

**ALBERTA TRANSPORTATION  
GEOHAZARD ASSESSMENT PROGRAM  
PEACE REGION – HIGH LEVEL  
2018 INSPECTION**



Site Number	Location	Name	Hwy	km
PH047-1	West of Deadwood, AB	Deadwood Slide	690:02	2.4
Legal Description		UTM Co-ordinates		
SW28-89-23-W5M		11U E 462,972	N	6,288,759

	Date	PF	CF	Total
<b>Previous Inspection:</b>	21-June-2017	3	3	9
<b>Current Inspection:</b>	21-June-2018	4	3	12
<b>Road AADT:</b>	230		<b>Year:</b>	2017
<b>Inspected By:</b>	Roger Skirrow, TRANS Ed Szmata, 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>	Slow slope movement into shallow valley affecting highway	
<b>Dimensions:</b>	50 m length of highway, 80 m overall length	
<b>Date of Remediation:</b>	2015: Constructed toe berm with French drains and routed creek through culvert; adjacent BF culvert replaced 2016: Paving and HTSCB installed	
<b>Maintenance:</b>	2008: 40mm overlay 2011: ACP Patch 2013: ACP Patch 2015: 341 tonne ACP patch placed for winter shutdown 2017: Small patch at guardrail near BF73271 outlet	
<b>Observations:</b>	<b>Description</b>	<b>Worsened?</b>
<input checked="" type="checkbox"/> Pavement Distress	Vertical drop removed with repaving; minor crack noted at west end of site grew slightly New cracks appearing on north side of highway over BF culvert which have been patched	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> Slope Movement	Slow creep movement significantly reduced with placement of toe berm	<input type="checkbox"/>
<input checked="" type="checkbox"/> Erosion	Minor erosion in ditch at west end and near culvert outlets	<input checked="" type="checkbox"/>
<input type="checkbox"/> Seepage		<input type="checkbox"/>
<input type="checkbox"/> Bridge/Culvert Distress	New 1800 mm dia. culvert below toe berm (BF86237) New 2200 mm dia. culvert at km 2.534 (BF73271)	<input type="checkbox"/>
<input checked="" type="checkbox"/> Other	Voids in ACP around HTSC Barrier posts	<input checked="" type="checkbox"/>
<b>Instrumentation (as of Fall 2018):</b>		
Destroyed	SP10-2, 3, and -5 and VW10-1 and -2 were destroyed before or during construction in 2015.	
Inclinometers	SI15-01 and -02 were installed during construction and initialized in October 14, 2015, about 3 weeks after significant movement occurred at the site. Cumulative deflections are 49 mm and 59 mm at rates of 4.2 mm and 2.2 mm, respectively. These rates are slightly above the average movement rates (since Spring 2016 after the repair) of 2.6 mm/yr and 1.3 mm/yr, respectively. During construction, the rates were 600 mm/yr to 800 mm/yr.	

**Assessment:**

The original failure appeared to be the result of toe erosion by the creek. Movement was relatively slow (creep) requiring patching every two to three years. The groundwater table through the highway embankment was also relatively high which may have been a contributing factor. In September 2015, the BF culvert to the east of the slide was replaced and the Contractor hauled through the slide area and stockpiled excavated material on the west edge of the slide. This resulted in immediate and significant movements with between 200 mm and 400 mm of height differential across the cracks in the highway surface. The movements continued even after the stockpiles were removed. Construction of the toe berm was completed in November 2015 and consisted of: installing a new 1800 mm diameter CSP culvert for the creek, installing French drains in the slope, placing a toe berm from the highway across the creek valley, and lining the overflow channel located at the south end of the berm. At the same time, BF72371 was replaced with a 2200 mm diameter CSP and the channels on either side realigned. The toe berm culvert (BF86237) was shifted slightly to the east during construction to accommodate a shallow gas line located near the inlet.

