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Fraser Valley Regional District  
45950 Cheam Avenue  
Chilliwack, BC  
V2P 1N6

**RECEIVED**

JUN 15 2006

Attention: Mr. Hugh Sloan,  
Director of Planning.

FRASER VALLEY REGIONAL DISTRICT  
DEPARTMENT \_\_\_\_\_

**SLOPES SOUTHEAST OF THE HOPE LANDSLIDE IN  
SUNSHINE VALLEY AREA  
GEOTECHNICAL HAZARD ASSESSMENT**

Dear Sirs:

Thurber Engineering Ltd. (TEL) is pleased to submit this letter that summarizes geotechnical knowledge of the above-mentioned slopes. The letter was prepared at your request following a February 23, 2006 meeting attended by you, TEL, Dr. Stephen Evans (by phone) and BC Ministry of Transportation officials.

Use of this report is subject to the enclosed Statement of General Conditions.

**1. BACKGROUND**

On March 7, 2003, TEL submitted a report to the Fraser Valley Regional District (the Regional District) titled *Sunshine Valley Area, Near Hope, BC - Preliminary Geologic Hazard Assessment*. It reviewed available geotechnical reports, scientific papers and theses about the Hope Slide area. During preparation of this report, we contacted Dr. Evans, knowing that he had special knowledge of the area. Dr. Evans is a landslide researcher of world-wide stature. He is currently a Professor in the Department of Earth Sciences at the University of Waterloo in Ontario. Prior to October 2003, he was employed by the Geological Survey of Canada and earlier, by the BC Ministry of Highways. His resume shows that he has authored or co-authored 67 refereed scientific papers. He has considerable knowledge of the Hope Slide area.

Section 7.2 of our report concluded: "*...there is a low, but not insignificant, probability of occurrence of a large landslide on the suspect slope southeast of the Hope Slide. If a slide were to occur, buildings and occupants on alluvial and colluvial fans north of the Sumallo River would be vulnerable and the consequences of landsliding would be high. For the*



*sake of public health and safety, we recommend that the suspect slope should be investigated and evaluated in detail."*

*We further concluded that "flooding and associated erosion and deposition effects, debris flows, debris floods and snow avalanches are likely to have much higher probabilities of occurrence than a major bedrock landslide run out on portions of the (Sunshine Valley development area)".*

We understand that the Regional District and the Province anticipates receiving subdivision applications for the area. TEL has no knowledge of the applications except that they are proposed to be located in the vicinity of existing developments in Sunshine Valley Resort.

In light of concerns raised by Sunshine Valley residents, we suggested that Dr. Evans be consulted to seek independent advice knowing that he was not in receipt of our 2003 report. The Regional District arranged the February 23 teleconference with him. We forwarded to him and other meeting participants an edited version of Figure 2 (a map of the area) from our 2003 report in order to facilitate discussion of feature locations. A copy of the map sent to Dr. Evans and others is attached to this report as Figure 1.

## **2. COMMENTS BY DR. EVANS DURING TELECONFERENCE**

### **2.1 History**

Dr. Evans observed that the Hope Slide was the second to occur in the area within the last 9,500 years (hereinafter rounded to 10,000 years and meaning the approximate number of years since the Late-Pleistocene regional deglaciation) and that the Hope Slide scar itself includes the source area for an ancient slide.

Comparable geologic conditions extend from the crest of the Hope Slide on Figure 1 across the upper mountain slope (hereinafter referred to as Slope A) between the Hope Slide scar and the margin of Huckleberry Creek canyon to the south.

He further noted that Slope A has undergone post-glacial deformation as seen on BC Government aerial photographs and by him in the field. For example, if a person were to walk down the slope adjacent to Huckleberry Canyon, disturbances would be noted in the form of cracks and anti-slope features



(uphill-facing slope scarps) that suggest the slope has been slowly deforming.

He also noted that, further south, the slope between Johnson Peak and Manson Ridge (on Figure 1) has deformed. Several years ago, he excavated a test trench across a linear fissure located northeast of the word 'Manson' on Figure 1. His trench observations also indicate that slow and gradual slope movements have occurred over the last 10,000 years.

## 2.2 Overview

Dr. Evans was asked about the probability of occurrence for a future slide in the area of Slope A. He noted that it is difficult to project but the fact that there have been two nearby slides since deglaciation suggests the probability could be 1:5000 annually. Some might argue that the 1965 slide was conditioned by unique geologic features. However these may only be revealed after a slide occurs. Much of Slope A is formed of granitic rock, unlike greenstones found in the Hope Slide scar. However, slope deformation features and rock mass characteristics mapped on Slope A are similar to those associated with the Hope Slide

He observed that run out effects will be difficult to model on the valley floor because rockslide debris will generate mud flows comparable to those that ran out from the flanks of the 1965 rock debris. He also expressed concern that Slope A is largely unsupported along the Huckleberry Creek canyon walls.

## 2.3 Other Comments

Dr. Evans quoted a portion of a scientific paper written by Drs. W. H. Mathews and K. C. McTaggart in the Proceedings of the Geological Association of Canada. v. 20, 1969. The authors were scientists in the Department of Geology at UBC. The final paragraphs of that paper read:

*"The occurrence of two major slides within the last 10,000 years suggests the possibility of another slide within the next 5000 years. However the two events hardly constitute good mathematical bases for estimating probability; the theory of probability cannot forecast when an unfortunate combination of landslide controls may arise. The monitoring of cracks around the headwall ... might prove useful insofar as the one segment the slope is concerned although, even here, if a new slide were launched by an earthquake, no warning devices could be effective.*



*The writers are prepared, themselves, to run the risk of this hazard while driving past the threatening hillside; indeed they can point to much greater hazards along Canadian highways which could be more effectively controlled. However, they would not care to live at the foot of this same hillside and can recommend that no permanent inhabited structures be established along this stretch of the highway.*

### 3. CONSIDERATION OF 2003 REPORT IN LIGHT OF DR. EVANS'S COMMENTS


In our judgment, Dr. Evans's comments add weight to the conclusions in our 2003 report and suggest that we may have underestimated the hazard in the Johnson Peak- Manson Ridge area.

