

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – SWAN HILLS  
2020 INSPECTION**



Site Number	Location	Name	Hwy	km
SH013-14 SH013-15	Little Smoky River	Little Smoky River Valley, North Hill – Sites #14 & #15	744:02	21.55-21.61 21.61-21.80
<b>Legal Description</b>		<b>UTM Co-ordinates</b>		
Site 14: SE28/SW27-76-22-W5M		11U E 478,675	N	6,163,221
Site 15: SE28/SW27-76-22-W5M		11U E 478,647	N	6,163,070

	Date	PF	CF	Total
<b>Previous Inspection:</b>	12-Jun-2019	Site 14: 12 Site 15: 8	3 3	36 24
<b>Current Inspection:</b>	3-Jun-2020	Site 14: 12 Site 15: 8	3 3	36 24
<b>Road AADT:</b>	240		<b>Year:</b>	2020
<b>Inspected By:</b>	Rocky Wang, TRANS		Ken Froese, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	<p><u>Site 14:</u> Highway is adjacent to slumps resulting from aggressive erosion along channel of tributary to Peavine Creek. This Site is 8 m above and 60 m away from the tributary gully of the Peavine Creek.</p> <p><u>Site 15:</u> Highway traverses deep-seated, retrogressive landslide with ongoing creep movement due partly to erosion at toe by the Little Smoky River and Peavine Creek resulting in cracking and sagging of the pavement surface at numerous locations. Approx. 4 km of the highway crosses this unstable north valley slope. This Site is 25 m above and 90 m away from the tributary gully of the Peavine Creek.</p>		
<b>Dimensions:</b>	<p><u>Site 14:</u> 55 m length of highway parallels active erosion area.</p> <p><u>Site 15:</u> 60 m length of highway with distortion and cracking.</p>		
<b>Date of Remediation:</b>	None		
<b>Maintenance:</b>	Routine crack sealing, milling, and patching, when required. 2017: Overlay through Sites 13, 15, and 14 2019: milling at Site 15 2020: Line painting, spot patching over crack at Site 15		
<b>Observations (Site 14):</b>	<b>Description</b>	<b>Worsened?</b>	
<input type="checkbox"/> Pavement Distress	Cracking with minor pavement surface distortion (dip)	<input type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	Slumps have developed along the creek valley and are retrogressing as creek continues to erode.	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Erosion	Significant erosion along channel of tributary to Peavine Creek.	<input checked="" type="checkbox"/>	
<input type="checkbox"/> Seepage		<input type="checkbox"/>	

<input checked="" type="checkbox"/> Bridge/Culvert Distress	Twin culverts at km 21.77 have partially obstructed inlets and outlets	<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
<b>Observations (Site 15):</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Cracking reflected through recent patch with minor pavement surface distortion (dip)	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Site is located on an active deep-seated landslide moving toward the Peavine Creek. There is also a slump at the top of the backslope.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Gully in the west ditch approx. 73 m in length	<input type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input type="checkbox"/> Other		<input type="checkbox"/>
<b>Instrumentation:</b>		
None.		
<b>Assessment:</b>		
<p>The overall valley slope is moving as several separate slide blocks in response to the toe erosion and downcutting of two different rivers resulting in numerous scarps, sag ponds, and differential movement zones going in slightly different directions. The highway intersects the scarps of these blocks at several locations resulting in an uneven highway surface and cracking.</p> <p>Site 14: The highway is adjacent to a tributary to the Peavine Creek and the channel is aggressively downcutting resulting in slumping less than 20 m from the highway – the nick point of one of the gullies is about 9 m from the culvert outlet. The erosion is driven by overland flow through the east ditch as well as the west ditch as the flow is diverted below the highway to the east ditch at this location. Heavy spring runoff and rain falls in 2019 and 2020 have significantly increased the width and length of the erosion. The remaining field marker for measuring the regression was reset in 2019 and the offset from the crest of the slumping decreased from 4.95 m to 2.5 m. The erosion occurring in the highway ditch could be controlled with erosion control products; however, the downcutting along the tributary channel would require extensive works to reduce the erosion as this natural process will continue to extend as the grade of the tributary moves toward equilibrium conditions (geological time-scale process).</p> <p>Site 15: The overall valley movements have led to a diagonal crack across the highway at this location which likely represents the upmost scarp of the deep-seated, retrogressive movement in the valley. There is a noticeable dip in the highway surface on the downslope side of the crack despite the milling in 2019. The crack pattern has become widely braided and required a small patch in 2020. In addition, there is some erosion located downslope (east) of the highway and shallower scarp which may both be contributing to the movement at the highway. Two pins were installed in 2017 to measure the regression of this feature; however, they could not be located in 2018 or 2019 but the second pin (which was 7 m away from the scarp) is now 2.4 m away. There is also a backslope slump that has formed about 1 m from the valley crest which may be the result of cut slope angle rather than the overall valley movement. Tension cracks were observed in 2017 in the field above this slump indicating that it is retrogressing although it did not appear significantly different since 2017.</p>		

