



THURBER ENGINEERING LTD.

GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

September 8, 2009

File: 15-16-229

Alberta Transportation
Room 301, Provincial Building
9621 - 96 Avenue
Peace River, AB T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (PEACE – HIGH LEVEL AREA) GEOHAZARD ASSESSMENT
HWY 688:02 PAT'S CREEK (PH50)
2009 ANNUAL INSPECTION REPORT**

Dear Sir:

This letter documents the 2009 annual site inspection of an area of slope instability located along Highway 688:02 about 2.5 km east of the junction of Highway 688 and Highway 2. Thurber Engineering Ltd. (Thurber) undertook this inspection in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE105/2008) with Alberta Infrastructure and Transportation (AT).

Mr. Robert Saunders, P.Eng. of Thurber undertook the inspection on May 27, 2009 in the presence of Mr. Roger Skirrow, P. Eng., Mr. Neil Kjelland, P.Eng. and Mr. Ed Szmata of AT.

1. BACKGROUND

This site has a history of stability problems associated with the north embankment slope. In 2001, two slides occurred in the north embankment which resulted in the lower slide mass being excavated and reconstructed with pitrun gravel placed over geotextile. A concrete end treatment around the culvert and a riprap lined swale constructed along the northeast edge of the fill to mitigate an erosion problem were also installed at that time.

In August 2006, Thurber undertook a callout inspection of a moderately large, shallow slope instability affecting the upper portion of the north embankment slope. Following that inspection, a preliminary engineering assessment was undertaken by Thurber, which included the drilling of a test hole in the westbound roadway and excavation of a test pit on the slope through the toe of the slump.

The results of that assessment, with several conceptual remediation options, were presented in a letter report dated February 20, 2007.

In 2007/8, UMA Engineering Ltd. (UMA) undertook a geotechnical investigation in support of the detailed design of long-term remediation measures for this site which included the installation of piezometers and slope inclinometers.

The site condition at the time of the 2008 inspection is described in our Part B assessment letter in the PH50 site binder. Additional information of the site is provided in the Geotechnical File Review in Section A of the binder.

2. SITE OBSERVATIONS

At the time of the May 2009 inspection, the slope instability on the upper portion of the embankment was approximately 60 m long and up to 25 m wide, centered within the north side of the embankment over Pat's Creek (Figure 50-1). Conditions within the slide area were relatively unchanged from 2008 (Photos 50-01 to 50-04).

The main slide was observed to be confined to the upper third of the slope. The upper portion of the embankment slope had a gradient of about 18° and the lower (stable portion) had a gradient of about 15°. Since 2007, the eastern end of the slide complex became more defined; however it does not appear to have changed significantly since 2008 (Photos 50-03 and 50-04).

The headscarp of the slide originally extended to the shoulder of the westbound lane. The guardrail was relocated in 2007/8 closer to the westbound driving lane as shown in Photos 50-05 to 50-07. The headscarp appears to have become a bit steeper and higher since 2008 but has not retrogressed further laterally.

In 2007, the estimated depth of the slide rupture surface was in order of 1 m, although this might have deepened slightly with time. The soil (fill) exposed within the headscarp was noted to be a high plastic clay.

Since the 2008 site inspection, shallow slumping on the lower portion of the embankment, below the 2006 slide, appears to have re-developed in the vicinity of the 2001 slide as shown in Photo 50-08.

3. ASSESSMENT

Based on the preliminary geotechnical assessment completed for the site, the cause of the slumping was determined to be a result of weathering and a loss of strength within the clay fill (i.e. loss of cohesion) over time. The trigger mechanism for the slide was likely a heavy precipitation event.

Further instability and retrogression is possible as runoff into the slide mass at the scarp areas is unimpeded.

4. RISK LEVEL

The risk level for this site has been assessed as follows:

$$PF(11) * CF(4) = 44$$

A Probability Factor of 11 is considered appropriate since the slide is active with a steady rate of movement, though movement might accelerate if heavy or prolonged rainfall occurs. A Consequence Factor of 4 is considered appropriate since the fill slope is associated with a high fill and a culvert structure. Further movement could result in closure of the westbound travel lane.

5. RECOMMENDATIONS

5.1 Short Term

In the short term, the site should be regularly inspected by the MCI to ensure the westbound travel lane does not become undermined again and fail further into the roadway.

5.2 Long Term

It is understood long-term remediation measures are currently being designed by UMA. These measures should be reviewed in light of the renewed slumping observed just about the culvert outlet and, if required, modified to incorporate this area as well.

5.3 Investigation

As this site was recently investigated by UMA in support of detailed design of remediation measures, no further investigation is considered necessary at this time.

