary Site Issue:	Soft subgrade leading to deep rutting	
Dimensions:	1.3 km length, up to 2.1 km with potential need fo	r rebuilding
Date of Remediation:	2009: Highway constructed	
Maintenance:	2012: 300m long subcut and replacement with co 2016: 0.6 m to 0.9 m of gravel placed over entire 2018: 0.6 m of Des 4-Class 20 crush placed over	length
Observations:	Description	Worsened?
▼ Pavement Distress	Deep rutting occurring in spring exposing subgrade	>
☐ Slope Movement		
□ Erosion		
□ Seepage		
☐ Bridge/Culvert Distress		
Other	Poor ditch drainage	
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.

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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 overlie 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 geosynthetics 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.

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e-file: \\\\H\13351 \text{PH079} \text{Inspection Report}



APPROXIMATE TEST PIT LOCATION

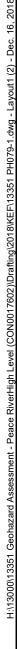
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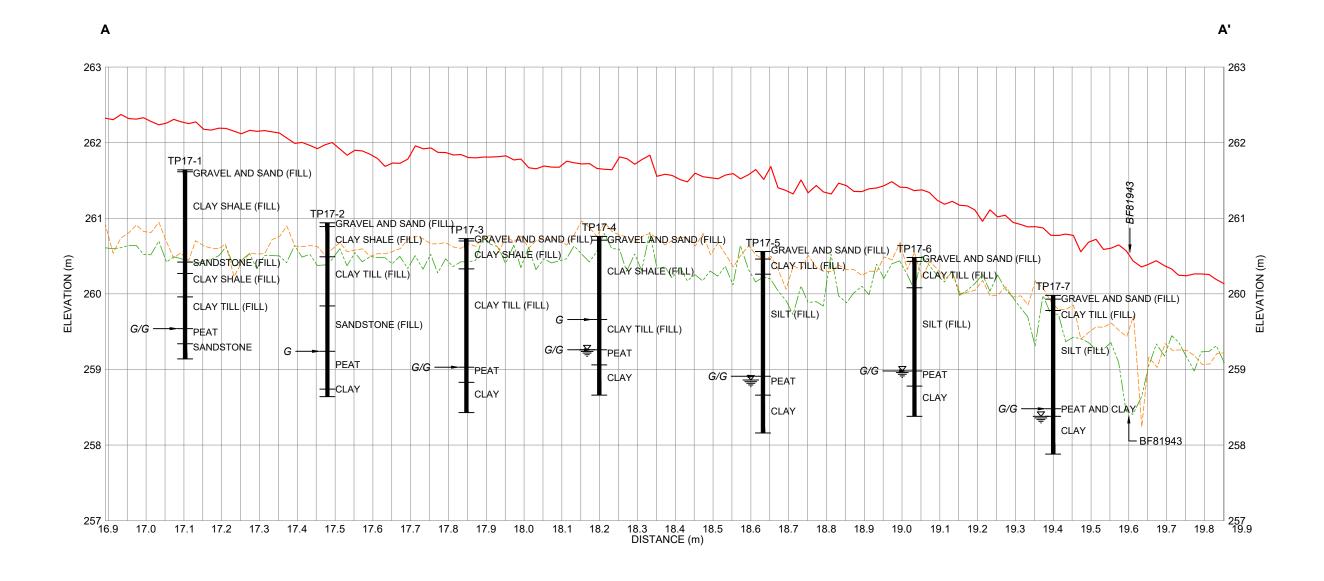
PH079-1: HWY 58:14 WEST OF GARDEN RIVER 2018 GEOHAZARD ASSESSMENT

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

<u>NOTES</u>

- 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 20°
FILE No.	1728



		Alberta Transportation	DATE EXCAVATE			ment Reconstruction	TEST PIT NO: TP1	
		TING COMPANY: LA PRAIRIE ETHOD: Brandt 410L / Test Pit	LOCATION: N650			553	PROJECT NO: 17	
		TYPE GRAB SAMPLE	LOCATION: NOSC	J2300.431, E00	0345.		ELEVATION: 261.	57 (m
DEPTH (m)	SAMPLE TYPE		REMARKS	SSN	SOIL SYMBOL	SOIL DESCRIP	TION	
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		>>▲Cpen > 215kPa	1	CL		SANDSTONE (FILL), dark gre- clay shale CLAY SHALE (FILL), very stiff CLAY TILL (FILL)	f, dark grey, silty	/ -:
2		206.5 Geogrid and go	eotextile	CI PEAT PEAT	7	stiff, pinkish brown, silty, sand shale nodules PEAT, dark brown, fine fibrous SANDSTONE, dark grey, fine	S	ay_
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				RED BY: KEF /ED BY: DWP		COMPLETION		ge 1 (

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2		308.		PEAT	77777 77777 77777	PEAT dark brown, fine fibrous, frozen		1
		287		PEAT	77 77 77 77			-
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		ETHOD: Brandt 410L / Test Pit		502626.079, E65		646	ELEVATION: 260.7	
		TYPE GRAB SAMPLE	l .					
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		Alberta Transportation		CT: Hwy 58:14 PH79 Er		ment Reconstruction	TEST PIT NO: TP1	
		FING COMPANY: LA PRAIRIE		XCAVATED: June 26, 2		216	PROJECT NO: 17	
		ETHOD: Brandt 410L / Test Pit TYPE		ON: N6502904.179, E65	01//6.	.216	ELEVATION: 260.	56 (m
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2			Gravel = 0%, Sand = 5.0% Silt = 80.6%, Clay = 14.4% Geogrid and geotextile	CL-ML CL-ML PEAT	771	CLAY		
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<u> </u>	1 1			FIELD LOGGED BY: TI	oc	COMPLETION		
				PREPARED BY: KEF		COMPLETION	DATE: 6/26/17	

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1		-Geogrid and	d geotextile	CL-ML PEAT	ruz.	-highly dilatant PEAT, black, organic, some roots, trees, and grasses, frozen CLAY, brown - grey, silty, trace organics, froze		- - - - -
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			PF	REPARED BY: KEF		COMPLETION DATE: 6/26/17		

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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)

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e-file:





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.

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Alberta Transportation 13351 \\H\13351 PH079 - Photos





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.

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

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