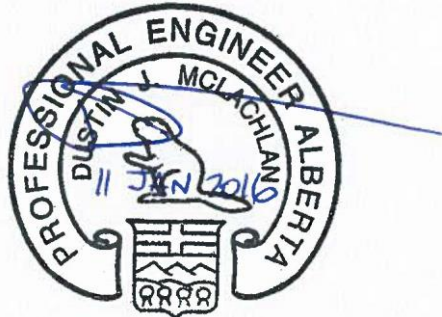


**PEACE REGION – SWAN HILLS
GEOHAZARD RISK ASSESSMENT
SITE INSPECTION FORM**

SITE NUMBER SH 18	SITE NAME Deer Mountain	HIGHWAY & KM HWY 33:14 KM 6	PREVIOUS INSPECTION DATE 02 July 2014	INSPECTION DATE 24 June 2015
LEGAL DESCRIPTION LSD 11-23-69-09 W5M	NAD 83 COORDINATES N 6095038 E 611315	PREVIOUS RISK ASSESSMENT		
		PF: 9	CF: 2	TOTAL: 18
		CURRENT RISK ASSESSMENT		
		PF: 9	CF: 2	TOTAL: 18

<p>SUMMARY OF SITE INSTRUMENTATION:</p> <p>No Instruments</p>	<p>INSPECTED BY:</p> <p>Amec Foster Wheeler: Curtis Treen, Dustin McLachlan, Vincent Huang Alberta Transportation: Ed Szmata, Rishi Adhikari</p> <p>Vincent Huang, E.I.T. Geotechnical Engineer</p>  <p>Dustin J. McLachlan, P.Eng. Senior Geological Engineer</p> <p>Reviewed by: Curtis R. Treen, M.Eng., P.Eng. Senior Associate Geotechnical Engineer</p> <p>Amec Foster Wheeler Environment & Infrastructure Permit Number: P 04546</p>
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PRIMARY SITE ISSUES:

Slumping of slope (bank) adjacent to small creek at the south east corner of the intersection of Highway 33:14 and the Deer Mountain turnoff road. Slumping is likely due to the combination of toe erosion, silty/sandy soils, and seepage from the slope. Soils on the exposed scarp consisted mainly of silty clay with intermittent sand/silt seams.

The creek is located in the south ditch adjacent and parallel to the Deer Mountain turnoff road. The creek crosses Highway 33 perpendicularly (flowing east to west) through a culvert. The toe erosion and slumping is south of the creek and although the slumping/erosion does not directly impact either the turnoff road or Highway 33, the slumping/erosion has historically caused blockage of the ditch requiring regular clean-outs.

The slope was remediated in Fall 2010 with the construction of a bioengineered retaining wall (Biowall - AT Design using geogrid reinforcement, biolgs, and willow plantings) which subsequently failed in Spring 2011. Material within the main body of the slide (including the failed biowall material) was soft and wet with seepage observed emanating from the base of the slide scarp.

The outlet of the culvert west of Highway 33 is submerged, likely due to the close proximity of riprap near the tree line and overall low drainage gradients in the ditch line. The culvert has been submerged since the 2012 site inspection.

Note: Refer to previous inspection reports for further details.

- APPROXIMATE DIMENSIONS:**
- ~ 30 m stretch of south creek bank with bowl shaped erosion/slump scarp undergoing active slumping and toe erosion. Slump scarp ~2 m high and the crest of the scarp was ~3 to 3.5 m above the elevation of the creek;
 - Direction of ongoing retrogression of slump to the south/southeast away from Deer Mountain Road and Highway 33.
 - Typical width of creek ~1 m to 2 m.

REMEDIAL ACTIONS:

Fall 2010:

Construction of bioengineering repair (Biowall - AT Design with biolgs and willow plantings). The 2011 site inspection report indicated that the biowall had failed in the Spring of 2011. The bioengineering wall, designed to remediate the slumping/erosion, failed shortly after construction (spring 2011). The wall may have blocked seepage from the face of the scarp and the material behind the wall became saturated. Possible factors contribution to failure of the biowall include the natural overland drainage from behind the crest of the scarp toward the slide and weak foundation soils within the slide mass.

