

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT
PEACE REGION (PEACE RIVER DISTRICT)
2022 INSPECTION**



Site Number	Location	Name	Hwy	km
PH079-1	160 km East of High Level	West of Garden River	58:14	16.8-19.6*
Legal Description		UTM Co-ordinates		
NW14-111-3-W5		11U E 651,925	N	6,502,976

	Date	PF	CF	Total
Previous Inspection:	22-Jun-2018	8	8	64
Current Inspection:	2-Jun-2022	6	6	36
Road AADT:	270		Year:	2022
Inspected By:	Rishi Adhikari, TRANS Max Shannon, TRANS		Ken Froese, Thurber Mark Gallego, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs		<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance Items

Primary Site Issue:	Soft subgrade leading to deep rutting	
Dimensions:	2.8 km length	
Date of Remediation:	2009: Highway constructed	
Maintenance:	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 2019-2022: More gravel placed, and highway regraded	
Observations:	Description	Worsened?
<input checked="" type="checkbox"/> Pavement Distress	Deep rutting occurring in spring exposing subgrade. Has become localized areas of minor distress.	<input type="checkbox"/>
<input type="checkbox"/> Slope Movement		<input type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Gully formed on north side of highway at east end immediately west of BF81943	<input checked="" 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:	<p>This gravel-surfaced road was built across a large muskeg deposit to replace a longer winter-only road which was 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 was insufficient for the vehicle loading experienced by this highway particularly during the spring thaw. The installation of a power line shortly prior to 2018 reduced the amount of fuel being hauled to the east to the Garden River community (part of Little Red River Cree Nation); however, there are still heavy trucks using the road for supplying the community. In the early spring of 2018, the</p>	

Contractor working on water and sewer upgrades at Garden River hauled in a significant amount of material which likely precipitated the failures observed later that year. The Maintenance Contract Inspector had set a permanent 75 percent road ban on the highway to try to increase the durations between failure.

The test pit program undertaken in 2017 identified that the gravel fill was thinner than expected for the number of overlays that have been done. 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. The groundwater table appeared to be at the top of the peat-to-fill contact.

At the time of the 2022 inspection, the highway seemed to be in much better condition than in 2018. The zones of roadway distress were typically limited in extent to less than 50 m and each of these documented individually and are shown on the Drawing with notes regarding the lineal extent and type of distress observed. Typically, the distress consisted of deep rutting one lane up to 250 mm (measured from trough to crest as the material was often pushed up at the edges). In many locations, the non-woven geotextile separator fabric had been exposed by repeated grading of the highway. A new zone of erosion was observed in the north ditch at the east end of the site adjacent to the large multi-plate culvert at km 19.64. The erosion channel was 42 m in length, up to 1.9 m deep, and up to 3 m wide. Near the nick point, the erosion came within about 4 m of the edge of the gravel surface.

* Note: km range extended in 2022 to capture newer areas to the west and east.

Thurber completed test pitting and survey of this highway. Test pit logs were attached to the 2018 Geohazard report. The attached site plan was based on this survey and the profile (Drawing 17288-2) is also attached for reference (stick logs show the soil profile).

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.

Medium-Term:

- The east end of the north ditch should be reconstructed and lined with erosion protection measures to reduce the down-cutting of the ditch and subsequent sedimentation of the adjacent creek at BF81943.

Long-Term remediation options:

It is understood that AT considered using 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. In particular, cellular confinement products such as Paradox Tough-Cell could be used as they provide horizontal confinement which allows use of poorer materials while providing better bridging of weak subgrades through distribution of the loading forces. Other products that may be considered individually or in combination are: Mirafi H2Ri (high-strength woven geotextile with horizontal wicking capabilities), high-strength woven geotextiles (functions as a replacement for the typical layer of non-woven geotextile and geogrid), conventional geogrids, and provision of insulation in combination with one of the above in a section where silty, frost-susceptible fill is present.

However, the methods used by the MCI since 2018 have proven somewhat effective though it is unknown on the long-term maintenance requirements of those methods.

Ongoing Investigation:

- This site is scheduled for one Geohazard inspection per Contract which should be sufficient.

Closure

It is a condition of this letter report that Thurber's performance of its professional services will be subject to the attached Statement of Limitations and Conditions.

