

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – GRANDE PRAIRIE DISTRICT  
2020 INSPECTION REPORT**



Site Number	Location	Name	Hwy	km
GP046	Hwy 43/Smoky River West	Hwy 43/Smoky River West Valley Backslopes	43:04	32
<b>Legal Description</b>		<b>UTM Co-ordinates</b>		
SE¼ 18-072-02 W6M		11U E 417770	N 6121417	

	Date	PF	CF	Total
<b>Previous Inspection:</b>	30-May-2019	11	4	44
<b>Current Inspection:</b>	27-May-2020	13	4	52
<b>Road AADT:</b>	7650		<b>Year:</b>	2019
<b>Inspected By:</b>	Rishi Adhikari, AT Ed Szmata, AT Dwayne Loewen, AT		Don Proudfoot, Thurber Nicole Wilder, Thurber	
<b>Report Attachments:</b>	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

<b>Primary Site Issue:</b>	Four shallow slump failures have appeared in the backslope cut above the EBL of Hwy 43:04 along the midpoint of the descent along the west valley slope of the Smoky River valley about 4.5 kilometers east of Bezanson, Alberta. Three of the slides are now connected (Slide 1 to 3).
<b>Dimensions:</b>	<p>Slide 1 (furthest to the west) was about 35 m wide but now Slide 1 and 2 are one slide about 115 m wide and extends about 30 m up the backslope from the EBL south ditch. The accumulated slide debris in the toe roll has now extended into the EBL south ditch (Photos 1 to 5). The backscarp is approximately 2.1 m high.</p> <p>Slide 2 has connected to Slide 1 and mentioned above and extends 30 m up the backslope with two sections of toe roll that have flowed into the EBL ditch (Photos 1 and 6). The backscarp is approximately 2.0 m high and there were two tension cracks that have developed into the backscarp now and connects to Slide 3.</p> <p>Slide 3 is about 108 m wide, extends 25 m up from the EBL south ditch margin up the backslope. The overall angle of the backslope is at about 20 degrees from the horizontal at Slide 3 (Photos 7 to 11). A portion of the toe roll is now in the EBL ditch. The backscarp ranges from 1.5 m to 3.0 m in height.</p> <p>Slide 4 (further to the east) has increased in size and is about 115 m wide, extends 40 m up the backslope with a distinct toe roll in the ditch (Photo 12). The backscarp varies from 1.0 m to 2.0 m high</p> <p>The overall angle of the backslope is about 20 degrees from the horizontal at Slides 1, 2 and 3 and at about 15 degrees from the horizontal at location of Slide 4.</p>
<b>Maintenance:</b>	No maintenance has been performed recently at the site. To maintain ditch flow, slumped material that accumulates at the toe of the slides and overflows into the EBL south ditch will need to be periodically removed.

Observations:	Description	Worsened?
<input checked="" type="checkbox"/> Pavement Distress	Some longitudinal cracks were on observed in the ACP of the EBL in 2017 but it is not believed to be related to the backslope failures. No change in 2020.	<input type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	All four slides have become more active this year. Slide 4 is more than double the size and there was fresh sloughed soil at all of the slides. Several tension cracks had developed into backscarps. Slide 4 has retrogressed further upslope and the backscarp is now beyond the fence line. The toe of Slide 4 is now partially blocking the highway ditch.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Some erosion and pooling of water was observed near the middle of Slide 3 and on the east side of Slide 4. The erosion near Slide 4 was approximately 1.5 m wide and 0.3 m deep.	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Seepage	Water was ponding on the outside of the toe roll of Slide 3 and 4.	<input checked="" type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress		<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Toe rolls of several slides are now in EBL south ditch in several locations. To maintain ditch flow, slumped material that accumulates at the toe of the slides and overflows into the EBL south ditch will need to be periodically removed.	<input checked="" type="checkbox"/>

**Instrumentation:** There are currently no monitoring instruments at this site

**Assessment:**

A review of available surficial geology maps for the site indicate that it is likely that the slumps in the backslope were initiated by a combination of loss of cohesion of the high plastic cohesive soils that compose the backslope soil stratigraphy, the overall slope steepness angles, (from 15 to 20 degrees from the horizontal) and slope height (10 m to 15 m). Thurber's experience in the Peace River indicates that this phenomenon can occur anywhere between 5 to 18 years following the exposures of the high plastic slopes to the elements for the first time. The loss of cohesion causes the formation of tension cracks in the high plastic soils. The degradation of the slopes then accelerates as surface run-off and precipitation water enters the tension cracks.