ITEM	CONDITION EXISTS		DESCRIPTION AND LOCATION	NOTICABLE CHANGE FROM LAST INSPECTION		
	YES	NO		YES	NO	SEE COMMENTS
PAVEMENT DISTRESS		X			X	
SLOPE MOVEMENT	X		Little to no retrogression of the slide scarp was observed between the 2014 and 2015 inspections.		X	
EROSION	X		Toe erosion of slide mass by adjacent creek		X	
SEEPAGE	X		On-going seepage from the face of scarp and some overland drainage behind crest of scarp is directed through a shallow channel over the crest of the scarp and into the main body of slide		X	
OTHER	X		Blockage in channel suspected downstream of culvert west of Highway 33		X	

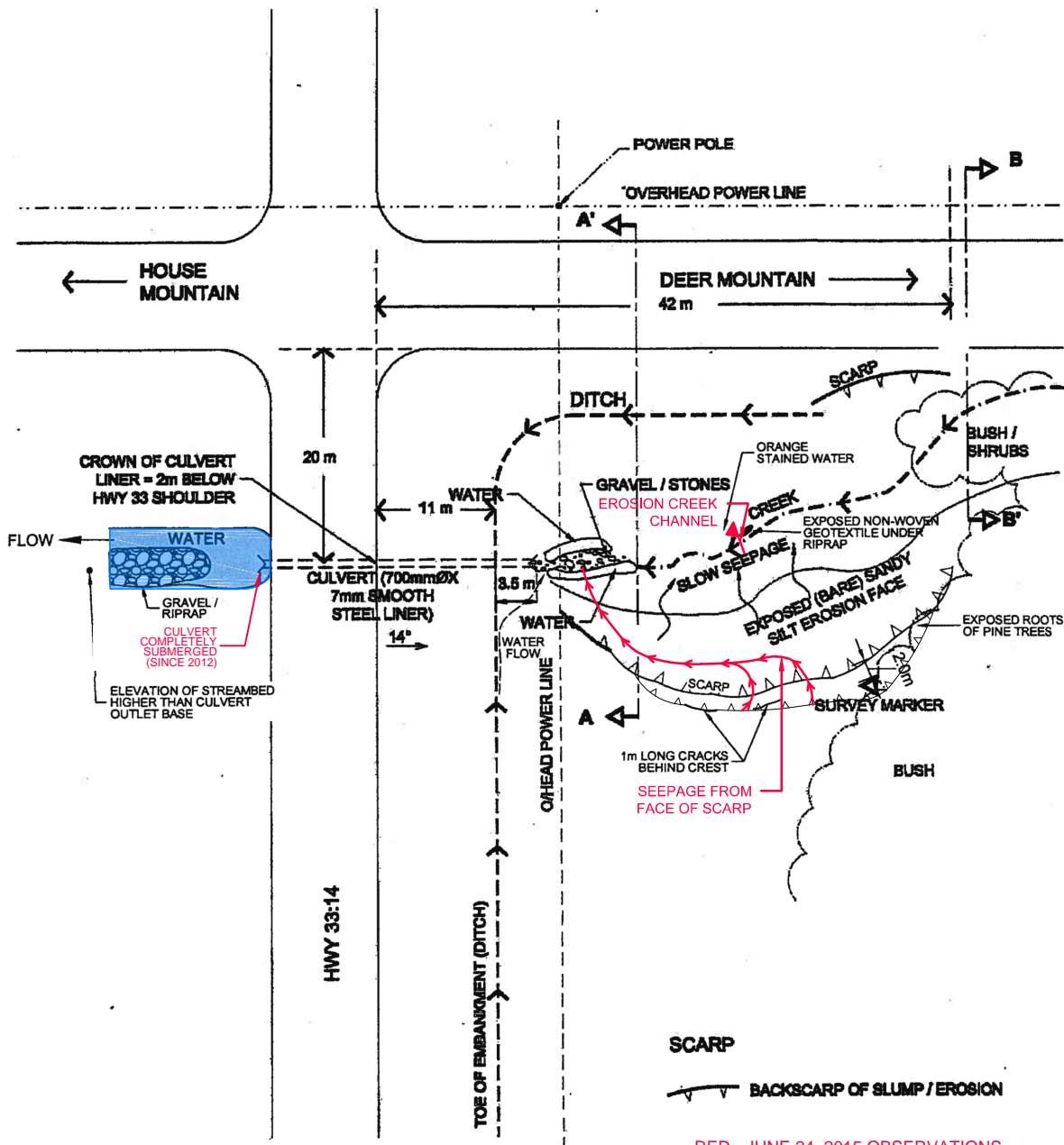
COMMENTS/RECOMMENDATIONS:

Little to no retrogression was observed between the 2014 and 2015 inspections. Seepage from the face of the scarp continues to be observed (Photo 1). Although further investigation and a new design for remediation of the slumping/erosion could be considered, the slumping/erosion has not historically impacted, and currently has a low potential to impact, operation of Highway 33 and/or Deer Mountain Road. Long term remedial measures that could be considered consist of a combination of slope flattening, gravel buttressing, and seepage or drainage control with plantings.