Renato Clementino, Ph.D., P.Eng.
Principal | Senior Geotechnical Engineer

Ken Froese, P.Eng.
Associate | Senior Geotechnical Engineer



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This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

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The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

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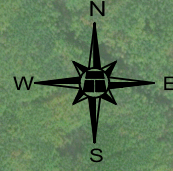
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H:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2022 GEOHAZARD\KEF\32121-PH079-1.dwg - 1n - Oct. 14, 2022



km18.226: SOFT ZONE JUST WEST OF 900mm CSP CULVERT: WESTBOUND LANE RUT AT SHOULDER 150mm DEEP; CLAYEY MATERIAL EXPOSED ON NORTH SHOULDER AND SHOULDER GRADED OUT ABOUT 0.5m OVER 5m LENGTH; PONDED WATER AT NORTH END OF CULVERT; SOUTH DITCH WET

km 18.144: ZONE EXTENDS 25m WEST: HARD DRY CLAY PUSHED UP AT CENTERLINE; WESTBOUND LANE RUTS UP TO 250mm DEEP OVER 3m WIDE AREA

km 18.928: POTHOLE WITH GEOTEXTILE EXPOSED

POSSIBLE MAXIMUM LENGTH FOR REPAIR
MINIMUM LENGTH RECOMMENDED FOR REPAIR

TP17-4

km 18.0
SPRING 2012 AREA OF DISTRESS

TP17-5
km 18.5
MAY 2016 & JUNE 2018 AREA OF DISTRESS

JUNE 2022 ZONE OF DISTRESS

km 17.631: 3m WIDE SOFT ZONE IN WESTBOUND LANE UP TO 100mm DEEP

km 17.618: 3m WIDE SOFT ZONE IN EASTBOUND LANE UP TO 100mm DEEP

km 16.866: ZONE EXTENDS 58m WEST: SOFT, SANDY ZONE IN WESTBOUND LANE OUTER WHEEL PATH UP TO 100mm DEEP; SOFT SHOULDER CONTINUES ANOTHER 100m WEST

km 19.534: ZONE EXTENDS 12m WEST: NON-WOVEN GEOTEXTILE EXPOSED IN SEVERAL PLACES; 100mm HUMP AT CENTERLINE

SEE DETAIL 1

km 19.599: ZONE EXTENDS 38m WEST: RUT IN WESTBOUND LANE BETWEEN CENTER LANE AND INNER WHEEL PATH UP TO 3.2m WIDE AND 220mm RUT/DIP

km 19.561: 5m LONG X 1.3m WIDE RUTTED AREA 100mm DEEP IN WESTBOUND LANE INNER WHEEL PATH

km 19.511: SOFT, VERY SANDY AREA MOSTLY IN EASTBOUND LANE WITH 100mm DIP

km 19.344: ZONE EXTENDS 14m WEST: SANDY ZONE WITH RUTS AT CENTERLINE AND INTO WESTBOUND LANE

km 19.305: ZONE EXTENDS 11m EAST: VERY SANDY ZONE ABOUT 5m WIDE WITH RUTS UP TO 150mm DEEP AND EXPOSED GEOTEXTILE IN EASTBOUND LANE

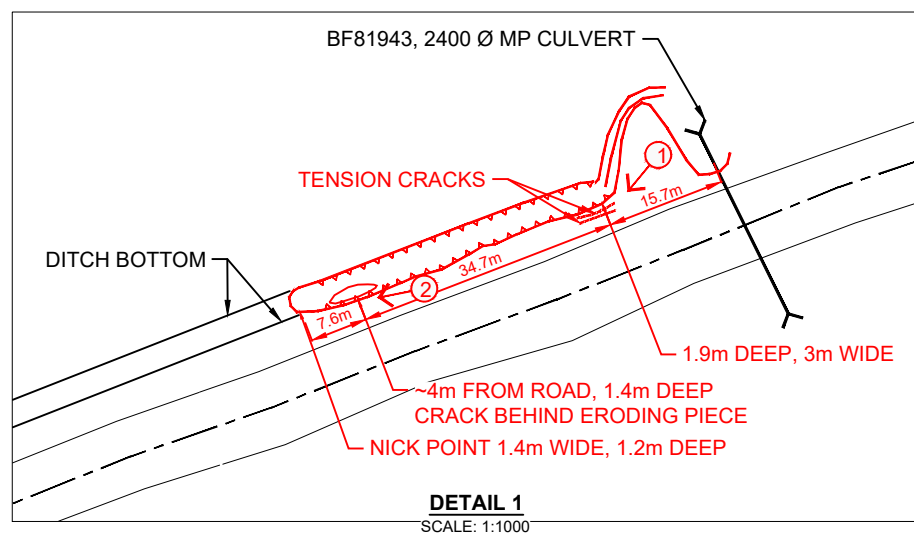
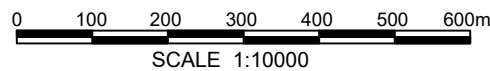
km 19.199: 250mm DEEP DIP

km19.171: ZONE EXTENDS 17m EACH SIDE IN BOTH LANES ABOUT 6m WIDE: RUTS UP TO 250mm DEEP AND GEOTEXTILE EXPOSED AT CENTERLINE; NORTH SHOULDER GRADED OUT ABOUT 0.7m; NORTH DITCH HAD PONDED WATER; SOUTH DITCH SOFT

