

**ALBERTA TRANSPORTATION
GEOHAZARD ASSESSMENT PROGRAM
PEACE REGION – HIGH LEVEL
2020 INSPECTION**



Site Number	Location	Name	Hwy	km
PH075-1	North of Peace River	Whitemud River (Sta. 44+380)	743:02	44.4
Legal Description		UTM Co-ordinates		
NE2-88-21-W5M		11U E 486,395	N	6,273,737

	Date	PF	CF	Total
Previous Inspection:	15-May-2019	11	4	44
Current Inspection:	4-June-2020	11	4	44
Road AADT:	110		Year:	2020
Inspected By:	Rocky Wang, TRANS Ed Szmata, TRANS		Ken Froese, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs	<input checked="" type="checkbox"/> Plans	<input type="checkbox"/> Maintenance Items	

Primary Site Issue:	Creek bank erosion and slumping of over-steepened slope above culvert inlet.		
Dimensions:	40 m of creek bank erosion		
Date of Remediation:	2009: Culvert replaced and sideslopes rebuilt.		
Maintenance:	None		
Observations:	Description	Worsened?	
<input type="checkbox"/> Pavement Distress	Highway is gravel-surfaced.	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	Slump above culvert regressed significantly in 2018 and continued in 2019 and 2020. There is minor bank slumping downstream of the outlet.	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Erosion	Slump on the west side of the creek at the inlet has continued to retrogress since 2015; erosion at end of north ditch channel relatively stable.	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Seepage		<input type="checkbox"/>	
<input checked="" type="checkbox"/> Bridge/Culvert Distress	No signs of distress in the culvert itself; however, the slide slightly obstructing the inlet in 2019 but was removed by erosion in 2020.	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Other		<input type="checkbox"/>	
Instrumentation:	None.		

Assessment:

The creek bank at the culvert inlet has regressed significantly since 2017 triggered by heavy runoff in Spring 2018. The spring of 2020 also had significant runoff and there was an ice jam at this site (reported by MCI). The scarps above the culvert have formed into numerous slump blocks 5 m (slope distance) from the edge of the gravel surfacing (was 8.85 m in 2018). Slumping continues to worsen along the west bank of the creek moving further into the slope than the tension cracks first mapped in 2017. In 2018, the pin installed 2 m upslope of the tension crack was only 0.36 m from the resulting scarp and was shifted 3 m further upslope. The pin was 3.0 m from the scarp in 2019 and had to be reset again in 2020. The slumping of the riverbank is undermining the embankment and is causing instability which will impact the highway and has started to impact the culvert obstructing the inlet slightly.

The embankment slope above the riprap was about 2H:1V which is steeper than usual for a slope constructed using clay in this area. This steeper slope will likely result in more rapid retrogression if the channel experiences similar water flows. The ongoing slumping on the west side at the culvert inlet has displaced much of the riprap apron which increases the vulnerability of the slope to future high water events. Furthermore, the point bar forming on the east side of the channel also concentrates flow into the west bank. This point bar had increased in size noticeably in 2020.

Erosion is starting to form where the north ditch contacts the west bank north of the culvert inlet. The rate of downcutting has slowed with only an additional 0.1 m deeper and wider since 2017.

The shallow gully that formed at the west side of the top of the outlet riprap has started to vegetate and did not appear to have increased in size since 2017. This gully has likely formed due to surface runoff short-cutting out of the ditch channel. It was also observed that the displaced riprap from the culvert outlet apron is mounded in the centre of the channel forcing flow around causing the increasing undercut on the east bank. The length of affected bank was slightly longer in 2020.

The risk rating was elevated from 36 to 44 in 2018 to reflect the higher rate of movement at the site.

Recommendations:**Short Term:**

- The maintenance contractor and MCI should review this site routinely, particularly after significant rainfall events, to ensure that the highway is not impacted by further slumping.

