



August 26, 2008

File: 15-16-218

Alberta Transportation  
2nd Floor, Provincial Building  
111 – 54 Street  
Edson, Alberta  
T7E 1T2

Attention: Mr. Cliff Corner

**NORTH CENTRAL REGION GEOHAZARD ASSESSMENT  
HWY 734:22 EROSION OF PEMBINA RIVER BANKS (NC28)  
SITE 8  
2008 ANNUAL INSPECTION REPORT**

Dear Sir:

This letter documents the 2008 annual site inspection of one of three sites located along Hwy 734:22 between 36.5 km and 40.5 km southeast of Robb, Alberta. Thurber Engineering Ltd. (Thurber) undertook this inspection in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE103/2008) with Alberta Transportation (TRANS).

Site 8 is located 39 km southeast of Robb on Hwy 734:22 (km 40.2, corrected from past reports) at legal land description SW18-46-18-W5M. Site features are shown in Figures NC28-2A and -2B (attached for inclusion in Section F). Cross-section A-A' on Figure NC28-2A shows the reconstructed slope in the guardrail area.

Mr. Don Law, P.Eng. and Mr. Ken Froese, P.Eng., of Thurber undertook the inspection on June 12, 2008, in the presence of Mr. Roger Skirrow, P.Eng., of TRANS.

## **1. BACKGROUND**

Thurber last visited the site as part of the Geohazard Assessments program in June 2007 and the site conditions at that time are described in our Part B assessment letter in the site binder. Additional background information is provided in the geotechnical File Review in Section A of the site binder.

During September and October 2006, a repair was undertaken to address the ongoing erosion and poor riparian habitat conditions at the site. The work was completed under Contract 7334/06 and is summarized in the Project Summary Report dated November 29, 2006, which should be referred to for details of the construction methodology employed. A bioengineering and biotechnical seminar/workshop was also held in conjunction with the repair work. Since that time, a site-specific monitoring program was established to observe the vegetative growth, rock riprap stability, and overall integrity of the various slope treatments. Daily monitoring of stream levels and weather conditions has been undertaken via a monitoring station installed at a nearby bridge. The results of the monitoring program are reported under separate cover.

## **2. SITE OBSERVATIONS**

Overall, the repairs appear to be stable and vegetation growth has continued to improve since 2007. No cracking was observed on the roadway but some minor settlement cracking was noted over the rootwad installations. Some minor rills were observed in the blown compost cover along the guardrail section. It was observed that the rock vanes were successful in maintaining the thalweg of the river flow away from the bank. It appeared that high water levels, buoyancy, ice breakup, debris, or a combination thereof, had caused some damage to the rootwads. The first two at the upstream end had partially pulled out of the bank and shifted downstream. The furthest downstream rootwad was entirely missing. This particular rootwad was installed by “stinging” rather than excavation and had only minimal cover which is likely the reason it was fully dislodged.

As part of the repairs, the top of bank was extended at least 2 m from the guardrail. Several compost berms were installed further north along the west ditch to direct surface runoff away from the high slopes that had experienced slumping in the past. This runoff is directed to the river partially via a live pole drain at the end of the compost berm and through a rock apron further downhill (immediately upstream of the guardrail). The voids in the rock apron were filled with road gravel and it appeared that some sediment had accumulated on the bank below the apron. In addition, inappropriate ditch grading had created a swale between the rock apron and the guardrail resulting in ditch flow bypassing the apron (see Photo 8).

The treatments on the uphill portion of the site were also relatively stable. Willow and grass growth is becoming established and there was only minor erosion noted over most of the areas. One bare spot was noted just upstream of the live pole drain/rock apron but compost was still in place. The furthest upstream gully had slumped or eroded slightly at the top end likely due to heavy runoff or spring rains but the debris has been contained by the vegetation.



The water level was high during the site visit; significantly higher than the same time in 2007. The river was flowing at just below bankfull elevation and there was evidence that the water level had been up to 0.5 m higher earlier in the month. Based on water level measurements at the nearby bridge (where the monitoring station is located), the river elevation was 1296.19 m at the time of the site visit (compared to 1295.62 m during the previous visit) and the peak elevation for 2008 was 1296.78 m and occurred on June 7 (about 0.4 m higher than previous record in 2006). Bankfull elevation is estimated to be 1295.97 m at the bridge location.