## **Recommendations:**

### Short-Term:

- Road maintenance should continue as necessary to maintain a safe roadway surface and may consist of milling, patching, and crack sealing of the ACP.
- Riprap could be placed at the headscarp of the erosion ravine to slow retrogression of the erosion up-gradient.

### Medium-Term:

- If the highway is not re-aligned, consideration should be given to remediating the erosion in the tributary channel at Site 14 by installing a series of rock check dams or armouring most of the channel bottom.
- Consideration could also be given to the installation of steel sheet piles along the highway at Site 14 as an interim measure if the gully regresses close enough to the highway that there is concern for the safety of the traveling public. A guardrail would also be required in this scenario. Preliminary engineering should be undertaken so that this remediation can be implemented quickly when required.

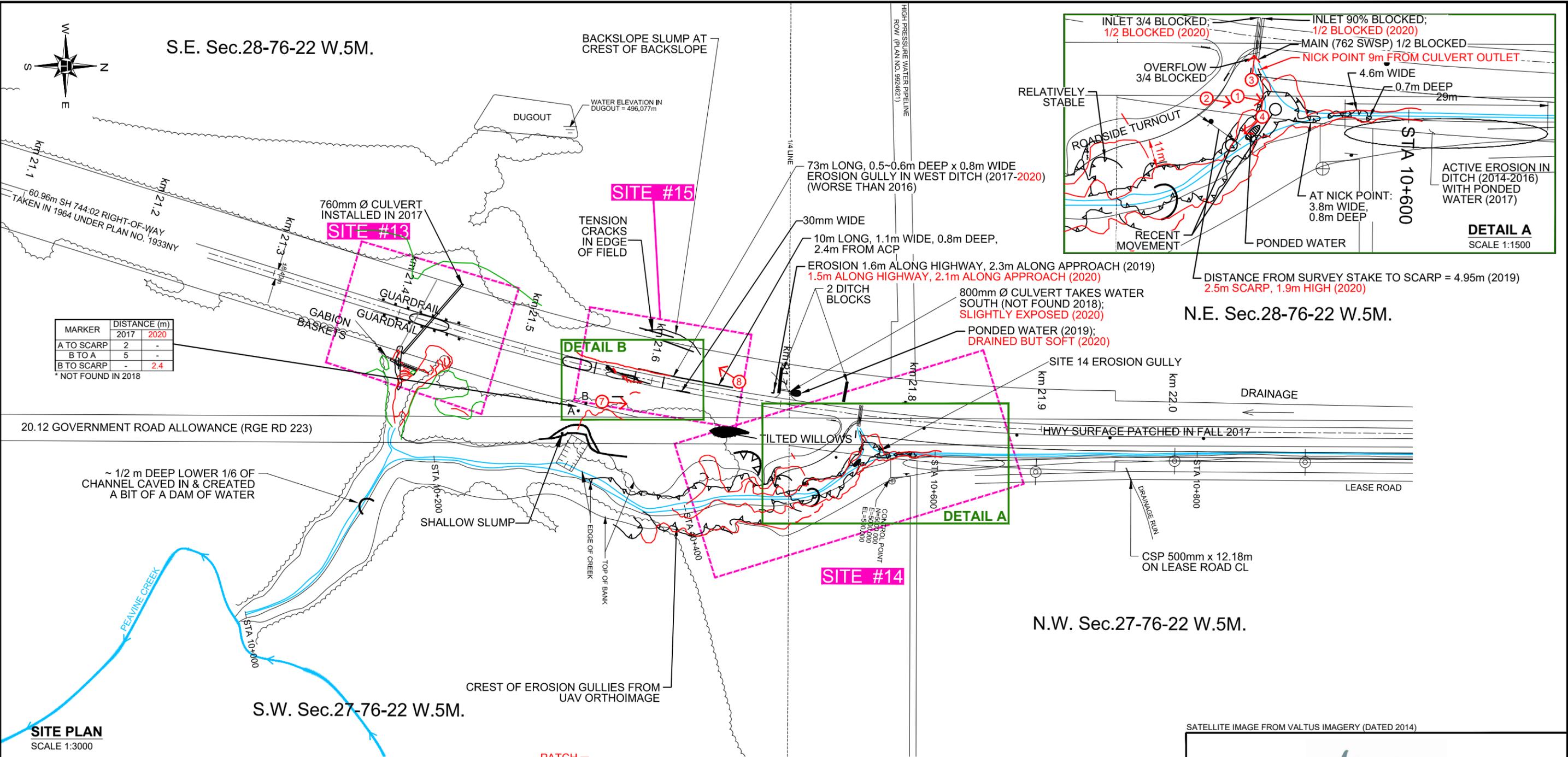
### Long-Term:

