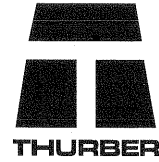


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October 6, 2004

File: 15-16-192

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

Attention: Mr. Rob Lonson, P.Eng.

**NORTH CENTRAL REGION GEOHAZARD ASSESSMENT
HWY39:06 - SLIDE NEAR GREENWOOD LAKE ROAD (NC23)
2004 ANNUAL INSPECTION REPORT**

Dear Sir:

This letter documents the 2004 annual site inspection of a portion of Highway 39:02 located at km 12.6. 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 inspection was undertaken on May 31, 2004 by Messrs. Don Proudfoot, P.Eng. and Renato Clementino, P.Eng. of Thurber. The site visit was carried out in the presence of Mr. Roger Skirrow, P.Eng. and Mr. Michael Baik of AT.

1. BACKGROUND

There was no relevant information available in AT's geotechnical files for this site. Some background information about the history of the distress at the site, provided by personal communication with Mr. Brian Swan, the previous MCI for the area, was reported in our 2002 report and will not be repeated herein. A summary of the most recent events are as follows:

- In 2001, a total of five slope inclinometers (SI01-1 through SI01-5), nine pneumatic piezometers (PN01-1 through PN01-7, PN01-1A and PN01-2A), one standpipe piezometer (SP01-2) and two groundwater monitoring wells (GW01-1 and GW01-2) were installed at this site. SI01-2 through SI01-5 have shown the development of a shear plane at depths of 20 m to 26 m. The current (spring 2004) readings indicate slope movement rates

of 2.9 mm (SI01-2) and 2.4 mm (SI01-3). SI01-1, located north of the highway shows no discernible shear plane or movement. Water levels above or near the ground surface were measured in most of the piezometers. PN01-1A, PN01-5 and PN01-7 have shown piezometric levels at 1.2 m, 0.5 m and 0.2 m above ground surface, respectively.

2. SITE OBSERVATIONS

The highway roadway surface, back slopes, and side slopes in the vicinity of the slide and the abandoned culvert outlet area were inspected. The bottom of the slope adjacent to Modeste Creek and the access trail were also inspected during this site visit.

The following points summarize the observations made during the reconnaissance. Site features are shown on the site plan, Figure NC23-1 and cross section, Figure NC23-2 in Section F. Selected photographs taken during the site reconnaissance are also included in Section F.

- The three tension cracks noted on the pavement surface in 2002 between the west culvert and the center (abandoned) culvert look the same as observed in 2003. A scarp crack noted in 2003 on the side slope, which seems to be an extension of the middle pavement crack did not change significantly since last year. The westernmost crack had no significant differential drop across it and appeared unchanged from last year.
- No signs of slope movement were observed on the back slope (south of the highway). The low area fed by an intermittent creek located south of the abandoned culvert inlet was again/still filled with water extending about 48 m south from the toe of the slope. Water is still accumulating along the east ditch that drains this low area. The ponded water area located about 35 m east of the abandoned culvert noted in 2003 did not change in 2004 as shown in Figure NC23-1.
- The sinkhole at the south end of the abandoned culvert appears larger and was full of water. The two smaller sinkholes on the north end of the culvert seem to have somewhat increased in diameter.
- Surface disturbance, which appears to have been caused by trucked equipment during the installation of Telus' new fibre optic cable, was noted, on the north side slope near the abandoned culvert.
- The scour located below the west culvert outlet is progressing towards the northeast along the tree line. A slump scarp is developing close to the culvert outlet. In addition a new scour is forming in the ditch west of the culvert as shown in Figure NC23-1.

- An old scour feature was observed in the treed area north of the abandoned culvert outlet, resulting from previous water flow through the culvert. This feature has not changed much since the last site assessment in 2003.
- It is worth mentioning that an asphalt patch was placed on the highway last September (2003) where the differential drop in the roadway surface was affecting traffic rideability.

3. ASSESSMENT AND RECOMMENDATIONS

Based on the observations made during the reconnaissance and the results of the slope inclinometer readings, the site continues to be affected by slow slope creep movements. The past history of the site shows that the slope movement is likely sustained by high pore water pressures on the failure plane of the slide from within fractured bedrock layers that are fed by the local watershed. These pressures and hence movement rates may rise higher with additional precipitation. A supplementary source of water to the slope is the ponded water at the abandoned culvert inlet, which is bigger in size due to the higher precipitation rates during last winter and this spring.

Design work and tender preparation has been completed for this site, which includes draining and regrading of the ponded water area south of the abandoned culvert, installation of a new culvert adjacent to the abandoned culvert, flushing and grouting of the abandoned culvert, and installation of horizontal wells into the bedrock to relieve pore water pressures on the failure plane. Construction is planned to be carried out in 2004.

4. RISK LEVEL

A risk level of 40 is considered applicable to this site, based on a Probability Factor of 10 (active but moderate, steady movement) and a Consequence Factor of 4. This risk level is the same as presented in 2003.

5. CLOSURE

We trust this assessment meets with your needs at this time. Please contact the undersigned should questions or concerns arise.

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

Renato Clementino, Ph.D., P.Eng.
Project Engineer

Attachments

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