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August 22, 2003 File: 15-16-173

Alberta Transportation
North Central Region – Edson District
568 Carmichael Lane
Hinton, Alberta
T7V 1X8

Attention: Mr Winston Bargery
Maintenance Contract Inspector

SH734:22 - EMERGENCY CALL-OUT
DITCH EROSION, NORTH VALLEY SLOPE
BRAZEAU RIVER, ALBERTA

Dear Sir:

This report presents the results of an emergency call-out conducted by Mr. S.M. Sather, M.Eng., P.Eng (Ont.) of Thurber Engineering Ltd. on August 8, 2003. The request for the call-out was made by Mr.Winston Bargery, who was present on site during the inspection. The site is located on Highway 734, along the north slope of the Brazeau River valley, extending from the bridge to about 600 m north of the bridge, as shown on Figure 1.

1. BACKGROUND

The background history of the site was discussed on site with Mr. Winston Bargery, and can be summarized as follows:

- SH734:22 was first constructed in the 1970s and is gravel surfaced
- Erosion of the west ditch segment from 100 m to 350 m north of the bridge has been occurring during periods of high precipitation.
- Silt and sediment have been entering the stream downslope of the road and may impact the Brazeau River.
- The road fill extending from 100 m to 350 m north of the bridge is steeply inclined and exhibits signs of settlement, shallow soil slides and gully erosion (associated with a culvert outlet)
- There is a problem with ice build-up on the road, in the ditches and at culverts during the winter months.
- Rip rap up to about 400 mm in size had been placed in the ditch prior to the latest erosion events
- A new bridge over the Brazeau River has been recently completed.

Continued...

2. FIELD OBSERVATIONS

A rough field survey of the road alignment and adjacent slopes was carried out during the filed visit using a compass, hand inclinometer and pacing. Several surficial geologic features and observations were also noted during the survey. The resulting data is summarized in Figure 1. Several photographs were taken during the traverse and selected photographs are attached. The location and orientation of each photograph is shown on Figure 1. Field observations are given in Table 1.

TABLE 1: FIELD OBSERVATIONS

Road Station*	Feature	Comments
0+115	West ditch	Recent lateral erosion of ditch
0+200	Bedrock outcrop	Sandstone, siltstone shale beds, dipping approx. 10° towards 260°, 35 degree cutslope with gravel-sized talus
0+235	Fill slope	Fill slope inclined at 33-36° on the east side, 2-3 m deep gully eroded at Culvert A outlet 2-3 m long tension cracks north of Culvert A Culvert A inlet partially blocked
0+250	Fill slope	6 m wide landslide on fill slope, 0.3 m depression along outside edge of road
0+290	West ditch	Recent lateral erosion, ditch 4m wide (photo 6),.
0+345	Culvert/stream	Some stream flow passing into west ditch
0+400	North Earth Slump	Approximately 70 m wide x 30 m long. Trees rotated back approximately 23 degrees, Seepage discharge along north ditch.

* Chainage measured from north edge of bridge

The culverts shown in Figure 1 were 500 or 600 mm diameter corrugated steel pipe with generally 300-400 mm of cover in the traffic lanes. The inlets and some of the outlets had significant damage.

3. PRELIMINARY ASSESSMENT

Several active geologic processes are present in the assessed portion of road. These processes include:

- Recent erosion of the west ditch between Sta.0+100 to 0+350.
- Local instability and erosion of the steep fill embankment slope between Sta. 0+225 to 0+290.
- Large earth slump north of road from about Sta. 0+375 to 0+450.

The first two items listed above are related to problems with the surface water drainage system affecting areas between the bridge and about Sta. 0+350. Under periods of high flow or as a result of ice build or debris at the culvert, the stream

flow at Sta. 0+350 appears to divert all or a portion of flow down the west ditch resulting in ice build-up and erosion of the ditch.

The factors leading to ice build-up cannot be well defined without further investigation during the fall/winter months. However, it appears that a significant portion of the water arriving at the culverts near Sta. 0+334 and 0+345 is originating from the seepage discharge zone along the cut slope between Sta. 0+375 and 0+620. This discharge is expected to continue during the winter months because of the low seasonal variation in groundwater temperature. The water discharged at the surface, would be expected to cool and freeze some distance downstream of the discharge area, depending on the weather conditions, water flow rates, ground and water temperatures.

