

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



Site Number	Location	Name	Hwy	km
PH001-2	Dunvegan	Dunvegan North	2:68	12.60
Legal Description		UTM Co-ordinates		
NE¼ 08-080-04 W6M		11U E 400694	N 6198867	

	Date	PF	CF	Total
Previous Inspection:	June 6, 2019	15	4	60
Current Inspection:	June 12, 2020	16	4	64
Road AADT:	2,680		Year:	2019
Inspected By:	Ken Szmata, TRANS Ed Szmata, TRANS Rocky Wang, TRANS		Don Proudfoot, Thurber José Pineda, Thurber	
Report Attachments:	<input checked="" type="checkbox"/> Photographs <input checked="" type="checkbox"/> Plans <input checked="" type="checkbox"/> Maintenance Items			

Primary Site Issue:	A landslide in the highway backslope. Upslope debris flow/rock fall hazard		
Dimensions:	Extends 90 m wide and 90 m north from the highway into the backslope. The lower 30 m of the backslope, where bedrock is exposed is inclined at 1H:1V. The upper 25 m of the backslope where the landslide is located in the colluvium, is inclined at 2H:1V.		
Maintenance:	Debris from upslope slides was removed from the highway surface and north side ditches and shoulders in July 2018.		
Observations:	Description	Worsened?	
<input checked="" type="checkbox"/> Slope Movement	<p>The approximate plan outline of the landslide is shown on Dwg. 13351-PH001-1. The exposed backscarp height at the center of the landslide was about 6 m (Photos 6 and 9).</p> <p>A graben had formed along the base of the scarp. The soil exposed in the backscarp and slide mass appears to consist mainly of silty sand, with some clay and hard/strong sandstone pieces embedded within it (Photos 10 and 11).</p>	<input checked="" type="checkbox"/>	
<input checked="" type="checkbox"/> Other	<p>Currently, the slide material is toppling over the edge of the steep bedrock slope at a slow enough rate that regular ditch cleaning has managed to keep pace with slide debris accumulation. The landslide debris accumulated in the SBL ditch consisted primarily of small chunks and small to large sized slabs of silty weathered sandstone bedrock and colluvium mixed with organics. Some of the landslide debris broke and bounced over the Jersey barrier and accumulated between the Jersey Barriers and the two-level of concrete lock blocks</p>	<input checked="" type="checkbox"/>	
Instrumentation:	There are no available records of previous geotechnical investigations and there are currently no instruments installed at the site.		

Assessment:

In the past, similar landslides and debris flows in this area have typically occurred in the gullies due to the concentration of surface runoff water from heavy rain fall events. The inferred slip surface for this landslide is likely to be along the top of the upper sandstone bedrock layer at an approximate elevation 423 m.

This landslide is considered to have been triggered by either a temporary rise in groundwater perched in the colluvium or a concentration of surface water runoff at this location. The primary concern for this site is the potential for further colluvium and weathered sandstone bedrock debris accumulating along the edge of the upper sandstone ledge debris to continue to fall onto the highway causing a risk to public safety. Furthermore, there is also a risk that the cascading landslide debris can dislodge undermined sandstone slabs from the two sandstone layers below that might travel faster and further out into the highway and possibly strike a vehicle.

The maintenance contractor has erected concrete lock blocks and jersey barriers to help contain the debris to keep it off the highway. However, there is still a risk that the remainder of the slide debris volume (about 20,000 m³) could fall catastrophically onto the highway in a fast-moving mudslide if it gets saturated during a heavy precipitation event. If the slide material came down in a big single event it could dislodge the concrete barriers and flow out onto and close the highway.

The provision of the concrete barriers has reduced but not eliminated the risk of further rock falls to the travelling public.