### **3. ASSESSMENT**

The repairs undertaken in 2006 appear to have stabilized this site. The rootwads appear to be still functioning as intended. Aside from any more unusually high river events, no further deterioration of this site is expected. Although minor erosion of the compost blanket was noted in a few areas, it is anticipated that future vegetation development will be sufficient to resist runoff. Maintaining the ditch swale to discourage ponding of water is recommended to reduce concentrated flow on the slopes. Directing the ditch flow onto the rock apron will reduce the amount of sediment entering the Pembina River.

### **4. RISK LEVEL**

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

$$PF(3) * CF(2) = 6$$

A Probability Factor of 3 is considered appropriate since the erosion by the river has been effectively removed. However, as the methods of repair at this site are experimental in nature, there remains the possibility that erosion could occur in limited areas especially during high flow events. With time, as vegetative cover is fully established, the probability of damage to the bank as a result of river erosion is expected to decrease. A Consequence Factor of 2 is applicable since the embankment is relatively low, no major structures are at risk, and only partial closure of the highway would result. This is the same risk level applied in 2007 and substantially lower than the level of 18 applied in 2006.

### **5. RECOMMENDATIONS**

#### **5.1 Short Term**

No short term remedial measures are required at this time. There remains the possibility that a high flow event could result in erosion that would threaten the

highway. Any significant changes noted by the maintenance contractor or MCI during routine road inspections should be assessed.

## 5.2 Long Term

Long term remediation measures have been undertaken and appear to be functioning as expected. It is recommended to discontinue detailed inspection and reporting on Site 8 on an annual basis under the GeoHazards program. Consideration should be given to reintroducing Site 8 to the annual program if there is any reason for concern about the long-term stability of the site.

## 5.3 Investigation

No additional investigation is required at this time.

## 5.4 Maintenance

The maintenance contractor should be directed to create a swale at the rock apron immediately upstream of the guardrail rather than between the apron and the guardrail (Photo 8 and location shown on Figure NC28-2A).