At the time of the 2014 and 2015 inspection, the outlet of the culvert west of Highway 33 was below water. A pond had formed downstream of the culvert likely due a large pile of silted rip rap at the downstream end of the pond blocking flow (Photo 4). The culvert outlet has been below water since the 2012 site inspection. Remediation of the suspected channel blockage downstream should be carried out by removal of the material causing the blockage.

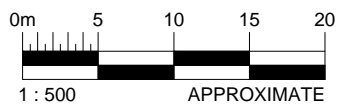
The ditch adjacent to Deer Mountain Road and downstream of the culvert outlet west of Highway 33 should be monitored for siltation and/or accumulation from toe erosion of the slide mass and cleaned as required.

Based on the lack of change in site conditions observed over the past 3 years and the relatively low consequence rating, it recommended that the site inspection frequency be reduced to once every two years.



SCARP
BACKSCARP OF SLUMP / EROSION

RED - JUNE 24, 2015 OBSERVATIONS
SEEPAGE AND DIRECTION



REFERENCE: SH18Plan.pdf DATED JUNE, 2007, SUPPLIED BY ALBERTA INFRASTRUCTURE AND TRANSPORTATION.

CLIENT: 	DWN BY:	VH	PROJECT: GEO HAZARD ASSESSMENT PEACE REGION (SWAN HILLS)	DATE:	JULY, 2015	
	CHK'D BY:	DJM		PROJECT No.:	EG10030	
amec foster wheeler Environment & Infrastructure 5681-70 STREET, EDMONTON, ALBERTA, T6B 3P6 PHONE 780-436-2152, FAX 780-435-8425	DATUM:	-	TITLE:	SH18: HWY 33:14 km 6, DEER MOUNTAIN, AB SITE PLAN	REV. No.:	A
	PROJECTION:	-			FIGURE No.:	FIGURE 1
	SCALE:	1:500 (APPROX.)				

