



August 11, 2006

File: 15-85-37

Alberta Infrastructure and Transportation
3rd Floor, Provincial Building
9621 – 96th Avenue
Peace River, Alberta
T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (PEACE RIVER – HIGH LEVEL AREA)
GEOHAZARD ASSESSMENT
HWY 88:18, SITE PH16, CULVERT REPLACEMENT NEAR FT. VERMILION
2006 ANNUAL INSPECTION REPORT**

Dear Sir:

This letter documents a site inspection undertaken by Thurber Engineering Ltd. (Thurber) for the above referenced site located on Hwy 88, approximately 2.5 km west of Fort Vermilion, Alberta. The inspection was undertaken by Thurber Engineering Ltd. (Thurber) in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE049/2004) with Alberta Infrastructure and Transportation (AIT). The inspection was undertaken on May 9, 2006 by Mr. Don Proudfoot P. Eng., and Mr. Gustavo Padros, M. Sc., of Thurber along with Mr. Ed Szmata and Mr. Roger Skirrow, P.Eng of AIT.

1. BACKGROUND

In Fall of 2003 an existing culvert was replaced with a 3.05 m diameter, 90 m long CSP culvert. Background regarding slope failures and mitigative measures undertaken during construction was provided in a letter dated June 11, 2004, which documented a site visit undertaken on June 4, 2004, by Mr. Don Law, P.Eng of Thurber. The letter report provided recommendations for slope flattening, subdrains and erosion protection. Additional recommendations regarding site drainage and erosion protection were provided in the 2004 Landslide Assessment Report dated November 24, 2004.

2. SITE OBSERVATIONS

The borrow pit area, culvert and side slopes were inspected during the site reconnaissance and our observations are shown on the attached site sketch plan. Selected photographs of the site taken on May 10, 2006 are also attached.

The vegetative cover on the east side slope was sparse leading to slope erosion. The erosion gullies noticed in the east slope in the June 20, 2005 site visit were repaired, but new minor erosion gullies were observed in that same slope, just 20 m north of the repaired erosion gullies. Seepage and a wet area were noticed near the toe of the slope, as shown in Figure PH16-1.

Noticeable silt accumulation was observed at the culvert outlet. This is consistent with last year's assessment. However, recent erosion gullies were observed on the south slope, close to the culvert outlet. Also, the silt fence above the culvert outlet is damaged.

An erosion gully previously observed in our June 2005 assessment, located half way up the slope in the north-west "V" shaped ditch, has not been repaired. No further signs of deterioration were noticed in that area. The south-east drainage ditch lined with geotextile and rip rap did not show any sign of malfunction.

The borrow pit area did not contain any significant wet areas or free standing water.

The soil erosion at the culvert inlet, above the rip rap level, has increased since our June 2005 assessment.

3. RECOMMENDATIONS

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

$$\text{Risk (20)} = \text{PF(5)} * \text{CF(4)}$$

A Probability Factor of 5 is considered appropriate since the remedial measures adopted appear to be working. A Consequence Factor of 4 is considered appropriate given a closure of the road could be the result of a slope failure caused by the erosion process.

4. RECOMMENDATIONS

The mitigation measures implemented to stabilize the east slope appear to be working. The slope seemed to be stable and did not show signs of tension

cracking of slope movement. However, the slopes are steep and long, therefore they may be considered as highly susceptible to erosion if not protected appropriately. In order to provide erosion protection the east slope should be double seeded and covered with straw matting to ensure sufficient grass coverage. The latter would constitute a short term solution. A long term solution, if required, would involve re-grading the east slope, and creating three flat benches across the slope, which would intercept and redirect the surface runoff to the nearby swale.

The erosion gullies noticed in the east and south slopes as well as in the north-west swale ("V" ditch) should be backfilled with gravel. The silt fence above the culvert outlet needs to be repaired. The accumulated silt at the culvert outlet should be removed.

The erosion hole at the culvert inlet should be repaired. The area should be cleaned up, followed by placement of non-woven geotextile, pit run gravel, and heavy rip rap. The material quantities approximately needed are 10 m³ of gravel and 15 m³ of rip rap.

All of the above measures, with the exception of long term slope benching, are considered to be maintenance items with a ball park cost of \$35,000.