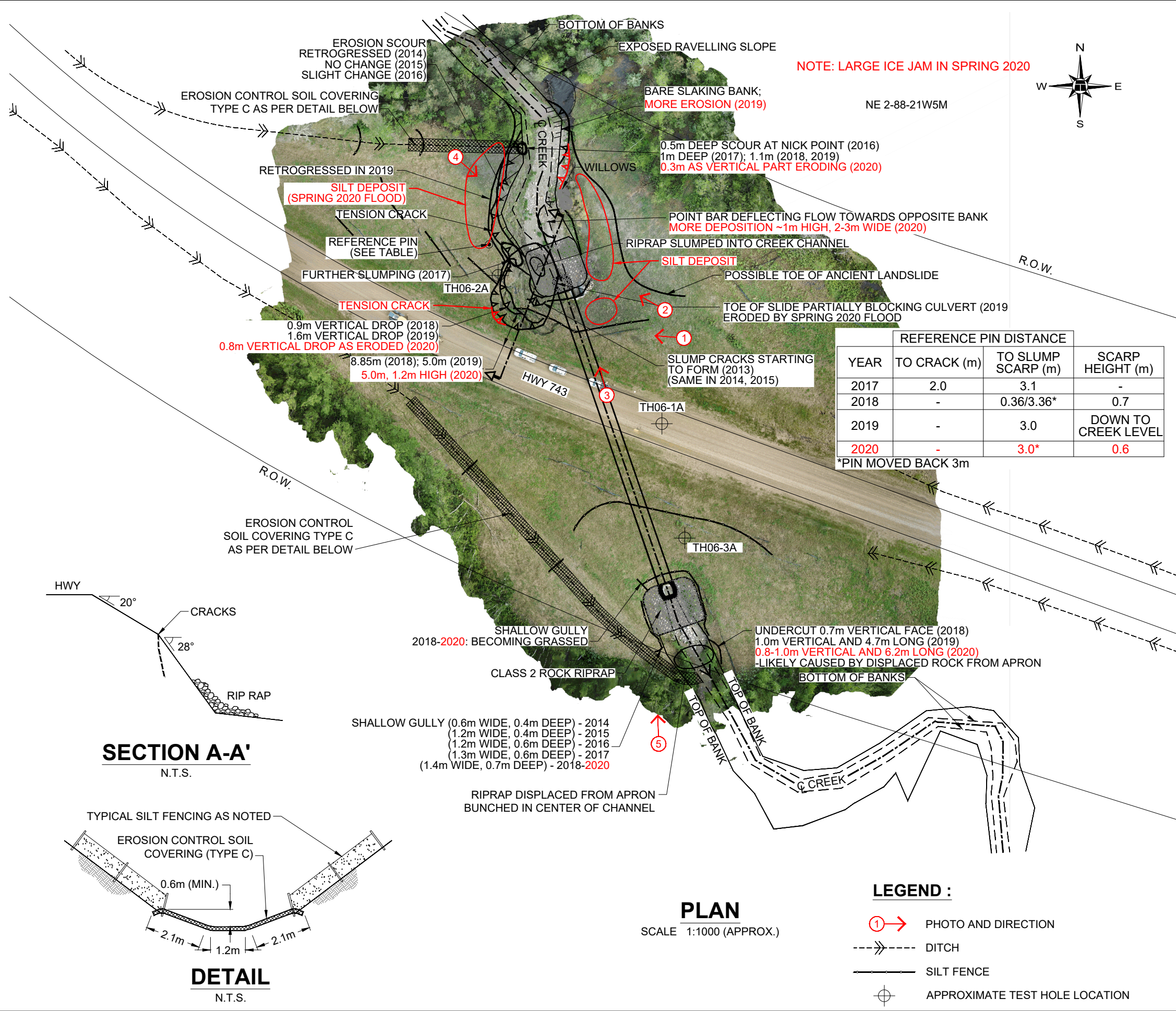
Long-Term:

- Rebuild the west bank north of the existing riprap upstream of the culvert inlet at a flatter slope and protect with additional riprap.
- The steep embankment slope above the culvert inlet needs to be stabilized. As the slope is now failing, it should be rebuilt with geogrid-reinforced granular material. A stability analyses should be undertaken to assess the potential effectiveness of these measures.
- Line the shallow gully on the west bank at the culvert outlet with riprap to limit deterioration. The mound of riprap downstream of the outlet should be redistributed to create a flow path down the centre of the channel rather than the unprotected sides.

