



September 29, 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 S21 – Highwood Base Road Creek, Highway 541:02
2008 Annual Inspection Report**

This letter documents the 2008 annual site inspection of Site S21 – Highwood Base Road Creek, on Highway 541:02 approximately 3 km east of the junction between Highways 40, 541 and 940 at Highwood House.

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 25, 2008 by Mr. Andrew Bidwell, P.Eng. and Mr. Bryan Bale of AMEC.

BACKGROUND

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

- The highway crosses a small, unnamed creek east of the intersection with the Highwood Base Road at this site. The creek flow is conveyed below the highway via a 1250 mm diameter culvert. The culvert outlet discharges onto a gravel bar along the north bank of the Highwood River.
- The site initially came to attention in August 2004 when a significant accumulation of debris was noted around the creek channel and along the north side of the highway. It appeared that earlier in 2004, the debris had blocked the culvert, overtopped the ditch

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

and flowed onto the westbound lane of the highway before being cleared by the maintenance contractor.

- A subsequent airphoto review and ground traverse upstream along the creek channel determined that the debris originated from the upper portion of the creek watershed. It also appeared that the debris may not necessarily have traveled downstream to the highway in a single debris flow event along the length of the channel, but rather had been transported downstream over time and that there was a large volume of debris still along the channel upstream of the highway.

SITE OBSERVATIONS

- Portions of the accumulated debris along the channel between the highway and treeline as well as within the culvert itself had been excavated and removed at some time since the June 2007 site inspection, presumably by AT's maintenance contractor. Photos S21-1 and S21-2 show views of the debris around and upstream of the culvert inlet as it appeared in June 2008. Photo S21-3 shows the debris accumulation as it appeared during the previous site inspection in June 2007.
- A geotextile liner underlying the debris along the flow channel just upstream of the culvert inlet was partially exposed at the time of the June 2008 site inspection (Photo S21-5).
- The culvert pipe was roughly 1/6 full of debris at the time of the 2008 inspection, compared to roughly 2/3 full as noted during the 2005 to 2007 inspections.

ASSESSMENT

The hazard of debris being transported down the creek channel is judged to remain unchanged from the previous inspections.

The purpose of the apparent geotextile liner below the debris along the channel for a short distance upstream of the culvert inlet is not clear. There does not appear to be a need to maintain a separation between the debris and the underlying material. Furthermore, the geotextile is vulnerable to damage during excavation and removal of the debris. In any case, the geotextile does not increase the hazard to the culvert and highway from the debris in the channel.

The removal of some of the debris around and upstream of the culvert inlet as well as within the culvert pipe itself has provided some additional "buffer" capacity before future debris accumulations fill and block the culvert. This has reduced the Consequence Factor and therefore the recommended Risk Level for this site (see below).

RISK LEVEL

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

- Probability Factor of 11 based on the apparent occurrence of debris flows blocking the ditch in 2004 and possibly 2005 along with the debris accumulation along the channel upstream of the highway. The Probability Factor may actually be closer to 9 over the long term, but it appears that in recent years a value of 11 is more accurate.
- Consequence Factor of 1 with reliance on the cleaned-out channel and culvert pipe to be able to accommodate the likely volume of debris flowing downstream over the next few years without overtopping the ditch and flowing onto the road. This is a reduction from the value of 3 recommended after the 2007 inspection, in order to reflect the removal of debris from the culvert pipe and upstream of the culvert inlet.

Therefore, the recommended Risk Level for this site is 11. This is a reduction from the value of 33 recommended after the 2007 inspection.

RECOMMENDATIONS

Maintenance and Short Term Measures

- AT's maintenance contractor should continue to remove debris as necessary to maintain the volume of debris within the culvert pipe and along the channel upstream of the culvert similar to or less than the amount seen during the June 2008 inspection.

Long Term Measures

- None recommended. The annual site inspections should be discontinued.

Investigation

No investigation work for this site is recommended at this time.



