

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 S38: Highway 22:08, Callum Creek Landslide**

This letter documents the 2012 annual site inspection of Site S38 - Callum Creek Landslide Site on Highway 22:08. The site is 11 km north of the Oldman River Bridge and approximately 10 km south of the Highway 22 and Highway 520 junction.

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

Minor tension cracking and settlement of the road surface at this site were first noted in 2005. The first inspection of this site under AT's Geohazard Risk Management Program was performed on March 3, 2011, after a member of the public notified AT of worsening conditions at this site. At the time of the site inspection, the road surface was exhibiting arc-shaped cracking and settlement across an approximately 80 to 100 m long segment of the road, which was interpreted to represent a landslide headscarp. The northern end of the affected road segment had a series of tension cracks in the pavement, roughly parallel to the road direction, and possibly indicating future expansion of the arc-shaped cracking. The landsliding did not appear to be linked to the landslide that was the subject of the pile wall repair a short distance northbound from this site. The road at the site has two lanes and appears to be a cut/fill embankment along the natural valley slope. The slope below the road is at an angle of 17 to 18°.

Borehole drilling and instrument installations were recommended in order to investigate the subsurface conditions at this site and to provide a basis for the selection and design of a repair for this site. This work was performed in April 2011. Please refer to the Spring/Summer 2011

monitoring report¹ for further information regarding the installations and initial instrument readings.

2.0 SITE OBSERVATIONS

Key observations from the June 2012 inspection are summarized and illustrated on Figure S38-1 and Photos S38-1 to S38-4 as follows:

- The road surface had a recent (2012) asphalt overlay and only very minor cracking had formed through the new overlay, following the same pattern as previous cracking. Refer to Photo S38-1.
- The upslope and downslope ditch were wet.
- Recent shallow sliding was observed on the downslope near the north end of the site. A fresh scarp was noted with 200 mm aperture and 100 mm down-drop. Refer to Photo S38-2.
- A fresh, subtle scarp was observed near the downslope highway shoulder at the south end of the site. The scarp is the probable flank of the slide. Refer to Photo S38-3.
- The slope below the road was traversed. There were no visible signs of a toe bulge or other features that may have indicated the lower extent of the landsliding. The slope had a slightly undulating appearance.
- Since the June 2012 inspection, settlement of the road surface worsened significantly, similar to the damage observed in 2011. Slide movement seems to increase seasonally at the site in mid to late summer.

3.0 ASSESSMENT

This site has active and significant landslide movement confirmed by the SI readings at 9 to 12 m depth beneath the road surface. Landslide movement may encompass the entire slope below the highway. The data from the vibrating wire piezometers indicates that there is water in the upper soil layers (measured at 6 m depth), to within 1.5 m below ground surface. The water pressure is likely a contributing factor to the slope instability.

There is a possibility that additional or accelerated landslide movement could lead to the loss of one or potentially both lanes of the highway. The construction of a temporary detour lane in the upslope road ditch would likely be required.

AMEC has submitted to AT a pile wall repair design to mitigate the landslide at the site. Refer to Figure S38-1 for an overall plan of the site features in relation to the proposed repair.

¹ AMEC report, "S38 - Hwy 22:08 – Callum Creek Landslide Site 2011 Geotechnical Investigation, Instrument Installations and Initial Readings", submitted to Alberta Transportation, June 2011, AMEC File No. CG25359

4.0 RISK LEVEL

The current recommended Risk Level for this site, based on AT's general geohazard risk matrix, is as follows:

- Probability Factor of 13 based on the active movement, possibly with an increasing trend in movement rates based upon the monitoring to date.
- Consequence Factor of 7 given that the landslide encompasses both lanes of the highway and failure would result in the closure of the road, possibly with a single detour lane in the upslope ditch with alternating one way traffic under a reduced speed limit and timed traffic lights.

Therefore, the current recommended Risk Level for this site is 91, which is unchanged from 2011.

5.0 RECOMMENDATIONS

5.1 Maintenance and Short Term Measures

- While the pile wall repair is constructed, the road should be maintained by placement of paving overlays and milling down the road surface to maintain a trafficable surface. The guardrail should be adjusted as necessary with successive overlays to maintain an effective height.
- Signage should be maintained (e.g. "Bump Ahead", "Slide Area") along with reduced speed limit as appropriate for the road surface conditions.

5.2 Long Term Measures

- The pile repair should be constructed.

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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Reviewed by:

APEGA Permit to Practice No. P-04546

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