Ongoing Investigation:

- It is recommended that the annual GeoHazard inspection should continue as scheduled.

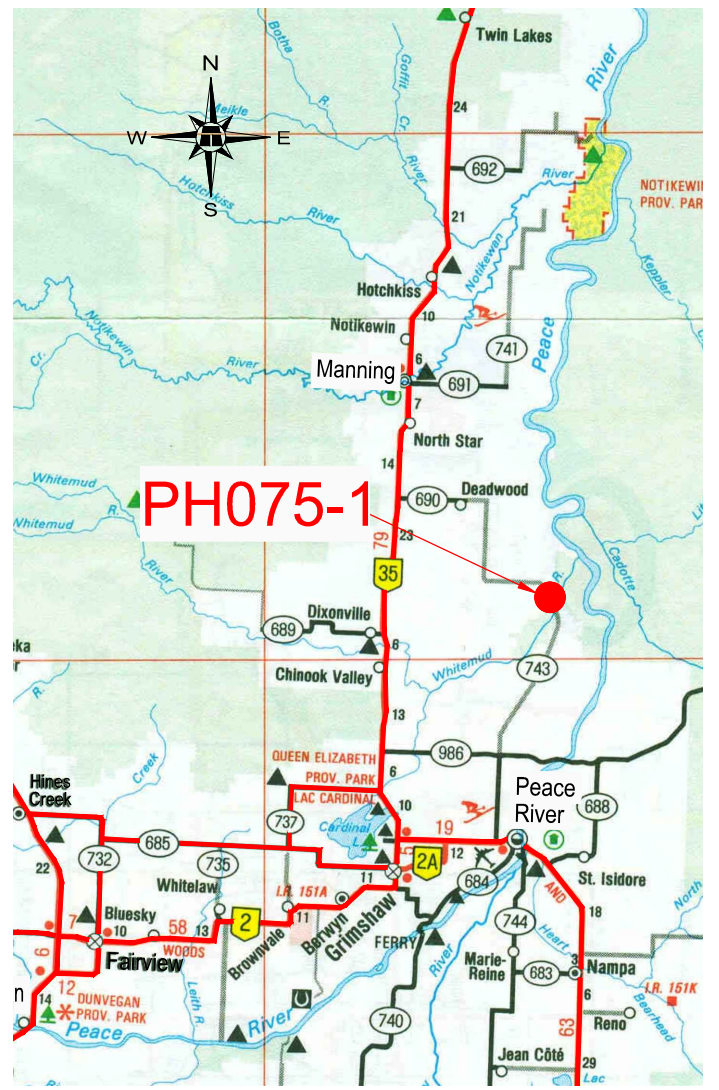
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NOTE: LARGE ICE JAM IN SPRING 2020

YEAR	REFERENCE PIN DISTANCE		
	TO CRACK (m)	TO SLUMP SCARP (m)	SCARP HEIGHT (m)
2017	2.0	3.1	-
2018	-	0.36/3.36*	0.7
2019	-	3.0	DOWN TO CREEK LEVEL
2020	-	3.0*	0.6

*PIN MOVED BACK 3m



- NOTES :**
1. FEATURE LOCATIONS ARE APPROXIMATE
 2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
 3. JUNE 2020 OBSERVATIONS SHOWN IN RED

UAV ORTHOIMAGE FLOWN BY THURBER 2020

Alberta

PEACE REGION (PEACE RIVER / HIGH LEVEL)

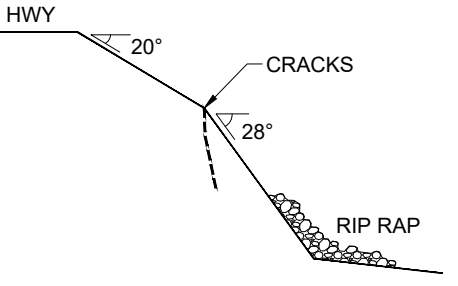
**PH075-1: HWY 743:02 AT km 44.4
2020 GEOHAZARD ASSESSMENT**