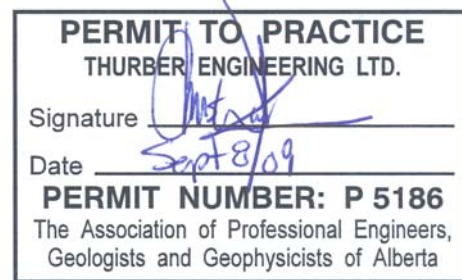
5.4 Maintenance

Until remediation measures can be completed, surface runoff should be directed away from the two scarp features at either end of the slide area. If possible, runoff should be intercepted at the ends of the embankment and directed down the slope outside of the slide area.

6. CLOSURE

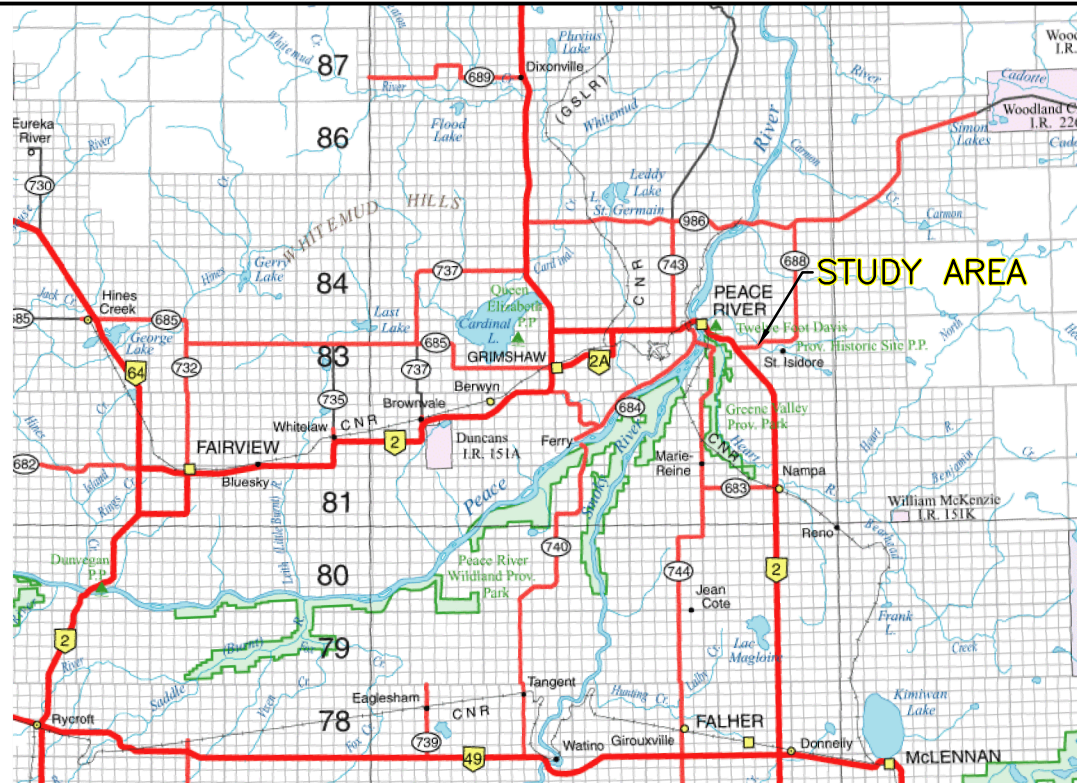
We trust this assessment and recommendations meet with your needs at this time. Please contact the undersigned should questions arise or if the slide condition worsens.

Yours truly,
Thurber Engineering Ltd.
Chris Workman, M.Eng., P.Eng.
Review Principal