In 2016, the highway was overlaid and high-tension steel cable barriers (HTSCB) installed through portions of the site. The toe berm appears to be performing well although the one crack that was noted in the old slide area in 2017 increased slightly in length in 2018 and a second crack was observed at the shoulder. Seepage was observed from the subdrain outlet. Minor erosion was noted in the ditch above and at the culvert inlet riprap (west side of site). Some erosion was observed on the banks beyond each culvert outlet likely as a result of the high flows experienced in Spring 2018. Two patches have been placed at the west end of the north HTSCB which may be associated with poorly-compacted fill in the post holes.

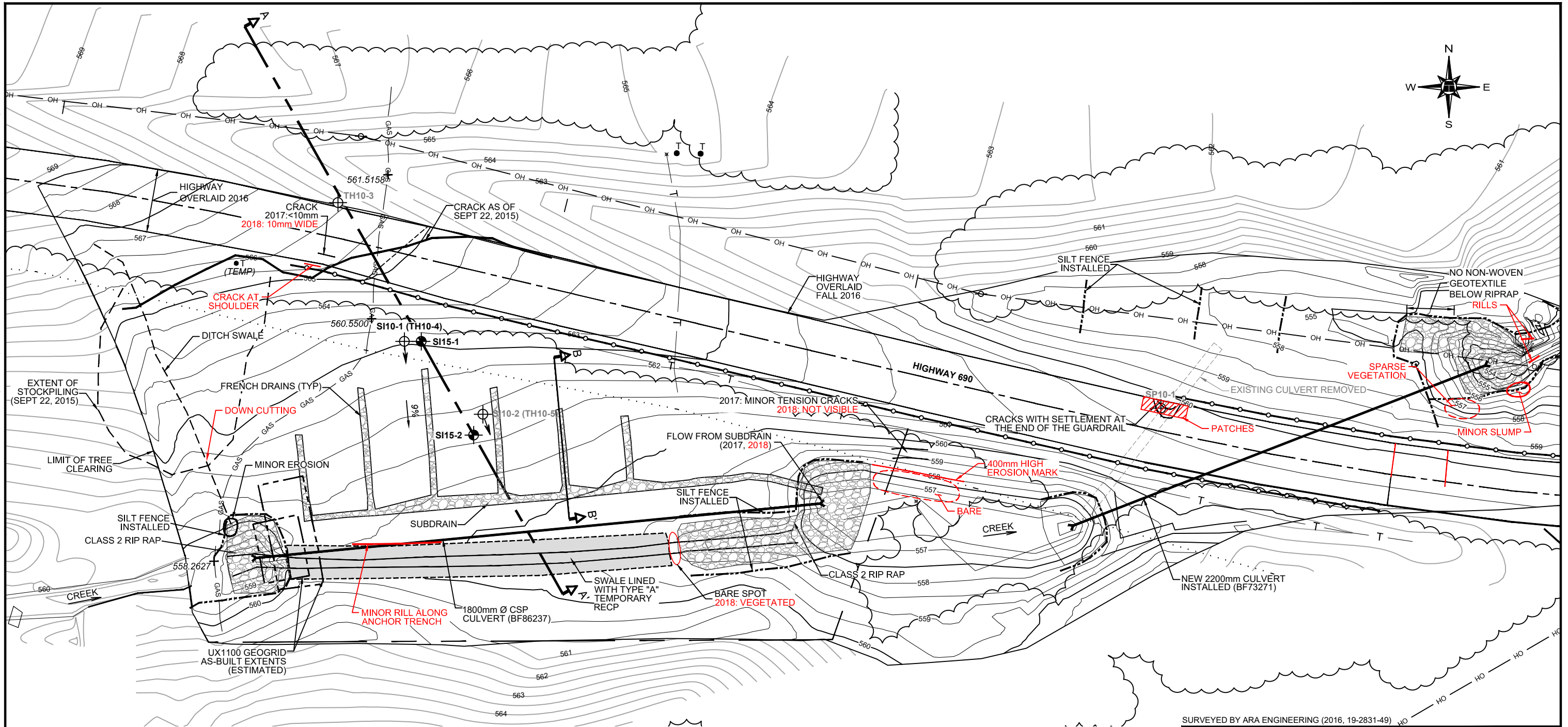
**Recommendations:**

## Short-Term:

- Remove or clean the grate at the subdrain outlet to improve flow.
- Consider placing additional seed and temporary erosion control blanket over erosion on south sideslope just east of the toe berm culvert outlet.
- Backfill voids around HTSCB posts.

