August 10, 2007 File: 15-85-72

Alberta Infrastructure and Transportation
Room 301, Provincial Building
9621 - 96 Avenue
Peace River, AB T8S 1T4

Attention: Mr. Ed Szmata

**PEACE REGION (PEACE – HIGH LEVEL AREA) GEOHAZARD ASSESSMENT**
**SHAFTSBURY TRAIL (SOUTH SITE)**
**2007 CALLOUT INSPECTION REPORT**

Dear Sir:

This letter documents the 2007 callout site inspection of an area of slope instability located below Shaftsbury Trail (Hwy 684:02) within the Town of Peace River. The site is located 2.2 km south of the intersection of Shaftsbury Trail and Highway 2.

Thurber Engineering Ltd. (Thurber) undertook this inspection in partial fulfillment of our Geotechnical Services for Geohazard Assessment, Instrumentation Monitoring and Related Work contract (CE047/2004) with Alberta Infrastructure and Transportation (AIT).

Simon Cullum-Kenyon, P.Eng. of Thurber undertook the inspection on July 5, 2007 with Ed Szmata of AIT and representatives of the Town of Peace River. Two sites were assessed at this time. The second site (designated as the North Site) is reported in a separate call-out letter.

## 1. BACKGROUND

This site has not been visited before, and no site binder currently exists. Rapid flow of mud, water and debris (mainly trees) has occurred from the slope below the highway onto the properties at the toe of the slope. This was reported to have occurred at least 3 times in the last three years at this location, with each event associated with heavy rain fall. Town of Peace River personnel also reported that

during heavy rainfall events water runs off the highway and towards the slope in this area.

## 2. SITE OBSERVATIONS

Selected photographs taken during the visit are attached.

In this area, Shaftsbury Trail runs north-south along the crest of a slope over a terrace of the Peace River, with several residences located on the terrace below the road. The slope has a height of about 15 m to 20 m and an overall slope angle steeper than 40º. The crest of the slope is approximately 10 m from the highway. The area between the highway and the slope is well vegetated, and has a very shallow slope.

The upper portion of the slope (estimated as 3 m to 5 m vertically) is comprised of a silty sandy clay, containing clasts ranging from gravel size to boulders. This portion of the slope was well vegetated and less steep. Beneath this, the slope was comprised of sandstone, forming a steeper, but well treed cliff over the remainder of the slope. There appears to be a gravelly horizon above the sandstone. Some organic colluvial soils have developed on the slope. Some of the trees on the slope appear to be dead (no leaves).

As shown in Photos 1 and 2, the failed materials have a relatively small volume, but appear to be very mobile, flowing from the slope to the terrace below. There does not appear to be a threat to the highway at this time.

## 3. ASSESSMENT

These failures can be described as small debris flows. They would have been triggered by saturation of the colluvial soils by either an increase in groundwater or a concentration of surface water at this location. Either of these could have been caused by the reported heavy rainfall prior to the slides. The clay soils would have essentially liquefied and flowed down the slope. The sandstone appears to be relatively intact. The vegetation and soil on the slope flowed with the failures, but remains intact on adjacent portions of the slope.

The main concern at this site is the potential for further debris flows affecting the use and safety of the properties below the slope. The highway does not appear to be at risk at this time.

## 4. RISK LEVEL

The risk level for this site (relative to highway issues) has been assessed as follows:

PF(7) * CF(1) = 7

A Probability Factor of 7 is considered appropriate since the slides have been reported to have occurred in each of the past three years and additional movement could occur following heavy or prolonged rainfall. A Consequence Factor of 1 is considered appropriate since loss of a portion of the roadway is unlikely, as is a threat to driver safety.

## 5. RECOMMENDATIONS

The two general methods used to mitigate debris flow hazards are to remove the source material and/or manage the debris (i.e. stop or direct the debris away from downslope facilities, often with a berm or other structure). Due to the small scale of this site, managing surface and/or groundwater flow may also be beneficial.

Removal of the source material would involve flattening of the slope and would require removal of the existing vegetation and soils on the sandstone cliffs, combined with stabilisation of the soils on the upper portion of the slope. Removal of the vegetation on the upper portion of the slope would be detrimental to the stability, and therefore this would not be a preferred solution.

Managing the debris form potential future slides by construction of a berm along the toe of the slope to collect it should be feasible. Such a berm would have to be properly designed in terms of height and “storage” capacity. Note that periodic “cleaning out” of the berm would be required. As an initial estimate, we would expect the cost of such a berm to be in the order of $50,000, but would depend on access, which may require the use of small equipment.

Installation of a curb along the highway may be beneficial, to direct surface water to a controlled location. Note that surface water from the road is only considered as a possible contributor to the slide(s) and hence should not be relied upon as the sole solution. A catch basin is located 150 m south of the site, which may be an appropriate point to direct surface water – grades and elevations should be checked to confirm this. The estimated cost of constructing a 200 m long asphalt curb in this area is $10,000.

## 6. CLOSURE

We trust this assessment and recommendations meet with your needs at this time. Please contact the undersigned should questions arise or if the slide condition worsens.

Yours very truly,
Thurber Engineering Ltd.
Simon Cullum-Kenyon, P.Eng.
Review Engineer

Chris Workman, P.Eng.
Principal Engineer

**Photo 1.**
Cartier residence slide. Debris from the slope has entered the developed area below. Note some apparently dead trees on the slope.

**Photo 2.**
Slide to the south of the Cartier residence.

**Photo 3.**
Crest of the slope above the Cartier residence slide.

**Photo 4.**
Highway upslope of the failure area. The edge of pavement is roughly 10 m away from the crest of the slope.