- It is understood that, at this time, the only long-term remediation option under consideration is realignment of the entire north hill section of Highway 744. However, given the high cost of this option and as it is a low volume highway, it is unlikely that realignment will be undertaken in the near future.

### Ongoing Investigation:

- It is recommended that the annual GeoHazard inspection should continue as scheduled.
- Minimum offset distances should be established so that remedial measures can be determined and implemented prior to distress of the highway.

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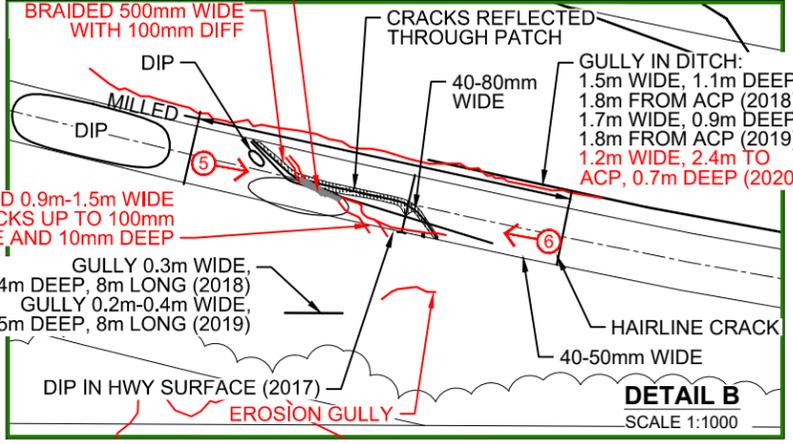


MARKER	DISTANCE (m)	2017	2020
A TO SCARP	2	-	-
B TO A	5	-	-
B TO SCARP	-	-	2.4

\* NOT FOUND IN 2018

**SITE PLAN**  
SCALE 1:3000

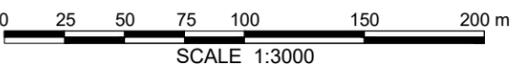
**OVERALL SITE PLAN**  
SCALE 1:30 000



**LEGEND**

① DIRECTION AND NUMBER OF PHOTO

- NOTES**
1. FEATURE LOCATIONS ARE APPROXIMATE.
  2. PREVIOUS OBSERVATIONS SHOWN IN BLACK (2013-2015 FROM AMEC FIGURE 1, PROJECT EG10030, PROVIDED BY ALBERTA TRANSPORTATION).
  3. SCARP EXTENTS UPDATED IN 2020 USING UAV PHOTOGRAMMETRY.
  4. JUNE 2020 OBSERVATIONS SHOWN IN RED.



SATELLITE IMAGE FROM VALTUS IMAGERY (DATED 2014)

**Alberta**

**PEACE REGION (SWAN HILLS)**

**SH013-14 & -15: HWY 744:02  
LITTLE SMOKY RIVER VALLEY  
2020 SITE INSPECTION PLAN**

**DWG No. 13355-SH013-14~15**

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
DATE	NOVEMBER 2020
FILE No.	13355

**THURBER ENGINEERING LTD.**



Photo 1, Site 14 – Looking north through east at increasing depth of erosion along the tributary.



Photo 2, Site 14 – Looking north along the ditch where the erosion gully begins.



Photo 3, Site 14 – Looking at twin culverts outlets which convey west ditch flow to the east.



Photo 4, Site 14 – Looking south at slumping along tributary channel.



Photo 5, Site 15 – Looking north at diagonal crack intersecting the highway. There is a slight dip in the east lane on the south side (downslope) of the crack.



Photo 6, Site 15 – Looking south at the main crack.



Photo 7, Site 15 – Looking north at head of shallow slump downslope of the highway.



Photo 8, Site 15 – Looking southwest at backslope slump at valley crest.



2020 UAV composite image of the erosion gully.