## Ongoing Investigation:

- It is suggested that the GeoHazard inspection could be discontinued for this site and that bi-annual instrumentation readings should continue as scheduled for the duration of the current contract.

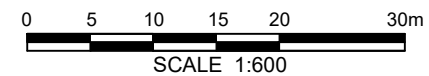


**LEGEND**

- SI LOCATION (2015)
- INSTRUMENT NOT IN USE
- STANDPIPE PIEZOMETER
- TEST HOLE
- VIBRATING WIRE PIEZOMETER
- SLOPE INCLINOMETER
- APPROXIMATE DIRECTION OF MOVEMENT IN SLOPE INCLINOMETER
- BOUNDARY OF LIDAR USED TO EXTEND GROUND ELEVATION CONTOURS BEYOND SURVEY LIMITS
- 561.5158+ ELEVATION OF GASLINE AT HYDROVAC POINT  
GAS LINE ALIGNMENT SURVEYED BY ARA SEPTEMBER 2015
- LANDSLIDE CRACK
- OVERHEAD POWERLINE (APPROX.)
- UNDERGROUND PIPELINE (APPROX.)
- UNDERGROUND COMMUNICATION LINE (APPROX.)
- HIGH TENSION CABLE BARRIER
- TELUS PEDESTAL (APPROX.)
- POWER POLE LOCATION
- TREELINE (APPROX.)

**NOTE**

1. JUNE 2018 OBSERVATIONS SHOWN IN RED



SURVEYED BY ARA ENGINEERING (2016, 19-2831-49)



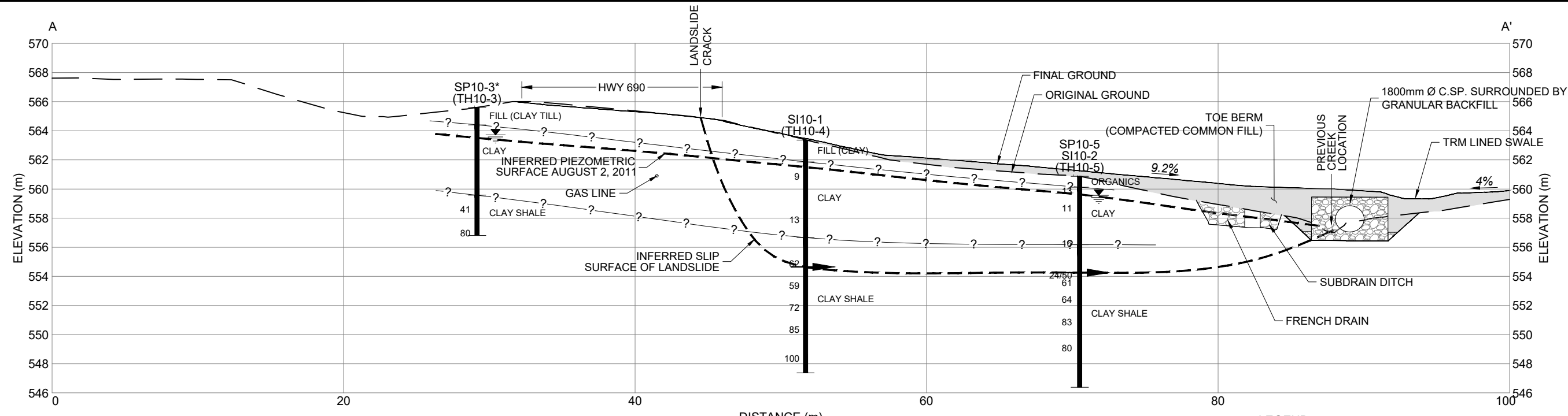
**PEACE REGION (PEACE RIVER / HIGH LEVEL)**

**PH047: HWY 690:02 DEADWOOD SLIDE  
2018 GEOHAZARD ASSESSMENT**

**DWG No. 13351-PH047-1-1**

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	1:600
DATE	DECEMBER 2018
FILE No.	13351

