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September 16, 2003

File: 15-16-167

Alberta Transportation
Room 223, Provincial Building
4709 – 44 Avenue
Stony Plain, Alberta
T7Z 1N4

Attention: Mr. Rob Lonson, P.Eng.

**NORTH CENTRAL REGION LANDSLIDE ASSESSMENT
HWY 661:02 NEAR NORTHEAST BOUNDARY OF
TOWN OF FT. ASSINIBOINE (NC14)
2003 ANNUAL INSPECTION REPORT**

Dear Sir;

This letter documents the 2003 annual site inspection of a portion of Highway 661:02 located on the northeastern boundary of the Town of Ft. Assiniboine. The work was undertaken by Thurber Engineering Ltd. (Thurber) in partial fulfillment of our Geotechnical Services, Monitoring and Assessment of Instrumentation and Landslides contract with Alberta Transportation (AT).

The site inspection was undertaken by Messrs. Don Law, P.Eng, Don Proudfoot P.Eng. and Renato Clementino, P.Eng. of Thurber on June 11, 2003. The site visit was carried out in the presence of Mr. Michael Baik, Mr. Roger Skirrow, P.Eng. of AT and Mr. Rick Ellewyn, AT's MCI for the area.

1. BACKGROUND

The site has had a history of slope failure, and of drainage measures undertaken to mitigate the effects of groundwater on the slide area since the slide was first reported in 1978. A description of the slope instability and chronology of events as interpreted from the AT geotechnical files was provided in Section A of the site binder.

A summary of the background information including historical observations and remedial drainage measures undertaken prior to 1997 was provided in the 2001 report and hence is not repeated herein.

An assessment and recommendations for remedial measures were provided by AGRA Earth and Environmental (AGRA) in letter reports to the MD of Woodlands dated October 10, 1997 and January 22, 1999. These reports are included in Section G of the site binder.

2. SITE OBSERVATIONS

The highway roadway surface, back slopes and side slopes were inspected during the 2003 reconnaissance in the mid and upper hill areas of the site. The side slope in the lower portion of the hill was also inspected. Photographs of the site taken during the reconnaissance are included in Section F of the site binder.

Maintenance of the roadway has not been undertaken at the site over the past year, as confirmed by Mr. Rick Ellwyn.

The following features and observations were noted during the site reconnaissance. The approximate locations of these features are shown on the site plans, Figures NC14-1 (overview) and NC14-2 (detail of the mid-hill slide area), updated for 2003 and attached for inclusion in Section F of the binder. A stratigraphic cross section from the previous AGRA report has previously been provided as Figure NC14-3 in Section F.

Mid-Hill Slide Area

- A 50 m section of roadway continues to be impacted by the mid-hill slide feature. This area is shown in detail on Figure NC14-2. The approximate locations of instrumentation installed previously are also shown on the figure. These instruments are not operational anymore, with the exception of SP97-2.
- The crack pattern has changed somewhat since the 2002 site reconnaissance; overall the area appears to have continued to subside and a graben-like feature is forming at the roadway surface. The differential height across the crack in the central/downhill portion of the crack feature has increased to a maximum of about 50 mm from the 5-8 mm observed in 2000 and 30 mm observed in 2001, and extends further as shown on Figure NC14-2. Some tributary cracks are now appearing at the central part of the main crack. The differential height across the uphill portion of the crack looks similar to what was observed last year. The upslope lane (i.e. right hand lane as you travel uphill) still appears to be relatively unaffected by the slope movements.
- The slump feature first noted near the toe of the slope in 2001 has not significantly changed since last year's site visit. Like previous years, some minor seepage was noted at the west end of the scarp and further up the slope.

- Water was heard trickling through the existing collection well at the toe of the mid-hill slope, but the flow rate was somewhat less than noted last year.

Uphill Roadway Distress

- The 30 m long shallow dip in the roadway shoulder and guardrail noted in the 2001 report, located approximately 100 m uphill from the mid-hill slide feature, seems to be worse since the last site visit. Some minor cracking was observed, similar to that noted in 2001. The bump first noted in 2001 approximately 30 m uphill from the shallow dip looks somewhat worse than noted last year.
- The limits of the graben feature first observed in 2000 on the upper side slope adjacent to the dip and bump features appear similar in shape from what was observed last year, however, the graben is more defined and larger in length.
- The older scarp feature observed below, (west of) the graben feature (first noted in 2001) has not changed significantly since the last site visit in 2002.

Other Areas

- No change was noted in the sinkhole first noted in 2000 on the side slope approximately half way down the slope, located between the two instability areas (approximately as shown on the site plan). There was no evidence of seepage or piping discharge from areas below the sinkhole feature during the 2003 site reconnaissance.
- The scarp area noted in the lower portion of the slope during the 2000 site reconnaissance does not appear to have changed much since then, and does not appear to be impacting the roadway at this time.

3. ASSESSMENT

As noted in previous reports, it is expected that the active slope instability has resulted from high pore water pressures in the slope generated from the natural groundwater regime, possibly combined with placement of embankment fill materials at the time of roadway construction and/or upgrading. The visual observations indicate that the mid-hill slide and upper hill area have moved somewhat during the past year. The lower hill area still appears inactive as of the 2002 site visit.

It is expected that, if no action is taken, the mid-hill (roadway scarp) and uphill (dip and bump) areas will continue to creep causing further distress to the highway at these locations.

4. RISK LEVEL

A risk level of 36 is considered applicable to the active slide areas of this site, based on a Probability Factor of 9 (active with moderate steady rate of ongoing movement) and a Consequence Factor of 4. This is the same risk level provided in our 2002 report. Other areas on the hill are considered to have a lower risk level.

5. RECOMMENDATIONS

Based on review of potential options for remediation and discussion during the site visit, local realignment upslope of the current alignment is considered the most appropriate option at this time.

High groundwater levels appear to be the major cause of the instability at this site, however insufficient information is available on the source and distribution of the groundwater to allow detailed assessment of remedial measures. A hydrogeological assessment has been undertaken, and additional field work including geotechnical instrumentation installation and geometric assessment has been proposed to determine the feasibility of realignment of the roadway upslope of its present location. It is recommended that this work be undertaken in 2003 to allow for readings to be collected and design work to be initiated as appropriate.

It is also recommended to flush and clean the existing collection points to improve groundwater discharge that seems to be decreasing along the years possibly due to siltation in the collection points.

6. 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

Renato Clementino, P. Eng.
Project Engineer

/slp
Attachments

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