As the backslope failures continue to grow, there is a high likelihood that additional debris material will accumulate into the EBL south side ditch obstructing groundwater flow causing water to pond at the toe of the slope. Ponded water will eventually saturate the slide debris material and exacerbate the landslide activity as a result and could infiltrate in to the highway subgrade, which could lead to a rapid deterioration of the pavement structure.

The slides are also progressing upslope and now are encroaching into privately owned land at the crest of the valley slope above the highway.

The most appropriate repair scenario should involve an overall flattening of the backslope angle to an angle of 4H:1V, or flatter, combined with the excavation/rebuilding of the backslope failures with imported soils and the installation of slope drains.

**Recommendations:**

**Cost**

**Short Term**

The maintenance Contractor and the MCI should regularly inspect backslopes for backscarp retrogression and debris accumulation in EBL ditch.

Maintenance

**Medium to Long Term**

The overall slope angle should be flattened, failed material in the backslope should be excavated prior to placing any new fill. The fill should be placed from the existing

\$400,000 to  
\$600,000

toe upwards to help buttress the existing slope. Subdrains should also be installed prior to placing the fill to drain the toe area of the slope.

(Cost of land Acquisition no included)







**Photo 1.**  
Looking southeast from the median of Hwy 43:04 towards the slides in the backslope above the EBL. The slides are identified from right to left as Slides 1 to 2 which have now become one slide.



**Photo 2.**  
Looking southeast from the edge of the EBL shoulder towards Slide 1 and 2 which are now one slide. The backscarp has a 2.1 m drop, is about 125 m in width and extends about 32 m down the slope.



**Photo 3.**  
Looking southeast along the backscarp of Slide 1. The average drop along the backscarp in the western half of the slide is about 2.1 m in height.



**Photo 4.**  
Looking south from the middle of Slide 1 & 2 at the scarp cracks. The ditch flow of the EBL is impeded by the accumulation of slide debris at the toe.





**Photo 5.**  
Looking north at  
small erosion gully  
that is forming from  
surface flow above  
Slide 1.



**Photo 6.**  
Looking southwest  
from the EBL of  
Hwy north shoulder  
43:04 at Slide 2.





**Photo 7.**  
Looking west  
from EBL ditch at  
Slide 3 Toe Roll.



**Photo 8.**  
Looking west from  
the west side of Slide  
3. The height of the  
drop along the  
backscarp varies  
from 1 m to 2 m in  
the western half of  
Slide 3.





**Photo 9.**  
Looking south at the backscarp of Slide 3 from near the middle of the slide. Slide 3 is about 100 m in width and extends about 35 m down the slope. The height of the drop along the backscarp is of about 1.5 m here.



**Photo 10.**  
Looking east along the backscarp of Slide 3 from near the center of the slide. The height of the drop along the backscarp varies from 1.5 m to 3.0 m in the eastern half of the slide.





**Photo 11.**  
Looking west across the backscarp from the east side of Slide 3. The drop at the backscarp about 2 m in the east half of the slide.



**Photo 12.**  
Looking south from the EBL ditch of Hwy 43:04 at Slide 4. Slide 4 is now about 115 m in width and extends 32 m from the crest of the slope to the level of the ditch south side bottom of the EBL. Slide 4 is now more active than the other 3 slides with a bulge and erosion at the toe.





**Photo 13.**  
Looking west across the backscarp from the west side of Slide 4. The drop at the backscarp about 1 to 1.5 m in the west half of the slide.



**Photo 14.**  
Looking southeast at Slide 4 backscarp extending beyond the fence 6-7 m.





**Photo 15.**  
Looking south at east end of Slide 3 which was the least active in 2020.



**Photo 16.**  
Looking south where Slide 2 now connects to Slide 3.