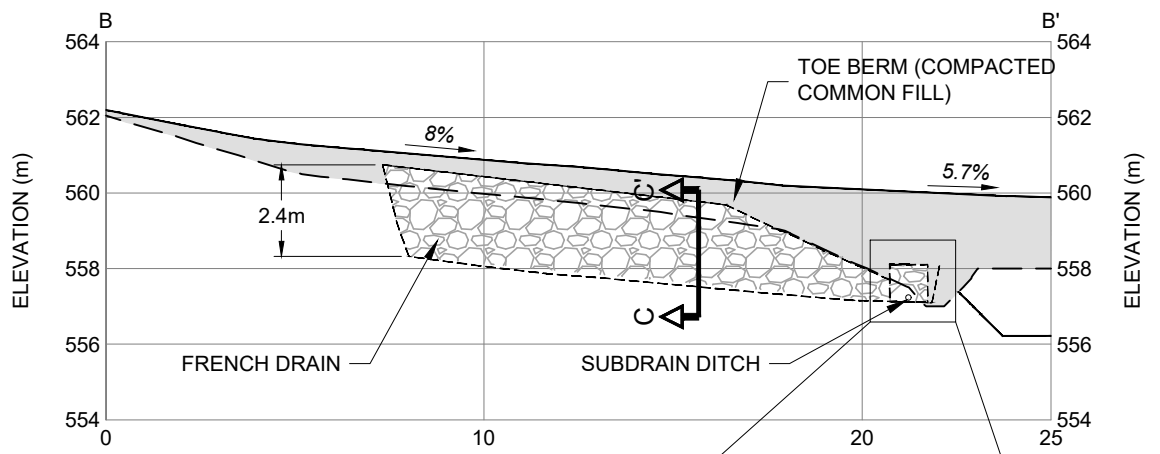




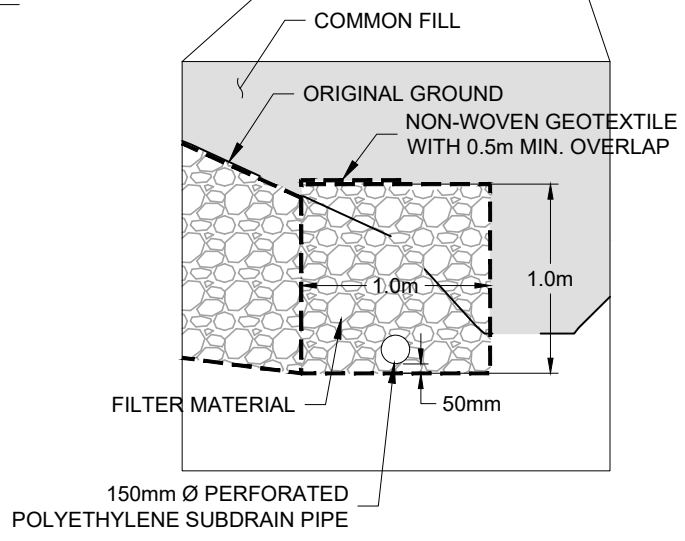
**CROSS-SECTION A-A'**  
SCALE 1:300

- LEGEND**
- 15 | SPT N VALUE
  - ▼ WATER LEVEL IN PIEZOMETER: WATER LEVELS TAKEN BY THURBER IN SP10-5 ON JUNE 2, 2014 AND IN SP10-3 ON OCTOBER 1, 2012
  - SP STANDPIPE PIEZOMETER
  - TH TEST HOLE
  - VW VIBRATING WIRE PIEZOMETER
  - SI SLOPE INCLINOMETER
  - ➔ DEPTH OF MOVEMENT IN SLOPE INCLINOMETER