Recommendations:**Cost**

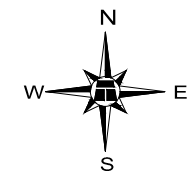
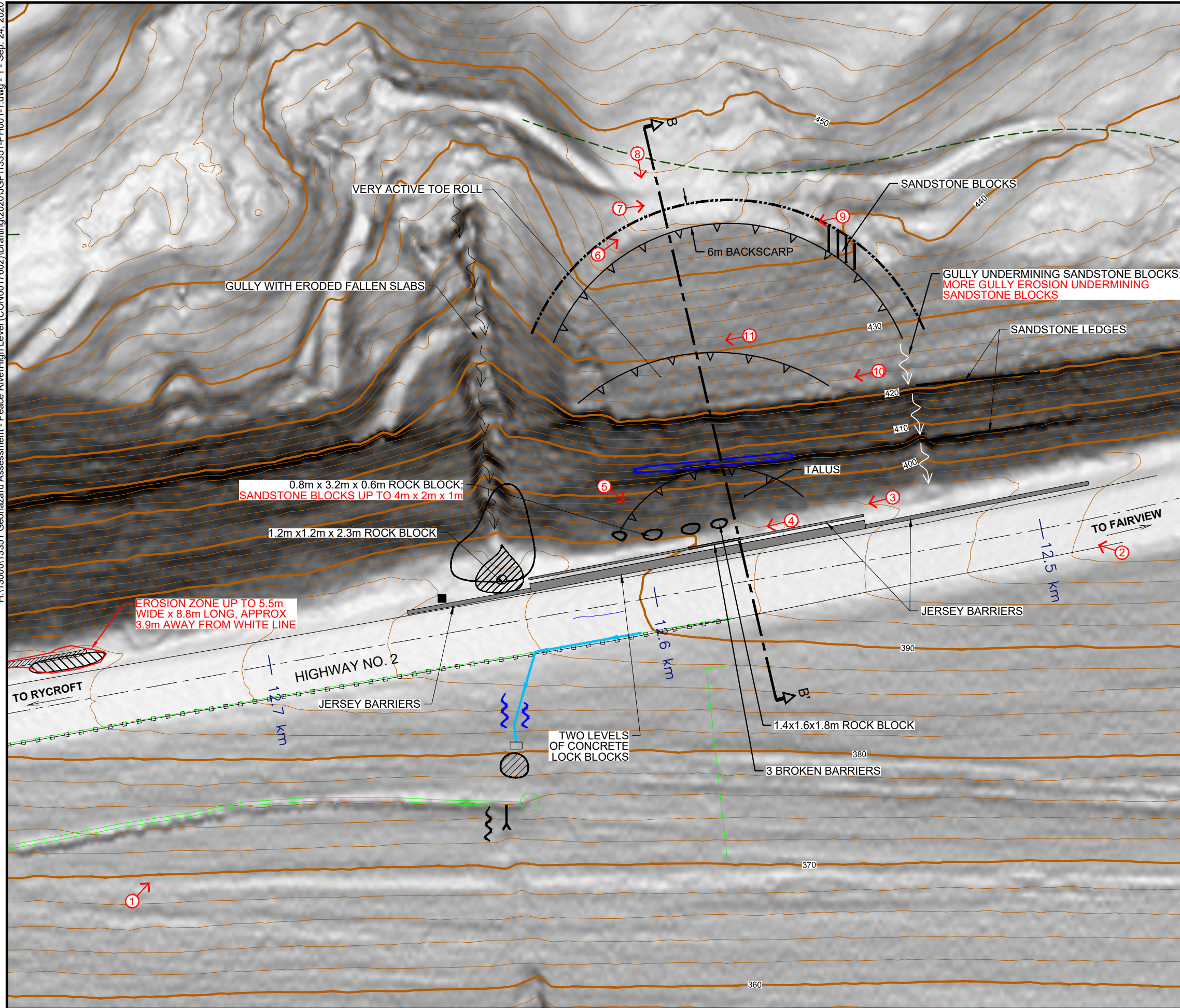
A warning sign should be posted at the top and bottom of the hill to warn of higher risk of rockfall and mudslide activity particularly during wet weather conditions.

If possible, the remaining slide mass should be carefully removed from the top of the slope to reduce the potential for further debris to fall onto the highway below. Due to the possibility of crumbling of the edge of the sandstone bedrock layer, equipment should be kept back at a minimum distance of 3 m from the crest of the steep backslope. This could be accomplished using a long reach excavator that would access the site from privately owned land to the north of the landslide. The excavator would push the failed material over the crest of the slope. This would need to be monitored with spotters equipped with two-way radios positioned at the top of the steep backslope section and along the highway. Once the outer 15 m of the landslide debris has been removed, the backscarp should be flattened to an inclination of 2.5H:1V and the remaining slide debris should be cut-down and flattened as a buttress with a slope angle of 5H:1V. Depending on the extent of the backscarp, this may require the acquisition of privately-owned land above the current landslide.

