



November 2012

CG25399

Alberta Transportation
2nd Floor, 803 Manning Road NE
Calgary, AB T2E 7M8

Attention: Mr. Ross Dickson

Dear Ross:

**Re: Southern Region Geohazard Assessment
2012 Annual Inspection Report
Site S25: Highway 3, Km 29.45, Near Monarch, AB**

This report documents the 2012 annual site inspection of Site S25 – Monarch, on Highway 22:14, near Monarch, AB.

AMEC Environment & Infrastructure (AMEC), a division of AMEC Americas Limited, performed this inspection in partial fulfilment of the scope of work for the supply of geotechnical services for Alberta Transportation's (AT's) Southern Region (AT contract CON0013506).

The site inspection was performed by Georgina Griffin, P.Eng., Bryan Bale, P.Eng., and Tyler Clay, E.I.T., of AMEC; and Roger Skirrow, P.Eng., Ross Dickson, and Nathan Madigan, E.I.T., of AT during the 2012 Annual Tour.

1.0 BACKGROUND

The site is located at Km 29.45 of Highway 3, on the east side of the Oldman River valley near Monarch, AB (refer to Figure S25-1). AMEC understands that the current alignment of Highway 3 at this site, a divided highway with a total of four lanes, was constructed in either 1995 or 1997. The highway at the site transitions from a large through-cut in the upper portion of the east Oldman River valley slope to a fill over the lower portions of the valley slope. Inactive landslide terrain is visible near the current highway right-of-way on the valley slope.

AMEC performed a call-out inspection of this site at AT's request on March 9, 2007. Settlement was noted in both the east and westbound lanes at the site. The settlement was thought to be caused by reactivation and/or ongoing creep of landsliding of the natural valley slope that existed before the construction of the highway and/or settlement or other instability of the highway fill at this location. For further details of the observations and assessment from this site

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visit, please refer to the report on the call-out inspection¹. AMEC also submitted a proposal and cost estimate for a geotechnical investigation for the site, including the installation of monitoring instrumentation² in March 2011 at AT's request.

2.0 SITE OBSERVATIONS

Key observations regarding changes in the site conditions since the 2011 inspection are summarized as follows:

- The eastbound lanes had two areas of recent patching (possibly paved in early 2011). Refer to Figure S25-2. The westernmost patch had the most settlement, noted by the suspension compression of vehicles traveling through the area (refer to Photos S25-1 and S25-2).
- The westbound lane had been recently patched (possibly late 2011) with subtle settlement but no new cracks (refer to Photo S25-3).
- The road surface was in approximately the same condition as was observed in 2011, with continued deformation of the road surface.

3.0 ASSESSMENT

The settlement of the road surface is near the cut/fill transition at the westbound end of the through-cut and roughly coincides with the former valley slope face position. This suggests that the settlement may be due to one or a combination of the following factors:

- Reactivation or ongoing creep of landsliding of the natural valley slope that existed before the construction of the highway. This is not considered to be the likely cause of the settlement because the pre-construction air photos of the valley slope do not show well-defined landslide terrain across the current highway right-of-way.
- New landsliding (i.e. starting after construction of the current highway in the natural valley slope that is now covered by the highway fill). This is possible but not expected because the construction of the through-cut would have resulted in a net unloading of the underlying slope and the volumes of fill placed during highway construction across the lowermost portion of the former valley slope face are relatively minor. Cracks observed in the westbound lane indicate possible sliding towards the gully to the south with movement towards 230° bearing; however, further investigation would be required to confirm.

¹ AMEC Earth & Environmental, 2007. *Call-Out Request: Highway 3, Km 29.45, Near Monarch, AB* Project Number CG25239, submitted to AT October 30, 2007

² AMEC Environment & Infrastructure, 2011. *Proposal and Cost Estimate for Geotechnical Investigation, S25 - Highway 3, Km 29.45, Near Monarch, AB*, Project number CG25352.600, submitted to AT March 9, 2011.

- Settlement or other instability within the highway fill at this location. Significant and ongoing settlement of the fill many years after construction would not be expected and there did not appear to be any signs of fill embankment instability on the fill slope below (north) of the westbound lanes. Relative to the other possibilities listed above, this is considered to be the probable cause of the cracking and settlement; however, the observations to date do not definitively indicate it to be the case.

4.0 RISK LEVEL

AMEC recommends the following Risk Level for this site based on AT's general geohazard Risk Level Criteria.

- Probability Factor of 5 to reflect the apparent active settlement of the road surface but with a very slow movement rate and/or indeterminate movement pattern.
- Consequence Factor of 1 because there does not appear to be an immediate threat to driver safety and to date the settlement has been manageable as a maintenance issue.

Therefore, the recommended Risk Level is 5, which is unchanged from the 2011 assessment.

5.0 RECOMMENDATIONS

The available information on this site does not indicate an immediate threat to driver safety and it is judged to be reasonable to continue to treat the settlement as a maintenance issue.

AMEC has submitted a cost estimate and proposal to perform a geotechnical investigation and instrument installations for this site. The data from the boreholes and instruments may provide a better understanding of the cause of the damage to the highway surface, and allow consideration of the cost-benefits of continued maintenance vs. attempting a more permanent repair. AMEC would be pleased to undertake the site investigation work if requested by AT.

6.0 CLOSURE

This report has been prepared for the exclusive use of Alberta Transportation for the specific project described herein. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it are the responsibility of such third parties. AMEC Environment & Infrastructure, a division of AMEC Americas Limited, cannot accept responsibility for such damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report has been prepared in accordance with accepted geotechnical engineering practices. No other warranty, expressed or implied, is made.

We trust that this meets your needs at this time. Please contact the undersigned if you have any questions or require any further information.