It is difficult to weigh landslide risks from such slowly deforming slopes and it takes immense efforts and much time to investigate and analyze them. However, as noted by Dr. Evans, in this case, a low probability of landslide occurrence is coupled with a high consequence for public health and safety.

There are a number of other slopes of this type in southwest British Columbia. Swiss landslide danger guidelines classify slopes with a low probability of failure but high a magnitude of occurrence (e.g. large volumes moving with destructive force) as Residual Dangers. The subject slope and others of its type are candidates for now available precise monitoring techniques (Gerath and Hungr, in prep.). However, the Mathews-McTaggart warning about seismic effects will almost always apply. Decisions about which slopes should be monitored require consensus amongst political officials, planning and permitting officials and landslide professionals.

We trust this information meets your present needs. Please do not hesitate to contact us if you have any questions

Yours very truly,  
Thurber Engineering Ltd.  
Dave Smith, P.Eng.  
Review Principal

  
Robert F. Gerath, P. Geo.  
Engineering Geologist



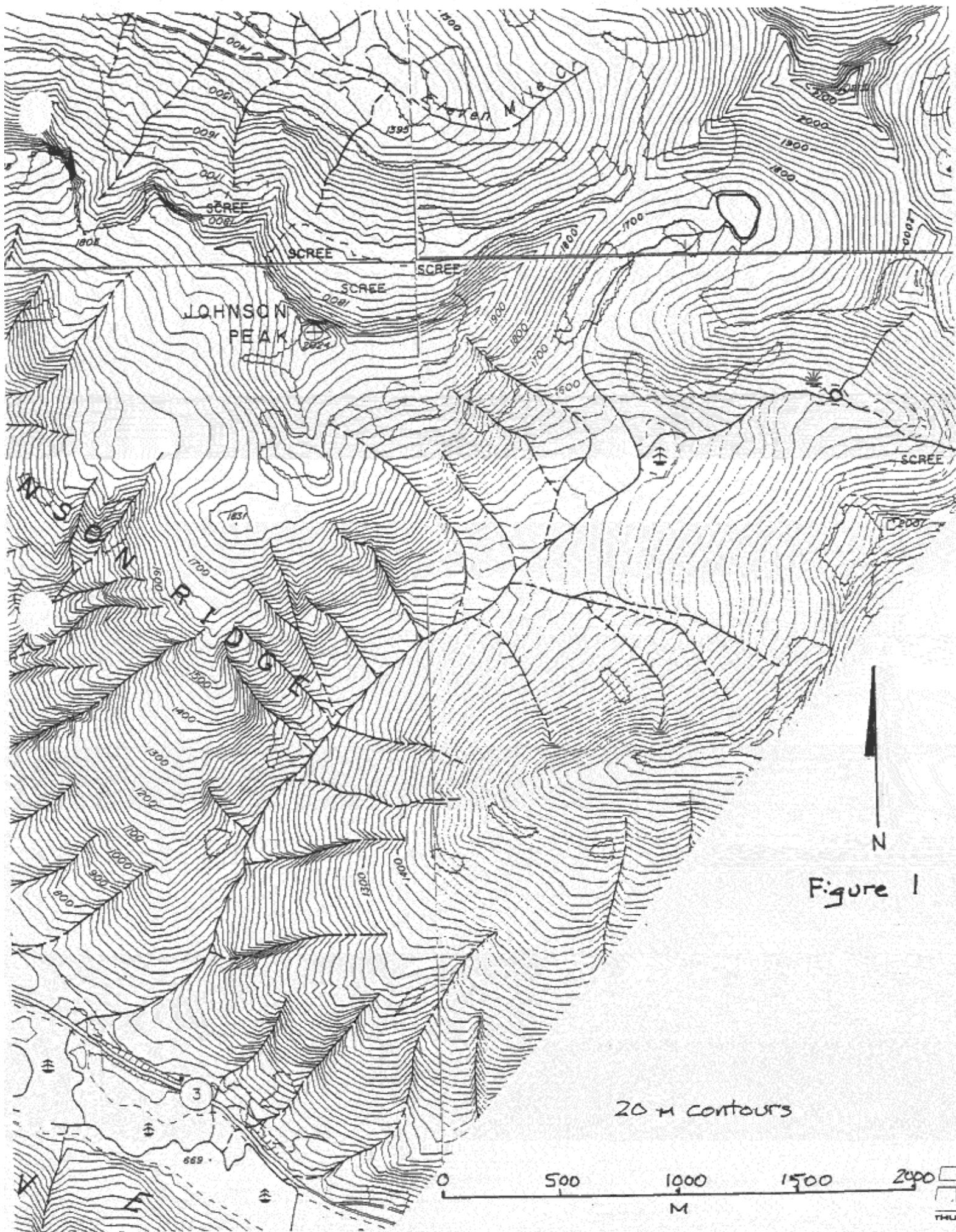


Figure 1

20 m contours