DWG No. 13351-PH075-1-1

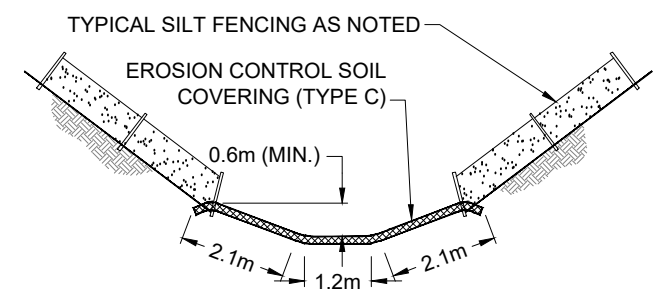
DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	APPROX. 1:1000
DATE	DECEMBER 2020
FILE No.	13351

THURBER ENGINEERING LTD.

SECTION A-A'
N.T.S.



DETAIL
N.T.S.



PLAN
SCALE 1:1000 (APPROX.)

- LEGEND :**
- ① → PHOTO AND DIRECTION
 - > DITCH
 - SILT FENCE
 - ⊕ APPROXIMATE TEST HOLE LOCATION

SHALLOW GULLY (0.6m WIDE, 0.4m DEEP) - 2014
 (1.2m WIDE, 0.4m DEEP) - 2015
 (1.2m WIDE, 0.6m DEEP) - 2016
 (1.3m WIDE, 0.6m DEEP) - 2017
 (1.4m WIDE, 0.7m DEEP) - 2018-2020

RIPRAP DISPLACED FROM APRON
 BUNCHED IN CENTER OF CHANNEL

UNDERCUT 0.7m VERTICAL FACE (2018)
 1.0m VERTICAL AND 4.7m LONG (2019)
 0.8-1.0m VERTICAL AND 6.2m LONG (2020)
 LIKELY CAUSED BY DISPLACED ROCK FROM APRON

0.9m VERTICAL DROP (2018)
 1.6m VERTICAL DROP (2019)
 0.8m VERTICAL DROP AS ERODED (2020)

8.85m (2018); 5.0m (2019)
 5.0m, 1.2m HIGH (2020)

SLUMP CRACKS STARTING
 TO FORM (2013)
 (SAME IN 2014, 2015)

0.5m DEEP SCOUR AT NICK POINT (2016)
 1m DEEP (2017); 1.1m (2018, 2019)
 0.3m AS VERTICAL PART ERODING (2020)

POINT BAR DEFLECTING FLOW TOWARDS OPPOSITE BANK
 MORE DEPOSITION ~1m HIGH, 2-3m WIDE (2020)

SILT DEPOSIT

RIPRAP SLUMPED INTO CREEK CHANNEL

POSSIBLE TOE OF ANCIENT LANDSLIDE

TOE OF SLIDE PARTIALLY BLOCKING CULVERT (2019)
 ERODED BY SPRING 2020 FLOOD

BARE SLAKING BANK;
 MORE EROSION (2019)

EROSION SCOUR
 RETROGRESSION (2014)
 NO CHANGE (2015)
 SLIGHT CHANGE (2016)

EROSION CONTROL SOIL COVERING
 TYPE C AS PER DETAIL BELOW

RETROGRESSION IN 2019

SILT DEPOSIT
 (SPRING 2020 FLOOD)

TENSION CRACK

REFERENCE PIN
 (SEE TABLE)

FURTHER SLUMPING (2017)

TENSION CRACK

EROSION CONTROL
 SOIL COVERING TYPE C
 AS PER DETAIL BELOW

EROSION CONTROL
 SOIL COVERING TYPE C
 AS PER DETAIL BELOW

CLASS 2 ROCK RIPRAP

SHALLOW GULLY
 2018-2020: BECOMING GRASSED

BOTTOM OF BANKS

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK

TOP OF BANK



Photo 1 – Looking west at north sideslope.



Photo 2 – Looking northwest at creek bank slumping upstream of the culvert inlet.



Photo 3 – Looking north at creek bank slumping upstream of the culvert inlet. Note fresh material deposits on the right-hand side of the channel.



Photo 4 – Looking south at culvert inlet.



Photo 5 – Looking north at culvert outlet and shallow gullies (arrows)



2020 UAV Image of slumping around culvert inlet.