

August 20, 2009

CG25309.B

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

Attn: Mr. Ross Dickson

**Re: Southern Region Geohazard Assessment Program
Site S22 – “S” Curve Slide, Highway 762:02
2009 Annual Inspection Report**

This letter documents the 2009 annual site inspection of Site S22 – “S” Curve Slide along Highway 762:02, south of Bragg Creek, AB and approximately 14 km southbound from the junction between Highway 22 and Highway 762.

AMEC Earth & Environmental (AMEC), a division of AMEC Americas Limited, performed this inspection in partial fulfillment of the scope of work for the supply of geotechnical services for Alberta Transportation’s (AT’s) Southern Region (AT contract CE061/08).

The site inspection was performed on June 12, 2009 by Mr. Andrew Bidwell, P.Eng., and Mr. Bryan Bale, EIT of AMEC in the company of Mr. Ross Dickson and Mr. Neil Kjelland, P.Eng. of AT.

BACKGROUND

A general description of the geohazard conditions at this site along with the site geological setting and chronology of previous events, investigations and monitoring work were provided in the 2007 annual inspection report¹ and are summarized as follows:

- The highway is constructed on an approximately 4 m thick fill embankment on the south/southeast facing slope above the west bank of a small creek.
- Ongoing landslide movement in the native soils underlying the embankment has been causing cracking and settlement of the road surface that has been inspected and monitored by AT and AMEC since 2006.

¹ AMEC report “Southern Region Geohazard Assessment, Annual Assessment Report, 2007”, project number CG25263, submitted to AT on November 6, 2007.

- Geotechnical borehole drilling, instrument installations and readings from the spring of 2007 onwards have shown that the landslide movement is occurring at or slightly below the elevation of the creek channel at the toe of the slope. The attached cross-section on Figure S22-2 shows the stratigraphy and depth of landslide movement. The primary cause of the landslide movement is judged to be the piezometric pressures in the native clay/silt underlying the embankment in conjunction with the load of the embankment which is resulting in sliding occurring at the contact with the harder, underlying clay till soils.
- The design of drainage trenches to attempt to lower the piezometric pressures in the landslide area and reduce the rate and magnitude of future landslide movement is underway at the time of writing, to be followed by the preparation of a draft tender package for the repair.

SITE OBSERVATIONS

Key observations from the June 2009 inspection were as follows:

- It appears that at least one asphalt overlay has been placed at the site since the June 2008 inspection. There was relatively little cracking in the current overlay at the time of the June 2009 inspection (Photos S22-1 and S22-2). The pattern and extent of the cracking and settlement of the road surface that was present in June 2009 was consistent with observations during past site inspections.
- A segment of 100 mm diameter steel pipe was noted to be protruding from the toe of the road embankment slope below the highway at the approximate location shown on Figure S22-1. Photo S22-3 shows a view of the pipe, which appeared to have been installed many years ago as a horizontal drain below the access trail across the slope. At the time of the June 2009 inspection, the pipe was discharging approximately 2 L/minute of clear water which was draining into a low-lying and swampy area between the toe of the embankment slope and the creek.

ASSESSMENT

The assessment of the hazard at this site has not changed since the 2008 inspection. The ongoing ground movement continues to cause cracking and settlement of the road surface. This has been treated as a maintenance issue since roughly 2005, with several overlays having been placed at the site to maintain a smooth running surface. The data from the SI's and piezometers show that the ground movement is continuing and the piezometric pressures – which are considered to be the primary driver for landslide movement – are largely unchanged since monitoring began in 2007. Therefore, it is judged that the ground movement similar to that measured in 2007 and 2008 will continue in 2009, i.e. relatively faster movement between roughly April and September, with slower but ongoing movement between roughly October and March.

The apparent horizontal drain outlet that was noted at one location on the slope below the highway suggests that a previous attempt to drain the groundwater from the embankment slope has been made and that the recommended installation of drainage trenches is a promising option for reducing ground movements at this site.

RISK LEVEL

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

- Probability Factor of 10 to reflect the active slope movement being tracked in the SI's.
- Consequence Factor of 2 to reflect the impacts upon the road to date and the expected future damage to the road, i.e. annual to semi-annual repaving required to maintain a smooth running surface.

Therefore, the recommended Risk Level for this site is 20, which is unchanged from the recommendations after previous inspections.

RECOMMENDATIONS

Maintenance and Short Term Measures

AT's maintenance contractor should continue to place overlays as required to maintain a smooth running surface.

Long Term Measures

The recommended drainage trenches should be installed. The design of and specifications for these trenches is underway at the time of writing, to be followed by the preparation of a draft tender package for the repair.

The semi-annual readings of the functioning instruments should be continued.

The annual inspections by AT and AMEC personnel should be continued.

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 Earth & Environmental, 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 Earth & Environmental,
a division of AMEC Americas Limited**

Andrew Bidwell, M.Eng., P.Eng.
Associate Geological Engineer

APEGGA Permit to Practice No. P-04546

Reviewed by:

Paul Cavanagh, M.Eng., P.Eng.
Associate Geotechnical Engineer

Attachments: Figures S22-1 and S22-2
Photos S22-1 to S22-3