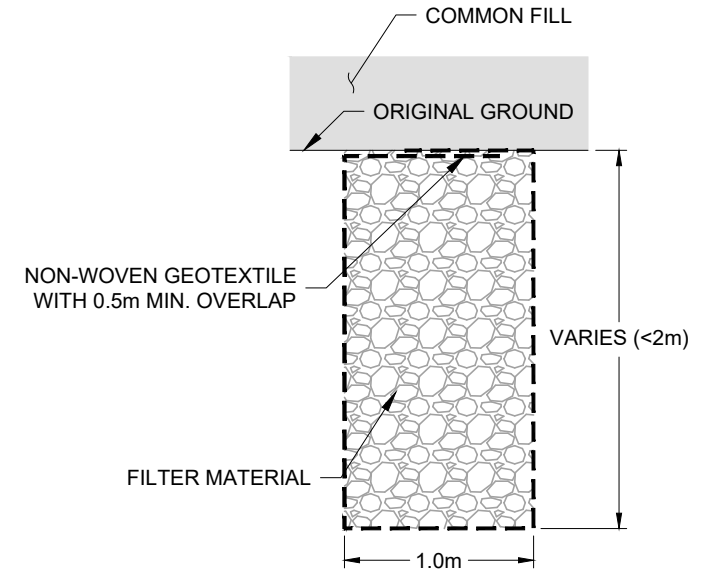
- NOTES**
1. DATA CONCERNING THE VARIOUS STRATA HAVE BEEN OBTAINED AT THE TEST HOLE LOCATIONS ONLY. THE SOIL STRATIGRAPHY BETWEEN TEST HOLES HAS BEEN INFERRED FROM GEOLOGICAL EVIDENCE AND SO MAY VARY FROM THAT SHOWN.
  2. ORIGINAL TOPOGRAPHIC DATA TAKEN FROM BASE PLAN PROVIDED BY HOGGAN ENGINEERING & TESTING LTD. (2011).



**CROSS-SECTION B-B'**  
SCALE 1:200



**SUBDRAIN DETAIL**  
SCALE 1:40



**SECTION C-C'**  
SCALE 1:40

SURVEYED BY ARA ENGINEERING (2016, 19-2831-49)



**PEACE REGION (PEACE RIVER / HIGH LEVEL)**

**PH047: HWY 690:02 DEADWOOD SLIDE  
2018 GEOHAZARD ASSESSMENT**

**DWG No. 13351-PH047-1-2**

DRAWN BY	KLW
DESIGNED BY	KEF
APPROVED BY	DWP
SCALE	AS SHOWN
LAST UPDATED	DECEMBER 2018
FILE No.	13351





Photo 1 – Looking east over repaired highway and toe berm.



Photo 2 – Looking at voids around HTSCB on south side of highway at the west end.



Photo 3 – Looking east at small crack at west end of slide area near the end of the HTSCB.



Photo 4 – Looking west at bare area at culvert outlet where possible tension cracks may be forming. Subdrain outlet is just on the far side of the culvert outlet. Note the eroded bare spot just beyond the riprap.



Photo 5 – Looking east from lined swale at bare spot between the swale and riprap apron where vegetation growth has been slowly improving.



Photo 6 – Looking west along lined swale located at the south end of the toe berm.



Photo 7 – Looking east at voids around HTSCB posts and settlement cracking of the pavement at west end of the north barrier located by the outlet of BF72371 culvert. Note that two patches have been required in this area.



Photo 8 – Looking at riprap placed over bare ground (no non-woven fabric below) at east end of north ditch at the outlet of BF72371.