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**

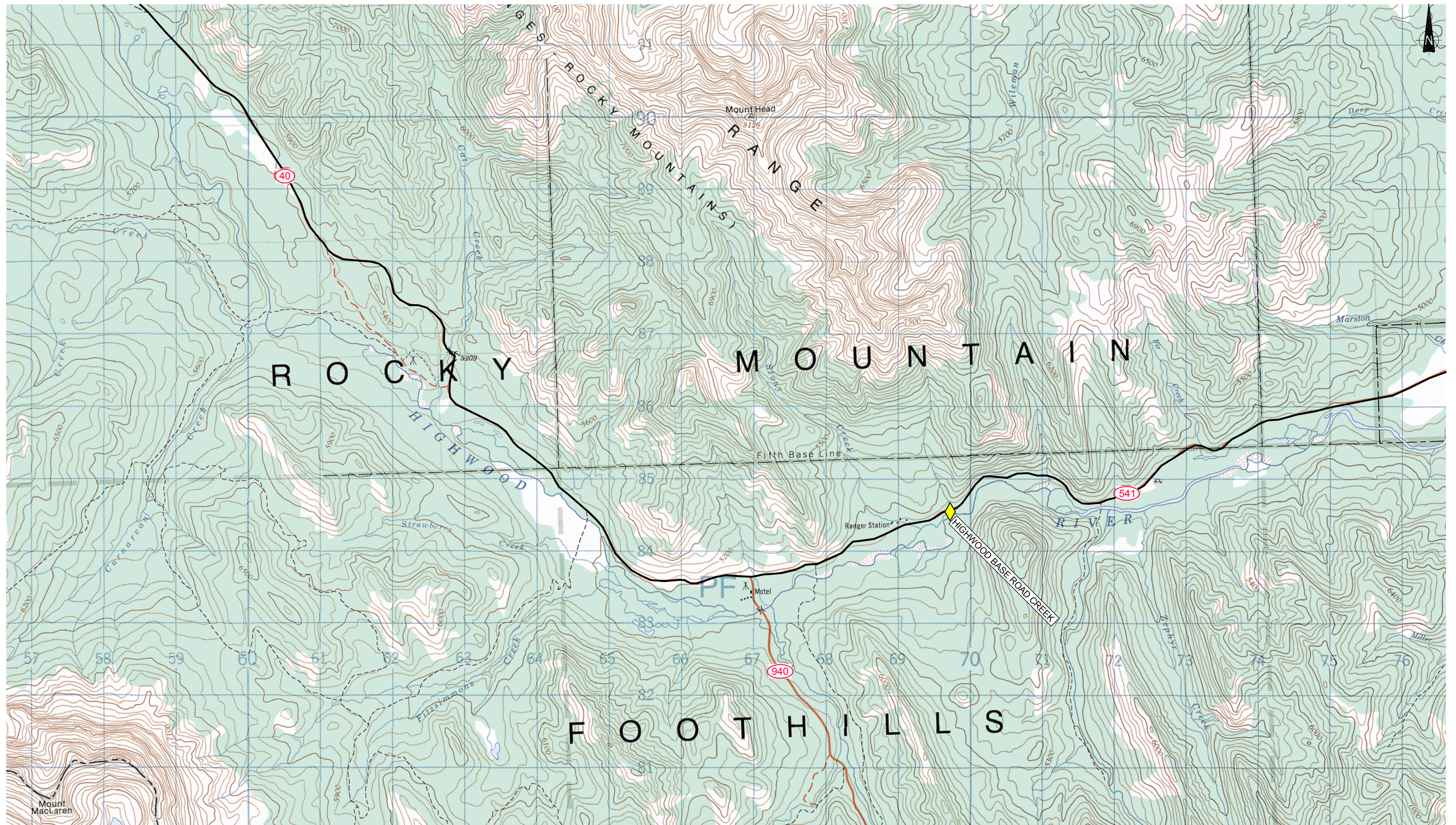
Andrew Bidwell, M.Eng., P.Eng.
Associate Geological Engineer

APEGGA Permit to Practice No. P-04546

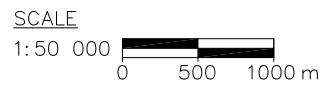
Reviewed by:

Pete Barlow, M.Sc., P.Eng.
Principal Geotechnical Engineer

Attachments: Location Map
Photos



MAP REFERENCE:
 1:50 000, 82-J/7,8,9,10,11,14, 82-O/2,3 (ETOPO)



		PROJECT: SOUTHERN REGION GEOHAZARD ASSESSMENT			
CLIENT:		TITLE: LOCATION PLAN S21- HIGHWAY 541- HIGHWOOD BASE ROAD CREEK			
DATE:	AUGUST 2008	JOB No.:	CG25277.B	CAD FILE:	
FIGURE No.:	S21-1	REV.	A		



Photo S21-1 (top) – June 2008

Facing upstream along the creek channel from the highway. Note the well-defined debris fan extending out from the treeline, with the creek channel incised into it.

Photo S21-2 (middle) – June 2008

Facing downstream towards the culvert inlet. The debris around the culvert inlet and within the culvert has been cleaned out since the June 2007 site inspection (compare with Photo S21-3), however the culvert was approximately 1/6 full of debris in June 2008. It is not known if the culvert was cleaned out completely after the June 2007 inspection and the current debris has accumulated since that time, or if a portion of the debris in visible in Photo S21-3 from June 2007 was left behind after the clean-out.



Photo S21-3 (bottom) – June 2007

Debris accumulation around the culvert inlet and within the culvert as seen during the June 2007 site inspection.



Photo S21-4 (top) – June 2008
Facing upstream from the culvert outlet,
with debris accumulation in the pipe.



Photo S21-5 (bottom) – June 2008
Geotextile exposed along the channel
upstream of the culvert inlet.