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

Attention: Mr. Rob Lonson, P.Eng.

**NORTH CENTRAL REGION GEOHAZARD ASSESSMENT
HWY 661:02 NEAR THE NORTHEAST BOUNDARY OF
THE TOWN OF FT. ASSINIBOINE (NC14)
2004 ANNUAL INSPECTION REPORT**

Dear Sir;

This letter documents the 2004 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 for GeoHazard Assessment, Instrumentation Monitoring and Related Work contract (CE046/2004) with Alberta Transportation (AT).

The site inspection was undertaken by Messrs. Don Proudfoot P.Eng. and Renato Clementino, P.Eng. of Thurber on June 1, 2004. The site visit was carried out in the presence of Mr. Roger Skirrow, P.Eng. of AT Geotechnical Branch.

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. A desktop hydrogeological assessment carried out by Thurber was presented in our letter report dated January 30, 2003. A proposed program for geotechnical instrumentation and hydrogeological investigation was provided in our proposal letter dated January 31, 2003. 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 2004 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.

The distressed pavement areas appear to have been recently patched, maybe last fall (2003). Some of the features observed last year during the site visit were covered by the new patch this year.

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 2004 and attached for inclusion in Section F of the binder. A cross-section from the previous AGRA report was presented in our 2000 report as Figure NC14-3 and is included in Section F of the binder for your reference.

Mid-Hill Slide Area

- Despite being covered by the new patch a 50 m long section of roadway in the mid-hill section continues to show signs of slide activity. 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, except for SP97-2.
- A faint crack following the same pattern as noted previously is re-appearing through the patch.
- A subdued scarp at the west end of the slide in the side slope appears to be an extension of the pavement crack, as shown in Figure NC14-2.
- Water was heard trickling through the existing collection well at the toe of the mid-hill slope. The depth of the well is 4 metres and it had 2 m of water at the time of this assessment.

Uphill Roadway Distress

- Like the mid-hill section the crack features were covered by the new patch but are re-appearing through the patch in some areas as shown on Figure NC14-1.
- The graben feature first observed in 2000 on the side slope adjacent to the highway appears similar in shape to what was observed last year, however, both ends of the scarp cracks have increased in length.
- The older scarp feature observed below, west and downslope of the graben feature (first noted in 2001) has not changed significantly since the last site visit in 2003.

Other Areas

- The sinkhole first noted in 2000 on the side slope approximately half way down the slope, looks like it was excavated by somebody or some animal perhaps to use as a den. There was no evidence of seepage or piping discharge from areas below the sinkhole feature during the 2004 site reconnaissance.
- Water was heard trickling through the existing collection well at the top of the backslope at the south end of the area. A water spring adjacent to the well was seeping into the well.

3. ASSESSMENT

As noted in previous reports, it is expected that the slope instability has resulted from natural high groundwater levels combined with placement of embankment fill materials at the time of roadway construction. The visual observations indicate that the mid-hill and upper hill slide areas have continued to creep over the past year. The lower hill area appears inactive since the 2003 site visit.

It is expected that, if no action is taken, the mid-hill roadway and uphill 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 2003 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 already been proposed to determine the feasibility of realignment of the roadway upslope of its present location.

As a maintenance item for short term improvement of the slope stability it is recommended to inspect 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.