The third item, the North Earth Slump between Sta. 0+375 and 0+450 is associated with significant seepage discharge near the overburden/bedrock contact. The overburden at the surface is comprised of silty, sandy gravel colluvium. The concave vertical curvature of the road alignment in this area suggests that the road may have been lifted by the rotation of the slump block. We are not aware of any reports of past road maintenance required in this area.

4. RISK LEVEL

Based on AT's criteria, the risk level for the instability has been estimated as follows:

Road embankment slope instability:

Risk (24) = Probability Factor (12) * Consequence Factor (2)

North Earth Slump:

Risk (24) = Probability Factor (6) * Consequence Factor (4)

5. RECOMMENDATIONS

The instabilities are not currently having a significant effect on the road surface. However, it is understood that during winter months icing of the ditch and road surface occurs and regular maintenance is required to keep the road operational.

The following preliminary recommendations are provided for the Short Term (fall 2003 and coming winter) to address the icing of the ditches and road, and to minimize silt and sediment deposition in the Brazeau River. Recommendations for medium term action are also provided.

a) Short Term

In the short term, an attempt should be made to collect the seepage discharge observed on the slope (north of 0+370), and divert it into the stream. This can be achieved by:

i) discharging some of the seepage into Culvert D (See Figure 1) and the remaining seepage from the slope should be directed through a subdrain pipe along the north side of the road and discharged downstream of Culverts C & B, or

ii) alternatively diverting all the seepage discharge from the slope into a subdrain along the north side of the road, and discharging it downstream of culverts C & B, in other words bypassing Culvert D.

It is important to note that the diversion work may not be easy to complete due to the soft soil conditions and depending on the amount of flow.

On-going maintenance to remove road icing will still be required south of 0+334 until more permanent surface water control measures are established.

The erosion gully north of 0+235 should be backfilled with appropriate rip rap; and the tension scarp should be backfilled and leveled to avoid water ingress that will have negative impact on the road embankment if left in the present state.

The observed North Earth Slump does not present a short term risk to the road, and remedial work is not warranted at this time. However, on-going monitoring of the slope and road conditions by the MCI should be implemented over the fall and winter period.

We recommend that a detailed survey of the area in question for conceptual or detail design be undertaken during fall or winter period.

b) Medium Term

The icing of the road and potential silting of the Brazeau River can be minimized by controlling the seepage discharge from the North Slope and runoff in general (= surficial water flow). This will require that the majority of the surficial water flow (west and north of 0+340) be intercepted north of Culverts B & C and directed into the stream downslope of the road. Surface drainage between 0+200 and 0+340 could be accommodated in the existing ditch if erosion control measures are present and additional flow from north of Sta. 0+340 is excluded. Additional erosion control measures may also be required between 0+000 and 0+200 to reduce erosion of the west ditch and minimize sediment delivery to the River. Depending on the hydrological parameters, a retention pond may have to be considered on the north side of the bridge prior to allowing discharge of surface runoff into the Brazeau River.

In summary, to provide the most effective solution a detailed hydrological/geotechnical study of the area should be undertaken a soon as possible. This study will optimize the location and design of existing or new culverts and surface water flow directions.

Prior to initiating this study, a topographic survey of the area should be undertaken, and a geotechnical program initiated to determine the groundwater and soil conditions at the site. A geotechnical program is required to assess the design requirements and feasibility of subdrains and other erosion control measures.

During this geotechnical program the cause of the slope failure at 0+400 will be assessed and appropriate repaired measures will be provided.

We will be pleased to provide you with a proposal to address the above medium term recommendations.