## 6. CLOSURE

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

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



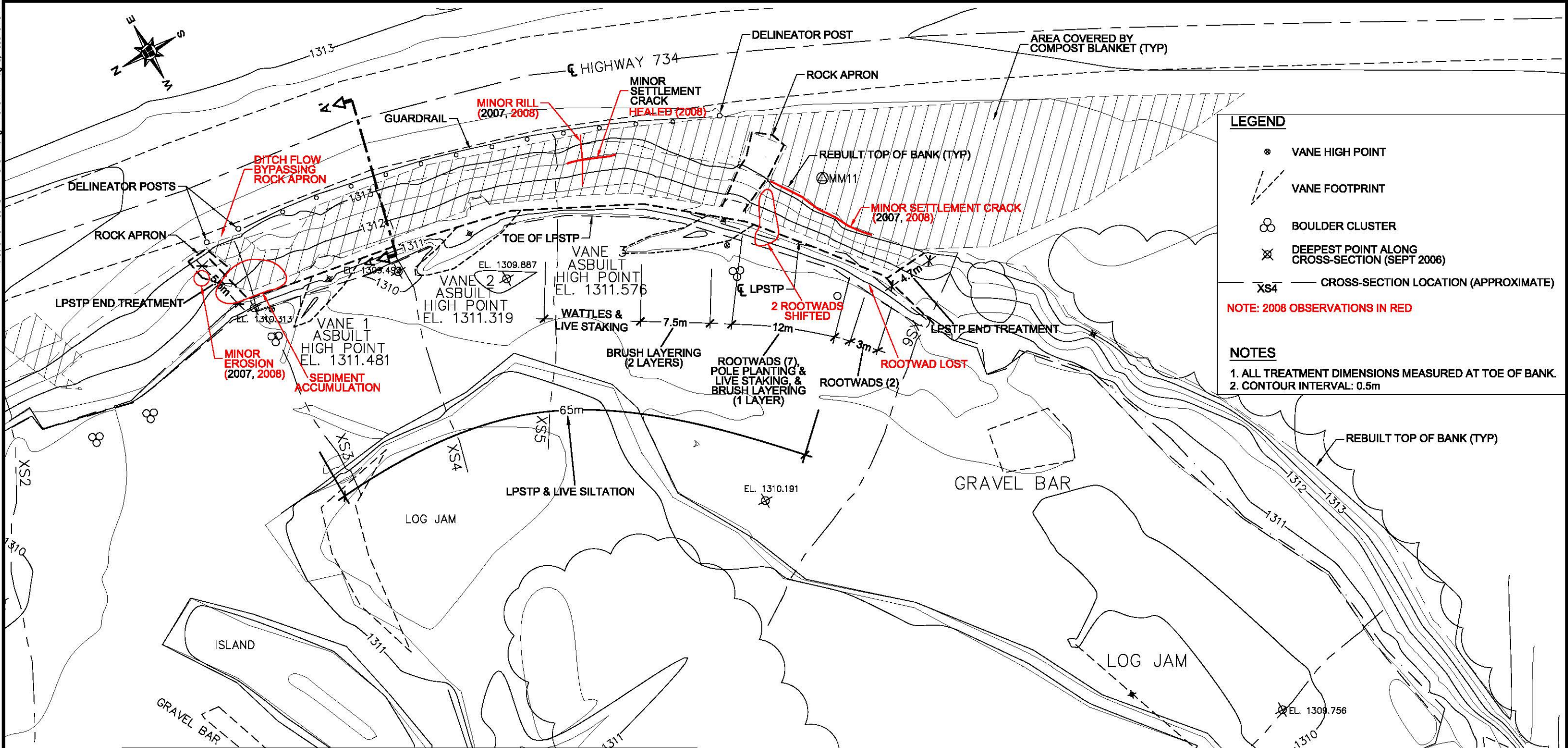
Ken Froese, P.Eng.  
Project Engineer

### Attachments

- Photographs 1 to 10

cc: Mr. Roger Skirrow, P.Eng., Director of Geotechnical Services, TRANS

Z:\1516-16-218\FIGURE NC28-2A.dwg - NC28-2A - Aug. 5, 2008 9:26 AM



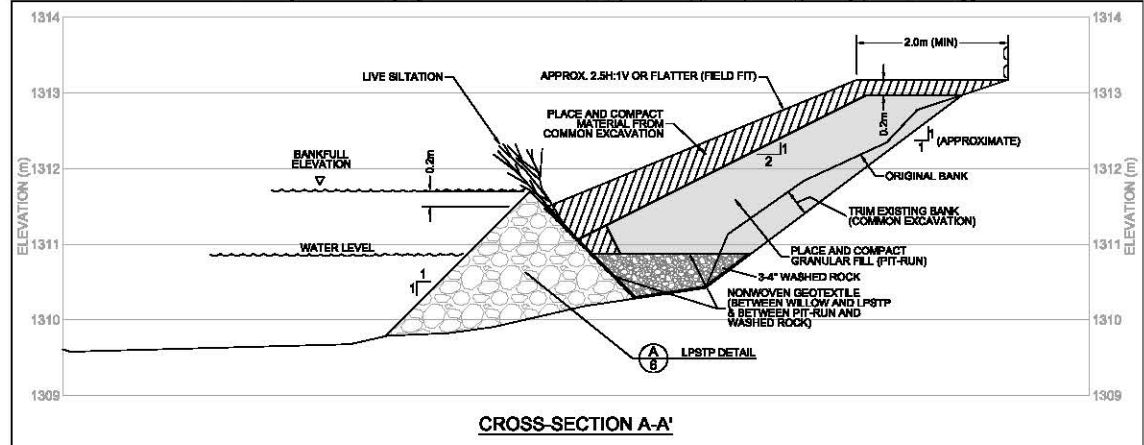
**LEGEND**

- ⊙ VANE HIGH POINT
- VANE FOOTPRINT
- ⊗ BOULDER CLUSTER
- ⊗ DEEPEST POINT ALONG CROSS-SECTION (SEPT 2006)
- XS4 --- CROSS-SECTION LOCATION (APPROXIMATE)