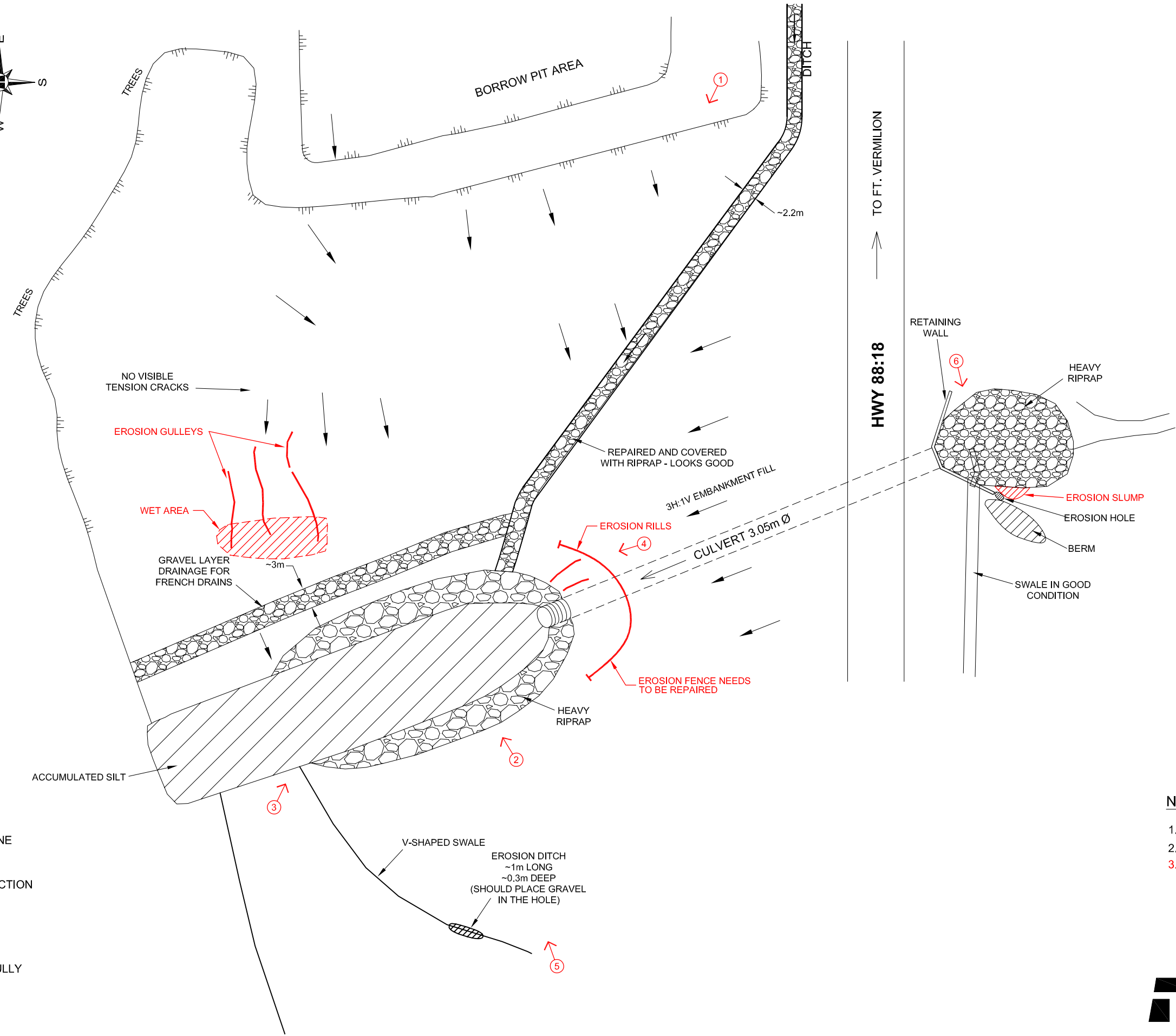
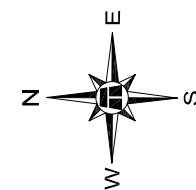
5. CLOSURE

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



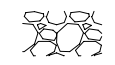

Yours very truly,
Thurber Engineering Ltd.
Don Proudfoot, P.Eng.
Review Principal

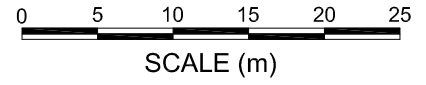
Gustavo Padros, M.Sc.,
Assistant Project Engineer
/dw

Attachments



LEGEND

-  WETTED ZONE
-  SLOPE DIRECTION
-  RIP RAP
-  EROSION GULLY



NOTES

1. FEATURE LOCATIONS ARE APPROXIMATE.
2. PREVIOUS OBSERVATIONS SHOWN IN BLACK
3. MAY 2006 OBSERVATIONS SHOWN IN RED

FIGURE PH16-1
HWY 88:18 FORT VERMILION
SITE SKETCH PLAN
 DATE : MAY 2006
 THURBER PROJECT #15-85-37





PHOTO 1: Overall view of the west slope.



PHOTO 2: Erosion gullies on the east slope.



PHOTO 3: Erosion gullies above culvert outlet, damaged silt fence and accumulation of silt.



PHOTO 4: Erosion gullies above culvert outlet and accumulation of silt.



PHOTO 5: Overall view of the east slope.



PHOTO 6: Erosion slump at the culvert inlet.