SITE C17: Slide at Intersection of H575:04 and H837:02

LEGAL LOCATION:	**27-29-21-W4**
REFERENCE LOCATION ALONG HIGHWAY:	
UTM COORDINATES (NAD 83):	**N 5,707,585 E 370,867**
AT FILE:	**H575:04 – H837:02**
AT PLAN & PROFILE:	
Date of Initial Observation:	April 2001
Dates of Previous Inspections: (Inspected by)	April 16, 2001 (AT) May 22, 2001 (KCCL) May 16, 2002 (KCCL) May 21, 2003 (KCCL) May 18, 2004 (KCCL)
Instruments Installed:	None
Instruments Operational:	None
Reading Dates: (Read by)	None
Risk Assessment:	PF(7) * CF(4) = **28**
Last Updated by:	Klohn Crippen Consultants Ltd. (KCCL)
Date:	June 2004

Location

The junction of SH575 and SH837 is located about 8 km northwest of the town of Nacmine. It is understood that SH575 in this location is constructed on fill placed on the slopes of the Red Deer River valley. It would appear that some cut and fill was undertaken to fit the highway alignment into the valley topography. Four features have been observed at this site and are described separately:

A. Slide on SH575 embankment
B. Culvert Erosion
C. Depression in Pavement
D. Culvert Erosion

General Description of Site Conditions

A. Embankment Slide

A shallow slide was observed in the side slope of the SH575 embankment. The slide is about 15 m wide and extends nearly the full slope height of the embankment (about 15 m). The scarp of the slide is about 3 m from the guardrail on SH575. A long crack is also present between the guardrail and the scarp.

The slide is shallow and encompasses approximately the upper 1 m to 2 m of the slope. The failure comprises a slumping of the upper material with corresponding bulging at the toe. The material appears to be a light brown silty clay fill. Typically the fill appeared relatively dry except for a seepage zone about 3 m below the top of the scarp. In this zone, the fill was quite wet and would appear to coincide with the invert of the ditch on the other side of the highway. There has been essentially no change in the status of the slide since the first inspection.

The shallow slide in the steep embankment slope is likely caused by the saturation of the fill leading to an "infinite slope" type failure. The source of water is likely underseepage occurring between the ditch on the south side and the north side slope. Some of this seepage may originate from the eroded culvert inlet. It is considered that if the culvert and ditch is repaired and the water is directed away from the fill, no further movements should occur and the slope can be reinstated. However, at present the crest of the slide is very close to the highway edge and could create a significant danger to traffic if the slide begins to regress.

B. Culvert Erosion

About 100 m along the highway up-slope of the slide, a 900 mm diameter CSP culvert carries water from a ditch at a steep gradient under SH575 and discharges in the lower embankment slope above SH837. Based on GPS coordinates at the ends

of the pipe, the culvert is about 140 m long. This culvert is in a highly deteriorated condition with a high level of corrosion and significant problems at both the upstream and downstream ends.

At the upstream end, the inlet area is highly scoured and deep erosion has occurred under the pipe to the point where it is very unlikely that any water can enter the pipe under most flow conditions. The culvert was placed at the confluence of a number of run off flow paths and so it is considered that the flow volumes are quite significant. It is possible that some of the flow seeps into the embankment rather than discharging through the pipe. There is also the potential for voids to form in the fill. This may have contributed to the slide on the side of SH575.

At the downstream end, extreme erosion has undermined the pipe leading to an overhang and collapse of the pipe.

At the upstream end, due to the high runoff flows at the inlet and the lack of erosion protection, this has lead to significant erosion and water flows bypassing the pipe and seeping through the fill, potentially creating voids. At the downstream end, extreme erosion has also occurred leading to retrogressive erosion of the slope and collapse of the pipe.

This culvert was replaced in 2002.

C. Depression in Pavement

About 50 m west of the culvert, both lanes of SH575 have a noticeable shallow dip. This area has been patched in the past, but the rate of the movement is unknown. Cracking was observed in the area including a transverse crack across the full pavement width and numerous short parallel cracks at the north end.

Both lanes of SH575 have a noticeable shallow dip. The reasons for the depression in the fill are not readily apparent but are likely due to movements induced by groundwater.

D. Culvert Erosion

About 300 m west of the patched area, there are two CSP culverts under SH575. The invert of the culvert furthest to the west could not be located and is assumed to be completely blocked.

Due to the damaged inlets, more water flow was passing towards the other problem areas. The culvert outlets were also inadequately protected against

erosion. The downstream erosion will therefore likely continue until such time as repairs are completed.

The outlet of the western culvert appeared to be in good shape (likely due to no flow passing through the pipe. The outlet of the eastern pipe has developed a significant erosion feature with an initially 2 m deep by 3 m wide gully opening up to about 10 m wide as the flow discharges down the steep slope towards SH837.

Geotechnical Conditions

Chronology (Refer to Section G for Further Information)

2001 – 2002
The features described above were observed at the site.

Fall 2002
The culvert under the embankment was replaced by directional drilling. The void left by the old culvert was grouted.

2003
No deterioration in any of the site features was observed.

Reports and Documents

May 2004 (KCCL) Inspection Form
May 2003 (KCCL) Inspection Form
May 2002 (KCC) Inspection Report (May 29, 2002)
May 2001 (KCCL) Inspection Report (May 24, 2001)
Note to File (AT)