



September 8, 2008

CG25277.B

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

Attn: Mr. Ross Dickson

**Re: Southern Region Geohazard Assessment Program
Site S10(A) – Archery Range, Highway 762:02
2008 Annual Inspection Report**

This letter documents the 2008 annual site inspection of Site S10(A) – Archery Range on Highway 762:02, approximately 12 km southbound of the junction between Highway 762 and Highway 22.

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 19, 2008 by Mr. Andrew Bidwell, P.Eng. and Mr. Bryan Bale of AMEC in the company of Mr. Ross Dickson and Mr. Roger Skirrow of AT.

BACKGROUND

There is limited background information available regarding this site. It is understood that there was a failure at this site in the mid-1990's – either a failure of the road subgrade and/or slope instability in the underlying native soil and the slope face downslope (west) of the road. This instability required temporary closure of at least the southbound lane of the road prior to repair. There are no details currently available on the associated investigation and repair aside from that the road was reconstructed with granular fill.

Settlement and cracking of an approximately 30 m long segment of the southbound lane at this site has been ongoing since approximately 2000. The semi-circular pattern of the cracking suggests a slump failure down towards the west. Asphalt overlays have been placed at this site at least annually since 2002.

Annual assessments have been performed at this site by AT and AMEC personnel since the spring of 2000.

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AMEC drilled a series of boreholes and installed two SI's and two pneumatic piezometers at this site in March 2007 as part of a geotechnical investigation to determine repair options for this site.

SITE OBSERVATIONS

There were no significant changes to the site appearance since the 2007 inspection.

- As shown in Photos S10(A)-1 to S10(A)-3, the circular landslide headscarp that was visible in previous years had re-formed through an overlay placed across the site. The lateral extent of the landslide damage to the road surface and the magnitude of the settlement over the past year was consistent with that noted in the previous annual inspections. The attached site plan show the approximate extent of the damage to the road surface and the attached cross-section shows the site stratigraphy and potential landslide failure surfaces.
- The appearance of the possible toe bulge adjacent to the base of the road embankment in the landslide area had not changed since the previous annual inspection.

Also, the readings of the instrumentation at this site in May 2008 showed that landslide movement is occurring around 7 m depth below the southbound lane and that no significant landslide movement has been measured below the northbound lane. This is consistent with the visible extent of the landslide damage at the road surface.

ASSESSMENT

The ongoing landslide movement below the southbound lane of the highway presents a significant, ongoing maintenance issue that has required one to two asphalt overlays per year for the last several years.

The data from the instruments installed in March 2007 has confirmed that there is no significant landslide movement below the northbound lane of the highway. Several repair options were determined for this site based on the data from the 2007 site investigation. Please refer to AMEC's previous report¹ for a listing of the repair options and the pros and cons of each. However, the downslope extent of the landslide movement (i.e. failure surface daylighting at or above the toe of the fill embankment vs. failure surface extending deeper and further westwards) needs to be confirmed in order to select either a toe buttress for the road fill embankment or a pile wall to support the road surface as the best repair option.

¹ "Highway 762, Site S10(A) Archery Range Site, Assessment of Landslide Conditions and Repair Options", submitted to AT on March 25, 2008, AMEC project no. CG25260.

RISK LEVEL

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

- Probability Factor of 11 based on the ongoing movement measured in the SI's.
- Consequence Factor of 4 based on the potential for the southbound lane of the highway to be taken out of service if overlays to mitigate the ongoing settlement of the road surface are not applied promptly. This is also consistent with the damage reported from the mid-1990's failure at this site where at least one lane of the road was temporarily closed until repairs could be completed.

Therefore, the current recommended Risk Level for this site is 44, which is unchanged since the 2005 assessment.

RECOMMENDATIONS

Maintenance and Short Term Measures

- AT's maintenance contractor personnel should continue to patch and regrade the settlement in the southbound lane of the highway as necessary.
- As discussed on site during the inspection, an SI should be installed adjacent to the toe of the road embankment slope in order to check the depth of landslide movement in this area and thereby determine if a toe buttress for the road embankment would be a suitable repair measure for this site or if a pile wall would be required.

Long Term Measures

- The semi-annual readings of the functioning instruments should be continued.
- The annual site inspections should be continued.
- If this site is to be repaired (rather than continued as a maintenance issue), then the repairs should be completed prior to the planned 2010 or 2011 100 mm overlay along the length of Highway 762.

Investigation

As described above, AMEC recommends that another SI be installed adjacent to the toe of the road fill embankment slope. The approximate cost for the SI installation, follow-up readings,

repair design and draft tender package preparation is \$40,000 to \$45,000. AMEC will submit a proposed scope and estimated costs for this work to AT under separate cover.

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: Site Plan
Cross-Section
Photos