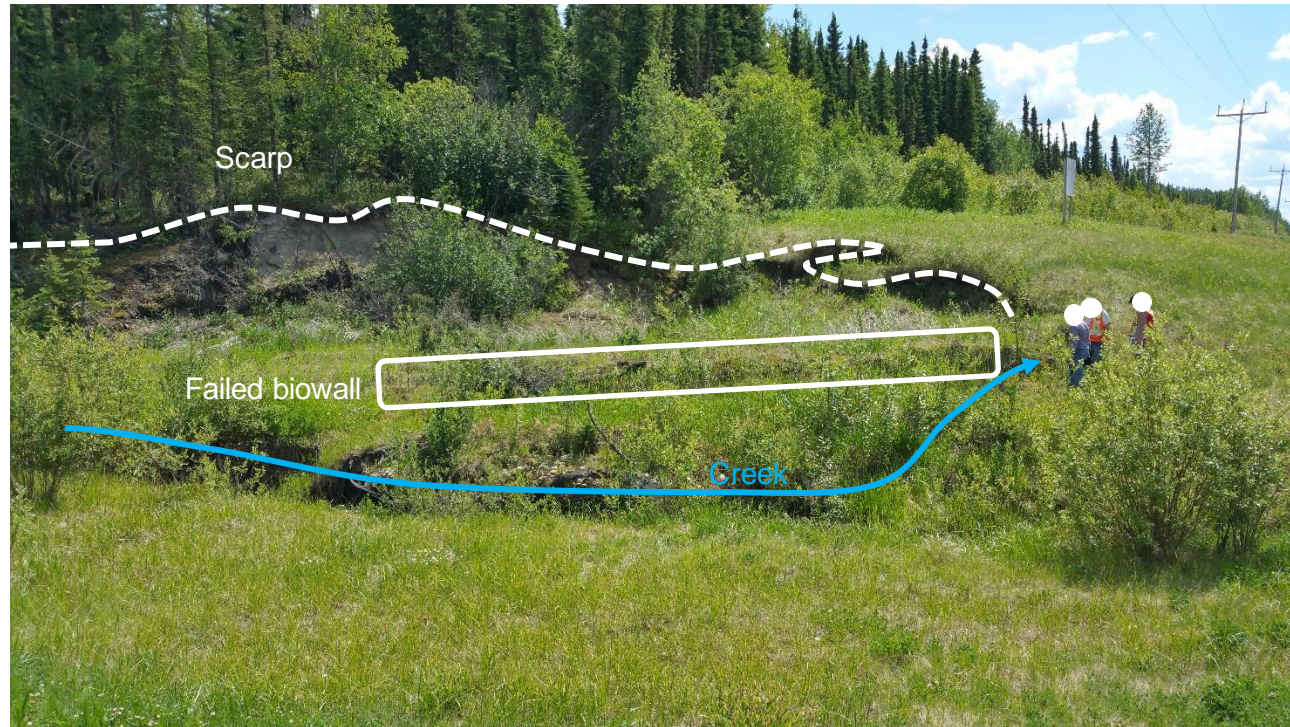


Photo 1: (looking south)
Slumping of the slope southwest of the intersection of Highway 33 and Deer Mountain Road. No significant changes were observed since the 2014 inspection.



Photo 2: (looking west)
Looking at pond downstream of culvert inlet west of Highway 33. Culvert outlet is completely submerged. Similar conditions have been observed since the 2012 inspection.

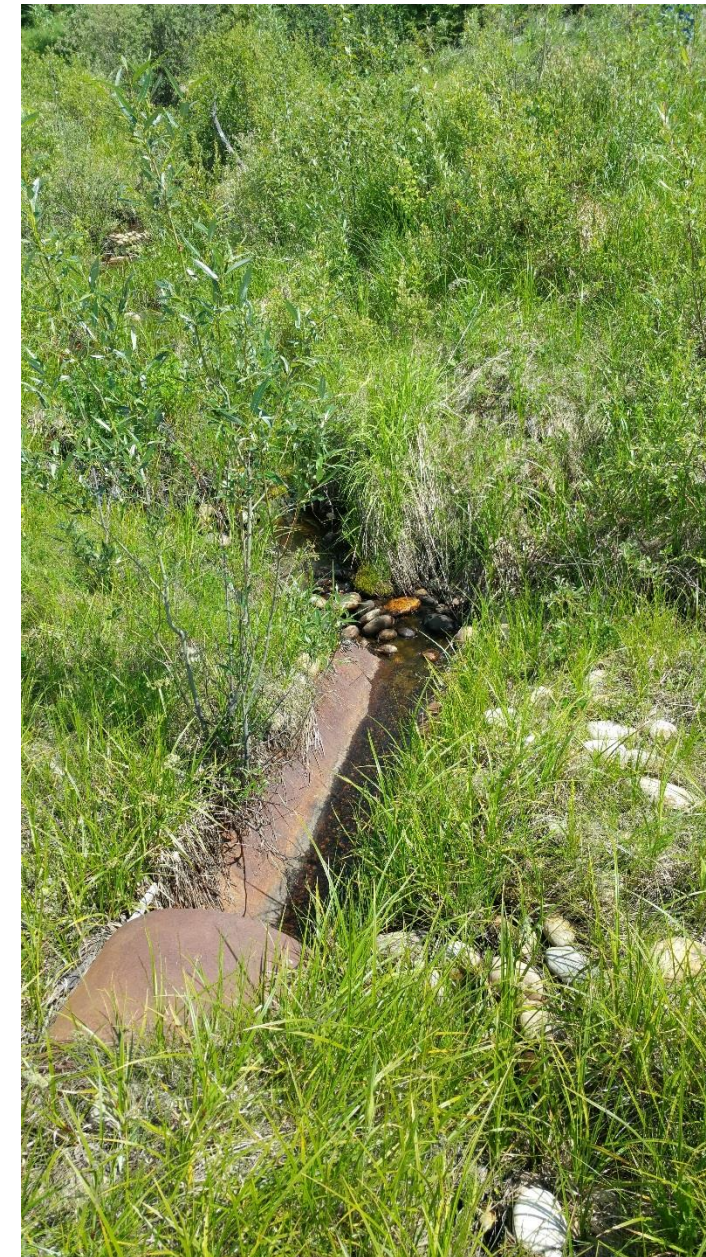


Photo 3: (looking east)
Culvert inlet east of Highway 33.