\$250,000

An alternate plan would be to leave the landslide mass to tumble down the backslope at its own rate and complete regular maintenance to remove the fallen debris during dry weather conditions to maintain a storage capacity behind the barriers and allow the ditch to pass runoff drainage. This option carries a higher risk of injury to the public.

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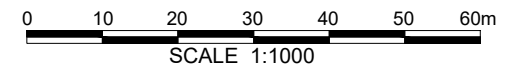


LEGEND

- SCARP
- SLOPE BREAK
- GULLY
- DIRECTION AND PHOTO NUMBER
- LANDSLIDE EXTENT

NOTE:

1. JUNE 12, 2020 OBSERVATIONS SHOWN IN RED



BASE PLAN PROVIDED BY



**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH001 DUNVEGAN NORTH**

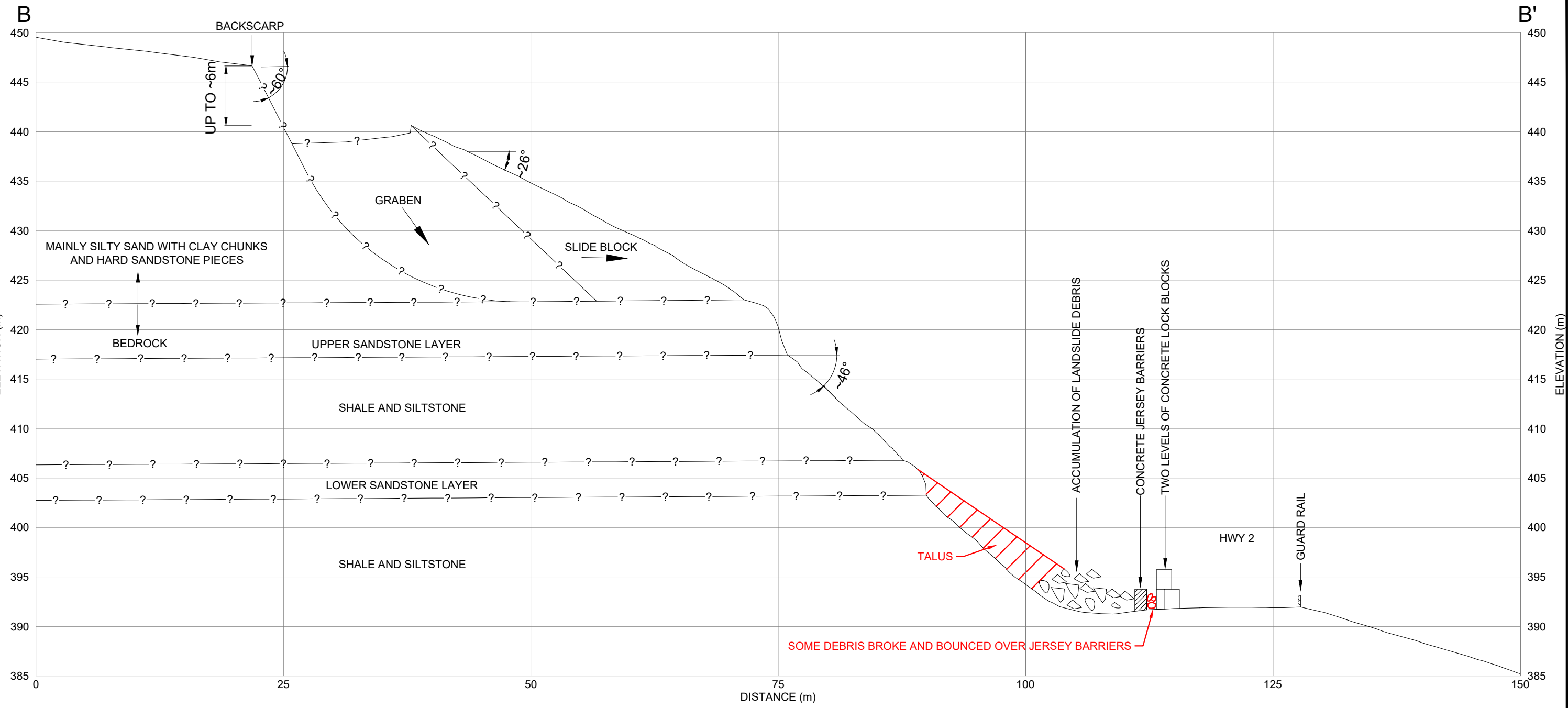
2020 PH001 INSPECTION PLAN


DWG No. 13351-PH001-1

DRAWN BY	KLW
DESIGNED BY	JGP
APPROVED BY	DWP
SCALE	1:1000
DATE	SEPTEMBER 2020
FILE No.	13351



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**PEACE REGION (PEACE RIVER/HIGH LEVEL)
PH001 DUNVEGAN NORTH**

CROSS - SECTION B - B'

DWG No. 13351-PH001-2

DRAWN BY	ML
DESIGNED BY	JGP
APPROVED BY	DWP
SCALE	1:400