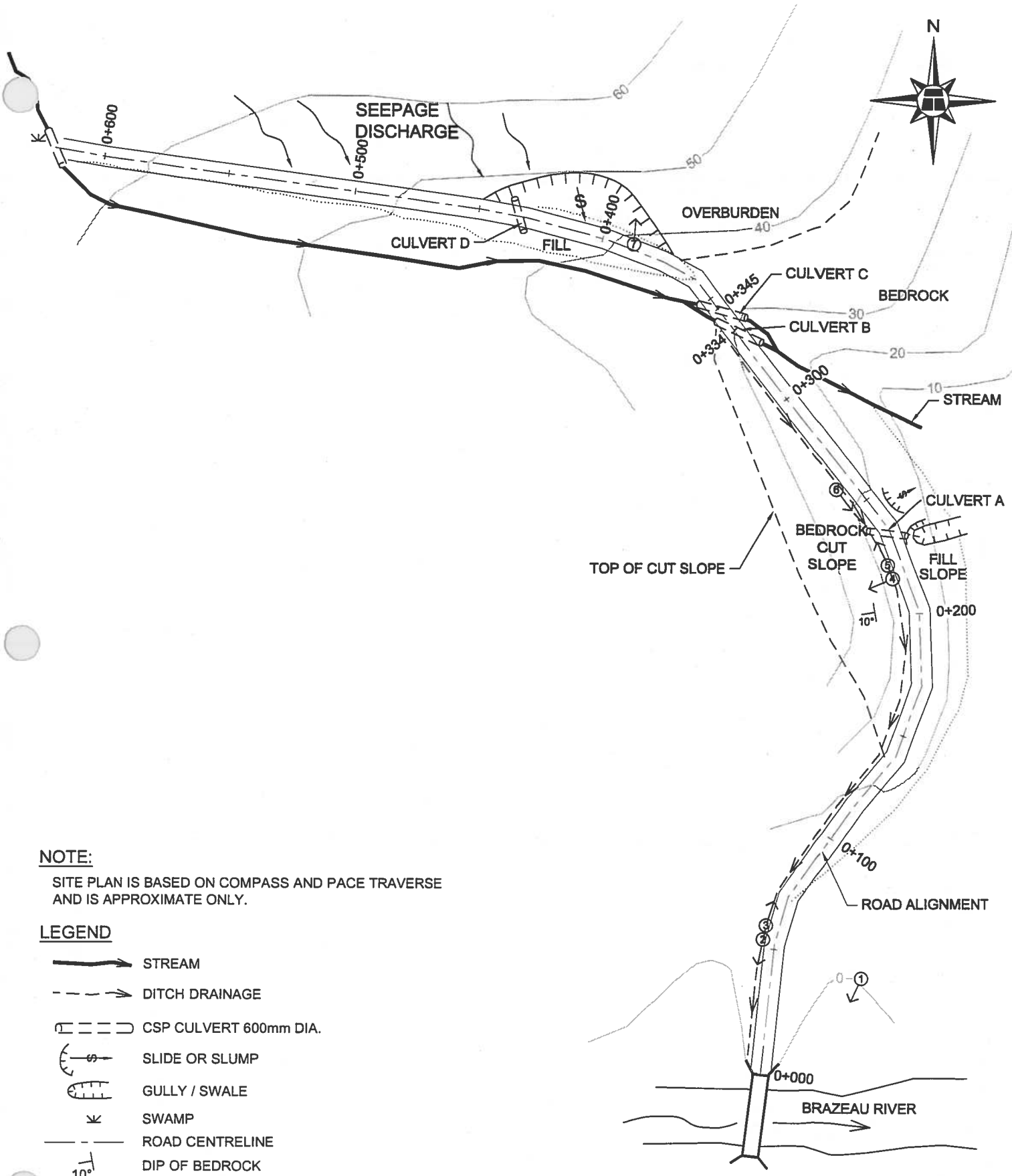
6. CLOSURE

We trust that the above information is sufficient for your present requirements. However if you have any questions or require any additional input please do not hesitate to call us.

Yours very truly,
Thurber Engineering Ltd.
D. Papanicolas, P.Eng.
Principal

S.M. Sather, M.Eng., P.Eng. (ON)
Project Engineer, Principal

/slp



NOTE:

SITE PLAN IS BASED ON COMPASS AND PACE TRAVERSE AND IS APPROXIMATE ONLY.

LEGEND

- STREAM
- DITCH DRAINAGE
- CSP CULVERT 600mm DIA.
- SLIDE OR SLUMP
- GULLY / SWALE
- SWAMP
- ROAD CENTRELINE
- 10° DIP OF BEDROCK
- ⑦→ PHOTOGRAPH LOCATION AND ORIENTATION

HWY 734:22 EMERGENCY CALL OUT - AUGUST 2003
FIGURE 1 SITE PLAN AND GEOLOGIC FEATURES

SCALE 1:2000 (APPROX.)
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PHOTO 1

PHOTO 2

HIGHWAY 734:22
SITE PHOTOGRAPHS
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PHOTO 3

PHOTO 4

HIGHWAY 734:22
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PHOTO 5

PHOTO 6

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PHOTO 7