**NOTE: 2008 OBSERVATIONS IN RED**

**NOTES**

1. ALL TREATMENT DIMENSIONS MEASURED AT TOE OF BANK.
2. CONTOUR INTERVAL: 0.5m



AS-BUILT SURVEY OCTOBER 21, 2006.  
BASE PLAN PROVIDED BY EXH ENGINEERING SERVICES LTD. THURBER PROJECT #15-16-218

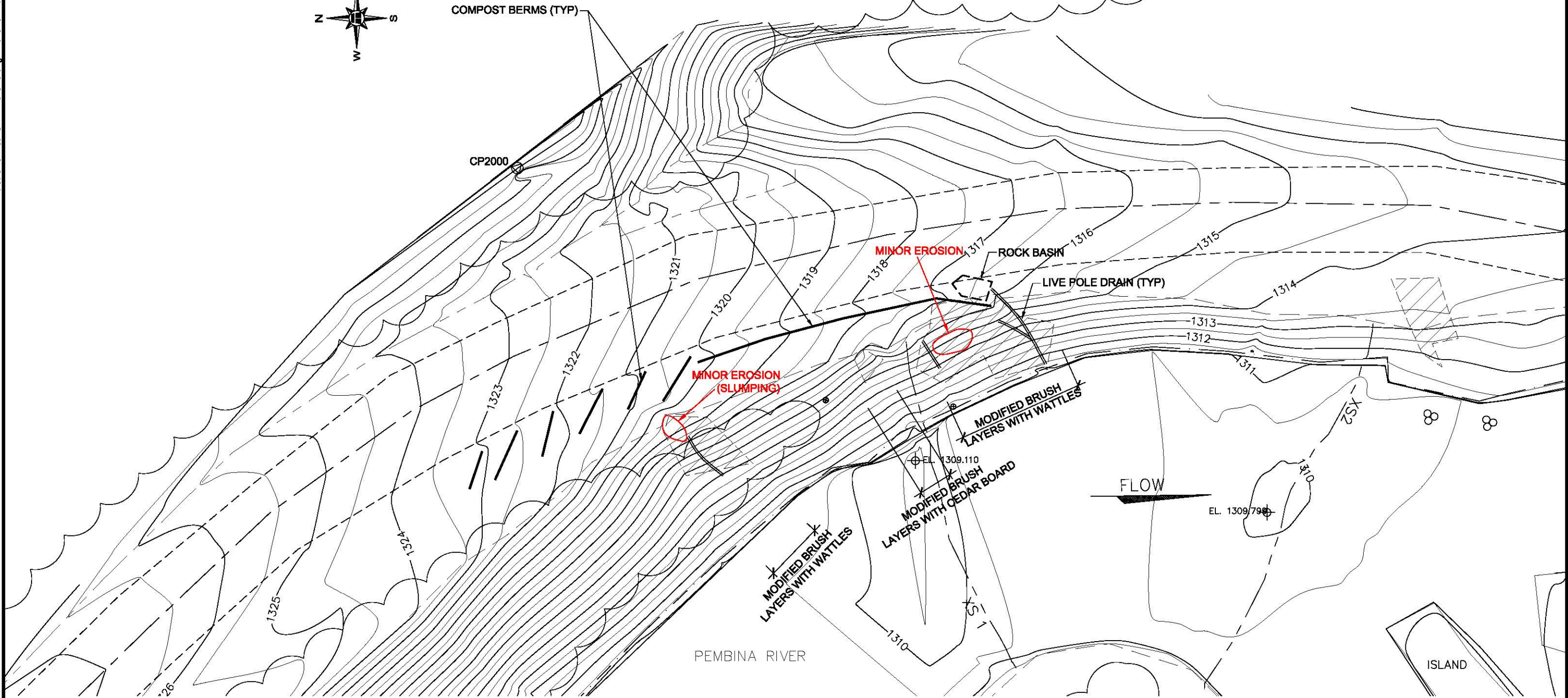
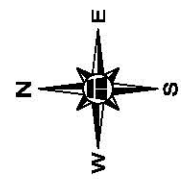
**ALBERTA TRANSPORTATION**

**SITE PLAN - SITE 8  
(DOWNSTREAM SECTION)**

**THURBER ENGINEERING LTD.**  
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

ENGINEER:	KEF	DRAWN:	CMH	APPROVED:	DJL
DATE:	JULY 2008	SCALE:	1:400	DRAWING No.:	<b>FIGURE NC28-2A</b>

NORTH CENTRAL 2008 GEOHAZARDS ASSESSMENT HWY 734 : 22 km 40.2 - (NC28) SW 18-46-18 W5M SOUTH OF ROBB, AB



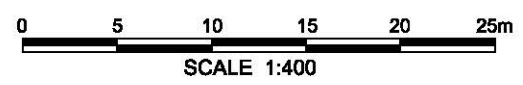
**LEGEND**

- ⊗ DEEPEST POINT ALONG CROSS-SECTION (SEPT 2006)
- XS1 — CROSS-SECTION LOCATION (APPROXIMATE)

NOTE: 2008 OBSERVATIONS IN RED

**NOTE**

CONTOUR INTERVAL: 0.5m



AS-BUILT SURVEY OCTOBER 21, 2006.  
BASE PLAN PROVIDED BY EXH ENGINEERING SERVICES LTD.

