

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



Site Number	Location	Name	Hwy	km
PH030	Judah Hill	Lookout Slides	744:04	57.43
Legal Description		UTM Co-ordinates		
SE¼ 20-083-21 W5M		11V E 483194	N 6229425	

	Date	PF	CF	Total
Previous Inspection:	6-July-2021	10	4	40
Current Inspection:	24-May-2022	11	4	44
Road WAADT:	620		Year:	2021
Inspected By:	Tyler Clay, TEL Ed Szmata, TRANS Max Shannon, TRANS		Don Proudfoot, TEL Roger Skirrow, TRANS	
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input type="checkbox"/> Maintenance Items			

Primary Site Issue:	<p>Several old slides on the steep slope west of the Sagitawa Lookout and north on Hwy 744:04.</p> <p>Highway was closed from May 2013 to January 2014, due to the occurrence of the Sunshine Landslide further north. Highway section through the area was realigned as part of Contract CON0015153 in 2015/2016 due to a landslide located near S110-3 that retrogressed into the SBL in June 2015. A temporary detour had to be built in the NBL ditch and the traffic was re-instated on the new/current alignment in mid-November 2015.</p> <p>Failures in the sideslope are retrogressing toward the re-aligned road north of the Lookout slide.</p>		
Dimensions:	Three slide areas each 15 m to 40 m wide.		
Maintenance:	Alignment repaved in 2016.		
Observations:	Description	Worsened?	
<input checked="" type="checkbox"/> Pavement Distress	Longitudinal cracking previously noted east of the north slide (km 57.65) now has transverse cracks connected that are in an arc-shape within the slide extents. Slide related cracks are open up to 20 mm. There is slight drop and hairline shoulder cracks occurring within this slide area. (Photos 4 and 7).	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Slope Movement	<p>No changes observed at Slide 4 (Photo 1). Increased retrogression and some flank expansion observed at Slides 2 and 3. Slide 2 main scarp offset 0.6 m from the guardrail and upper slide area was well vegetated (Photos 2 and 3).</p> <p>The landslide scarp in the highway sideslope at km 57.65 appears to be actively moving with increased downdrop (Photos 5 and 6) resulting in approximately 0.5 m of retrogression since 2021. Scarp is offset 2.0 m from the guardrail.</p>	<input checked="" type="checkbox"/>	

<input checked="" type="checkbox"/> Erosion	An erosion gully was noted approximately 40 m south of Slide 4 at the southern end of the site (Photo 8).	<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"/>

Instrumentation:	
<p>Inclinometers and piezometers were installed in early March 2010 at Slide 1 and at additional slides further to the north along Hwy 744/Judah Hill. SI10-3 could no longer be read at the end of the summer of 2015 and was subsequently found sheared in August 2015 following a landslide failure.</p> <p>As part of the bi-annual reading program, the operational instruments were read on June 11, 2022.</p>	
SI10-1, SI10-2, and SI10-3	<p>SI10-1 showed a rate of movement of 2.3 mm/yr over 1.4 m to 6.3 m depth and no discernible movement over 14.2 m to 15.4 m depth since the fall of 2022 readings.</p> <p>SI10-2 showed a rate of movement of 1.9 mm/yr over 0.4 m to 4.1 m depth and a rate of movement over 4.3 mm/yr over 4.1 m to 8.3 m depth since the fall of 2022 readings.</p> <p>Average annual movement rates in both SI's have been typically at or below 4 mm/yr and relatively consistent since installation in 2010. Total cumulative movement in both SI's is at or below 25 mm.</p> <p>Prior to its loss (sheared at 2.8 m depth), SI10-3 had three zones of movement from 2.7 m to 10.7 m and appeared to be most active in the upper 6 m where movement rates had increased to 47.3 mm/yr from the Fall 2014 to the Spring 2015 readings and up to 264 mm/yr in the subsequent readings taken during the summer of 2015.</p>
PN10-1 and PN10-2	<p>Since the fall of 2022 readings, pneumatic piezometer PN10-1 showed a decrease in groundwater level of 0.09 m, while PN10-2 showed an increase in groundwater level of 0.01 m. The current groundwater level in PN10-1 is the lowest measured in the instrument since September 2011.</p>
Assessment:	
<p>The existing slides occurred on steep slopes (36° to 38°) and are similar in appearance to the Heart River slides. The previous repairs at Slide 1 (shredded tire fill wedge) appear to be effective, although there may be some ongoing movement in the backscarp causing minor pavement distress.</p> <p>The October 2015 landslide at SI10-3 was remediated as part of Contract CON0015153 with a realignment of the affected highway section into the backslope further to the east. The extent of the realignment was limited by the presence of the ATCO natural gas pipeline right-of way which flanked the highway alignment along the NBL. It is now understood that ATCO has since abandoned this section of line which in turn will provide some additional space for future realignments, if required.</p> <p>There is continuing slide activity in Slides 2 and 3, and in the newly regraded highway sideslope below the SBL at km 57.64, possibly in response to surface and groundwater drainage. There is further slide development at the previously observed tension crack and the crack in the pavement have been observed to be slowly expanding at the km 57.65 slide. The slide could potentially reach the guardrail within a few years if large increments of retrogression or erosion occur following particularly wet seasons. The arc-shaped pavement cracking developing above this slide area is</p>	