BASE PLAN PROVIDED BY WSP, SURVEYED 2017-07-16; SATELLITE IMAGERY FROM ESRI WORLD IMAGERY DOWNLOADED 2022-09-22

LEGEND

- APPROXIMATE TEST PIT LOCATION
- CULVERT
- SCARP CRACK (APPROXIMATE)
- CRACK (APPROXIMATE)
- PHOTOGRAPH NUMBER, AND APPROXIMATE DIRECTION AND LOCATION



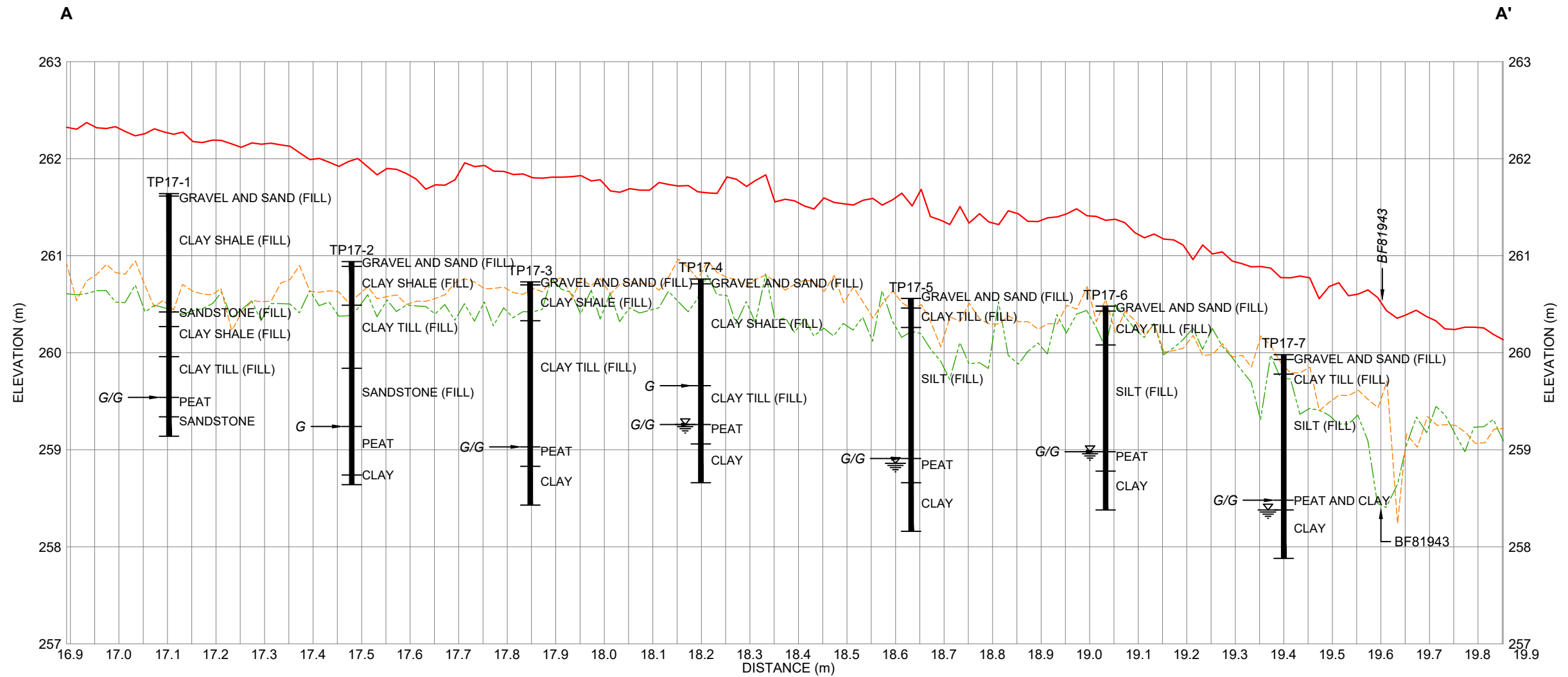
PEACE REGION (PEACE RIVER / HIGH LEVEL)

PH079-1: HWY 58:14 WEST OF GARDEN RIVER
2022 GEOHAZARD ASSESSMENT

DWG No. 32121-PH079-1

DRAWN BY	ML
DESIGNED BY	KEF
APPROVED BY	RVC
SCALE	1:10 000
DATE	OCTOBER 2022
FILE No.	32121





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





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 – km 19.58.



Photo 4 – km 19.53



Photo 5 – km 19.30



Photo 6 – km 19.20



Photo 7 – km 18.22



Photo 8 – km 18.12