Respectfully Submitted,

**AMEC Environment & Infrastructure,
a division of AMEC Americas Limited**

ORIGINAL SIGNED AND STAMPED NOVEMBER 20, 2012

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Geological Engineer

Bryan Bale, M.Sc., P.Eng.
Staff Geotechnical Engineer

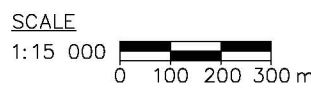
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APEGA Permit to Practice No. P-04546

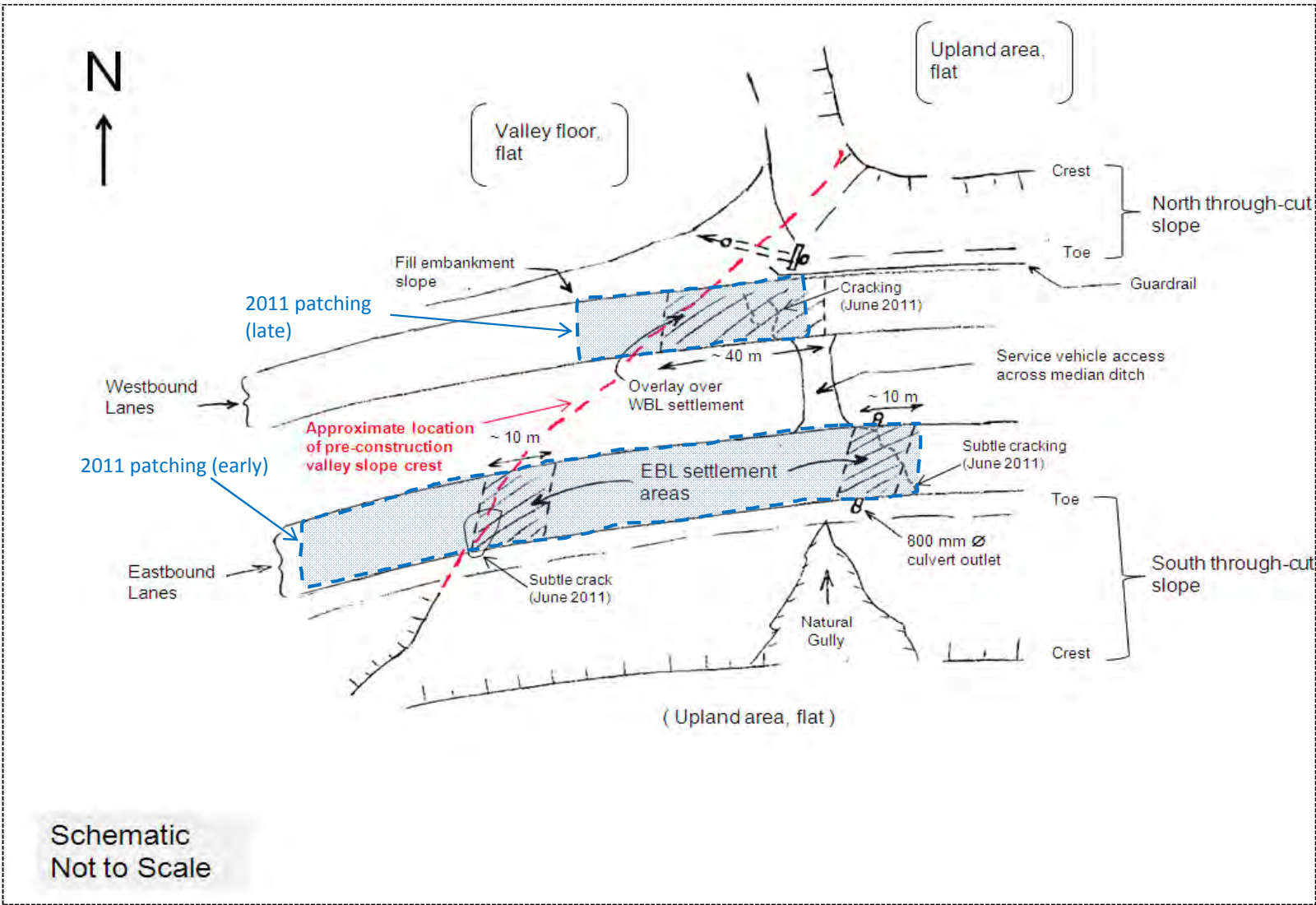
Georgina Griffin, M.Eng., P.Eng.
Associate Geotechnical Engineer



AIR PHOTO REFERENCE: AS5160B 24, LN-2, 01/06/21, 1:20000



CLIENT: 	PROJECT: SOUTHERN REGION GEOHAZARD ASSESSMENT 2012 ANNUAL INSPECTION				
	TITLE: SITE LOCATION HIGHWAY 3 - MONARCH				
DATE: NOVEMBER 2012	JOB No.: CG25399.200	CAD FILE: 25399D10.dwg	FIGURE No.: FIGURE S25-1	REV. A	



Client	Alberta Transportation		Figure S25-2	
Project	Southern Region Geohazard Assessment		Date:	Revision
	S25 - Hwy 3:29.45 - Monarch		Nov-12	
	Site Plan Schematic		Job No.	
			CG25399.200	
			File No.:	
			S25_siteplan(2012).xlsx	





Photo S25-1 – June 2012

Facing north across the site. Settlement is present within the patched areas on both the eastbound and westbound lanes, marked with a red outline. The most settlement was noted in the westbound lane.



Photo S25-2 – June 2012
Facing southwest across the westbound lane at the main settlement area.



Photo S25-3 – June 2012
Facing southeast across the eastbound lane at the cracking in the easternmost patch. The cracking here had approximately 20 mm aperture with no down-drop and may be indicative of active sliding in this area.