indicative that a slide surface is potentially undermining the NBL, and a large increment of movement could impact the driving surface. The operating SI near this area (SI10-2) appears to be outside of the main movement zone.

Recommendations:

Cost

The slide activity in the highway embankment sideslope and overall performance of the newly implemented surface drainage measures should be regularly monitored by the Maintenance Contractor in the meantime.

Maintenance
Inspection

The landslide at km 57.65 is expected to continue to move and retrogress toward the new highway alignment. A tied back pile wall should be considered to protect the new alignment from this feature. The wall will need to be in the order of 35 m to 40 m wide with two rows of tie-back anchors.

\$1.5-3M

Sub-excavation of the slide mass and replacement with shredded tire light weight fill could be considered as a shorter-term, cheaper solution.

\$300,000

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.

Don Proudfoot, P.Eng.
Principal | Senior Geotechnical Engineer

Tyler Clay, P.Eng.
Geological Engineer



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

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.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

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.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

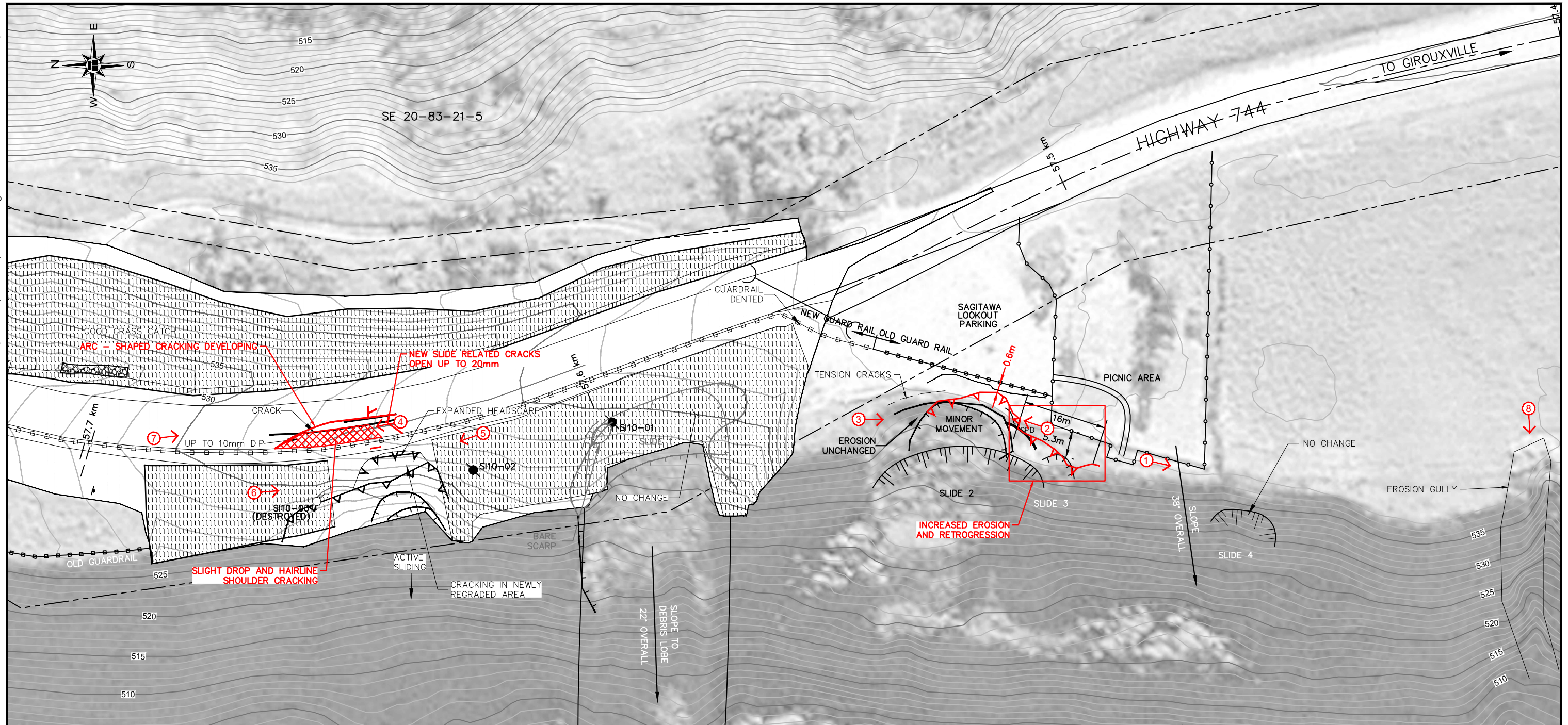
6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES




Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.


H:\32000\32121 AT GRMP Peace River District 2021-2025\CAD\2022 GEOHAZARD\TTC\32121-PH030-1, PH033-1, PH033-2.dwg - PH30 LOOKOUT SLIDES - Oct. 09, 2022



LEGEND:
 SLOPE INDICATOR 
 SLOPE INDICATOR 
 DIRECTION AND NUMBER OF PHOTO 

NOTES:
 1 LOCATION DATA RECORDED USING HANDHELD GPS RECEIVER. ALL LOCATIONS ARE APPROXIMATE AND ARE FOR ILLUSTRATIVE PURPOSES ONLY.
 2 MAY 24, 2022 OBSERVATIONS SHOWN IN RED.






PEACE REGION (PEACE RIVER DISTRICT)

**PH030 LOOKOUT SLIDES
2022 SITE INSPECTION PLAN**

DWG No. 32121-PH030-1-1

DRAWN BY	ML
DESIGNED BY	TTC
APPROVED BY	DWP
SCALE	1:750
DATE	OCTOBER 2022
FILE No.	32121



THURBER ENGINEERING LTD.



Photo 1.
Looking southwest from above Slide 2 towards Slide 4 (No change since 2021).



Photo 2.
Looking northeast along backscarp of Slide 2 which is 0.6 m from the parking lot guardrail. Some localized main scarp retrogression, flank retrogression and additional pavement cracking since 2021.



Photo 3.
Looking southwest towards the upper part of Slides 2 and 3. Visible retrogression and movement in the main scarp and upper southern flank since 2021. Disturbed slide mass area is well vegetated.



Photo 4.
Looking northwest along from SBL of Hwy 744:04 at km 57.6 at south end of realignment done in 2015-2016. New transverse cracks have formed joining the previous longitudinal crack in the NBL to form arc-shaped crack within the downslope slide extents.



Photo 5.
Looking north from downslope of the SBL of Hwy 744:04 at km 57.63. Increased dropdown within the disturbed slide mass. Headscarp has retrogressed 0.5 m since 2021; offset from the guardrail is now at 2.0 m.



Photo 6.
Looking south at the active slide near km 57.65. Ongoing retrogression and erosion at the main scarp and south flank.



Photo 7.
Looking south along SBL of Hwy 744:04 at km 57.68. New transverse cracks have formed joining the previous longitudinal crack in the NBL to form arc-shaped crack within the downslope slide extents.



Photo 8.
Looking at the top an erosion gully located at the southern edge of the site, approximately 50 m south of the Slide 4 area. Gully is offset approximately 70 m west of the highway.