Robert Saunders, M.Eng., P.Eng.
Senior Geotechnical Engineer

Attachments



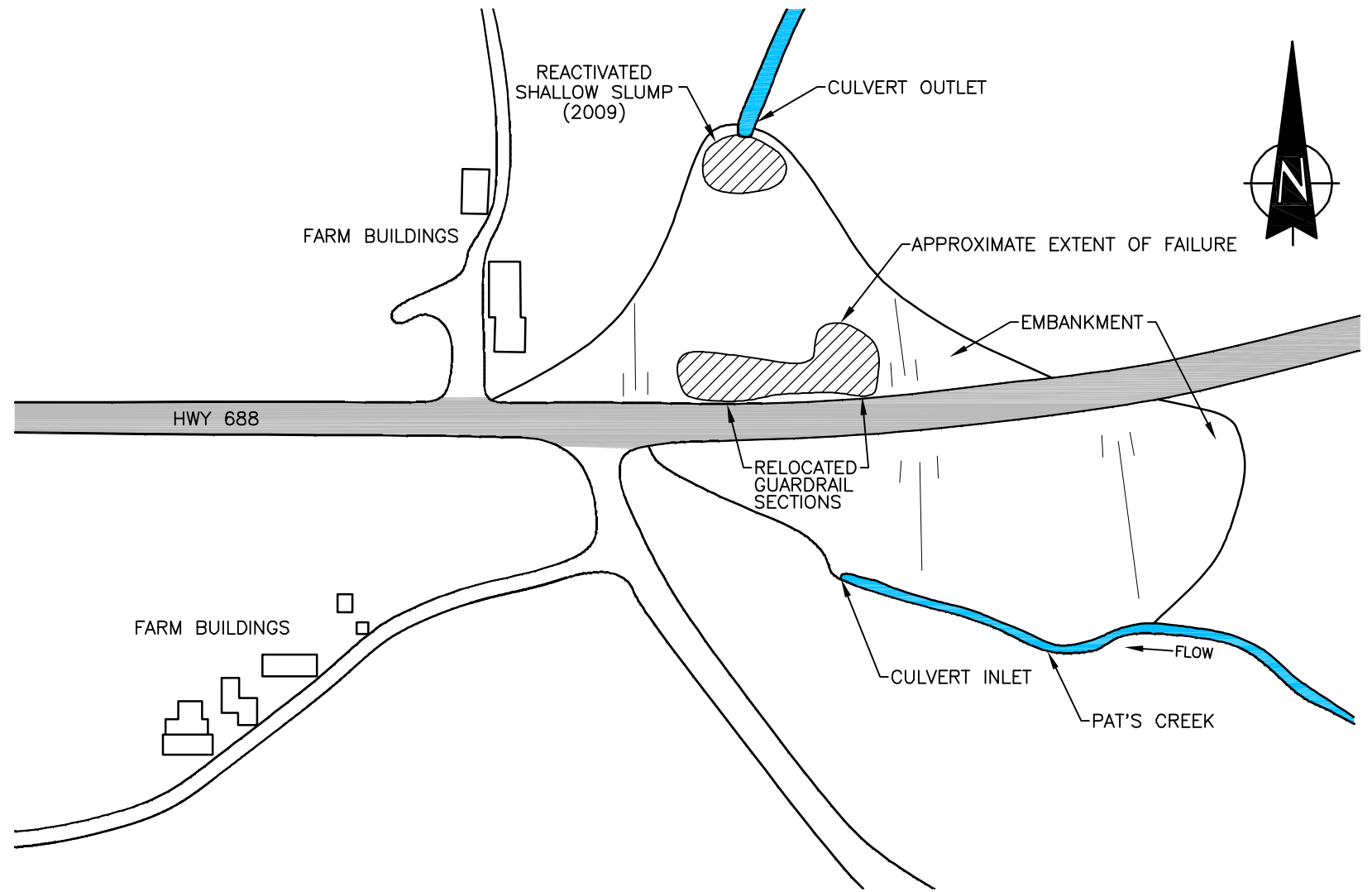
KEY MAP

SCALE 1:1 000 000



LOCATION MAP

SCALE 1:10 000



DETAIL MAP

SCALE 1:2 000 (APPROX.)

NOTES:

- 1 AIRPHOTO BASE FROM TARIN RESOURCE SERVICES LIMITED (1 m/PIXEL) 1999.
- 2 SLIDE FEATURES ARE SHOWN APPROXIMATELY ONLY.
- 3 DRAWINGS MUST BE USED IN CONJUNCTION WITH ATTACHED REPORT AND ARE SUBJECT TO THE STATEMENT OF GENERAL CONDITIONS.

DRAWN BY	ICB/ACM	DESIGNED BY	RJS	APPROVED BY	WCW
SCALE	AS SHOWN	DATE	AUGUST 27, 2009	FILE No.	15-16-229-B2C

Government of Alberta
Transportation

PEACE REGION (PEACE RIVER/HIGH LEVEL)

**PAT'S CREEK
HWY 688:02 (PH50)
LOCATION PLAN**

FIGURE PH50-1



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Photo 50-01

May 2009

Looking southwest at unstable fill slope below roadway.



Photo 50-02

May 2008

Similar view as Photo 50-01 above taken in 2008. Main slide is relatively unchanged in this time period.



Photo 50-03

May 2009

Looking south at east end of slide complex.



Photo 50-04

May 2009

Looking downslope at eastern flank of slide complex shown in Photo 50-03.



Photo 50-05

May 2009

Looking east along headscarp of western end of slide complex.



Photo 50-06

May 2008

Similar view to Photo 50-05 taken in 2008. Headscarp has become a bit steeper and higher since 2008.



Photo 50-07

May 2009

View looking west along headscarp of eastern end of slide complex.



Photo 50-08

May 2009

Shallow slump re-developing on lower portion of embankment below main slide, just above culvert.