THURBER PROJECT #15-16-218


**ALBERTA TRANSPORTATION**

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**SITE PLAN - SITE 8  
(UPSTREAM SECTION)**

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NORTH CENTRAL 2008  
GEOHAZARDS ASSESSMENT



**THURBER ENGINEERING LTD.**  
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

ENGINEER:	KEF	DRAWN:	CMH
DATE:	JULY 2008	SCALE:	1:400
APPROVED:	DJL	DRAWING No.:	<b>FIGURE NC28-2B</b>



Photo 1 – Looking northeast at repaired slump area below guardrail, June 12, 2008.



Photo 2 – Looking southeast at repaired main slump area, June 12, 2008.



Photo 3 – Looking upstream at rootwads. Note that upstream 2 have shifted, June 12, 2008.



Photo 4 – View of displaced rootwads at upstream end of treatment, June 12, 2008.

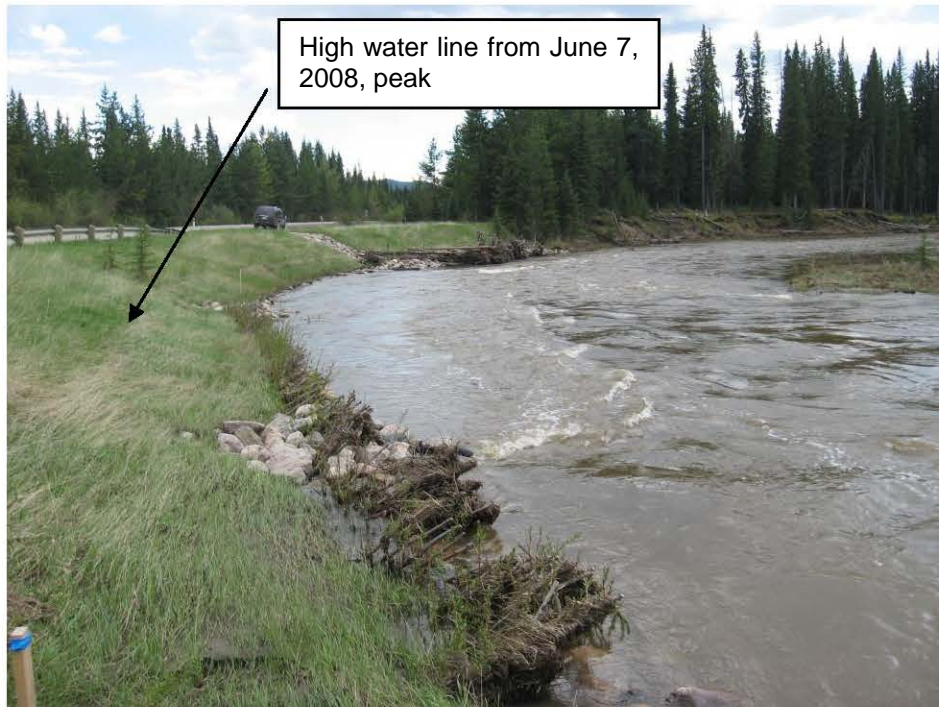




Photo 5 – Looking southwest at repaired slump area at south end of site, June 12, 2008.



Photo 6 – Typical live staking growth after one full growing season, June 12, 2008.



High water line from June 7, 2008, peak

Photo 7 – Looking downstream at repaired section along guardrail. Note high water line, June 12, 2008.



Photo 8 – Accumulated debris on rock apron upstream of guardrail and bypassing ditch flow, June 12, 2008.



Photo 9 – Modified Brush Layering with Cedar Boards, June 12, 2008.



Photo 10 – Modified Brush Layering with Wattles (furthest upstream) showing one season's growth and minor slumping at top, June 12, 2008.