DATE	SEPTEMBER 2020
FILE No.	13351



THURBER ENGINEERING LTD.

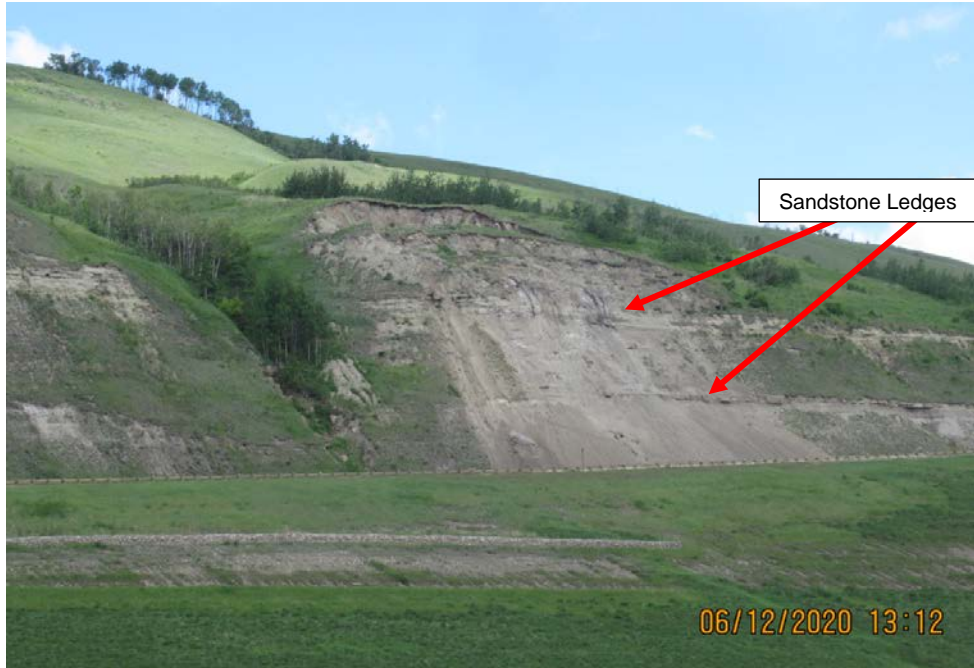


Photo 1: Looking northeast at the landslide site from the north terrace of the Peace River



Photo 2: Looking northwest at the highway backslope below the landslide and concrete barriers



Photo 3: Looking west at accumulated debris from the SBL ditch of Hwy 2:68 at the highway backslope below the landslide



Photo 4: Looking west from SBL ditch of Hwy 2:68 at sandstone slabs, talus, boulders, and soil chunks that have accumulated between the ditch below the landslide and the Jersey Barrier



Photo 5: Looking southeast at landslide debris; note talus, boulders, and soil chunks that have accumulated in the ditch below the landslide



Photo 6: Looking northeast along backscarp of the landslide



Photo 7: Looking east from landslide backscarp



Photo 8: Looking south from the middle of the backscarp of the slide



Photo 9: Looking west along the backscarp



Photo 10: Looking west along the toe of the slide



Photo 11: Looking southwest within the landside mass; note active toe roll