DEBRIS TORRENT CONCERNS
COLD SPRING AND FAIRMONT CREEKS

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1.0 Introduction

Water Management staff have identified a debris torrent hazard emanating from the upper drainage basins of Fairmont and Cold Spring Creeks in the Fairmont Hot Springs area (Figure 1). Similar terrain exists throughout the area and it is suspected that debris torrents may present a concern below and in other stream catchments.

The purpose of this report is to document the file information and field obsedrvations used by Water Management Branch (WMB) staff to undertake a preliminary assessment of the debris torrent hazard.

2.0 Background

In August 1988 Fairmont Hot Springs Resort Ltd. submitted a proposal to subdivide property affected by Cold Spring and Fairmont Creeks. A site inspection was performed by WMB staff on November 15, 1988. Observations of debris flow activity on the property prompted the WMB to require a restrictive covenant as a condition of subdivision approval. The covenant used states:

> The location and elevation of any building to be placed on the lands shall be established by a Professional Engineer having experience in hydrology, stream flow hydraulics and debris torrent hazard assessment and approved by the Regional Water Manager, ...

This report was prepared in response to a request from Fairmont Hot Springs Resort Ltd. (FHSRL) for the WMB to document its specific concerns. Following receipt of the report FHSRL will retain the services of an engineering firm to examine the debris torrent and flooding potential on FHSRL property.

3.0 Hydrology

The streams in the study area drain into the Columbia River at the north end of Columbia Lake (Figure 1). Basin parameters for Cold Spring and Fairmont Creeks are listed below:

	Cold Spring Creek	Fairmont Creek
Drainage Area, (Ab)	7.7 km^2	10.1 km^2
Elevation at Fan Apex	945 m	1000 m
Maximum Elevation	2560 m	2620 m
Elevation Range,(Hb)	1615 m	1620 m
Slope of Fan	6.3 degrees	6.3 degrees

Miscellaneous low flow measurements have been obtained for Cold Spring Creek by FHSRL for the last few years. However, the author is not aware of any peak flow measurements. WMB files contain one 200 year flow estimate for Cold Spring Creek made by WMB's Hydrology Section in 1984. The maximum daily flow was estimated to be 1.95 m^3/s. The corresponding instantaneous discharge was estimated to be 2.52 m^3/s (Attachment 1 for details).

In their 1988 report (1) JNMacKenzie Engineering Ltd. provided an estimate of 1.89 m^3/s as the 200 year return period maximum instantaneous flow for Cold Spring Creek (a catchment area of 8.55 km^2 was used).

The streams in the area generally peak in April or May during the snowmelt runoff period. However, annual peak discharges can also result from high intensity rainstorms. In July1984 a rainstorm resulted in flooding along Fairmont Creek. The rain triggered a debris flow witch deposited material on the golf course and private property.

4.0 Debris Flow Activity

The following field observations and calculations form the bases for WMB's concern about a possible debris torrent hazard on FHSRL property situated on the Cold Spring and Fairmont Creek fans and other small drainages (see Reference 1 for a description of a debris torrent):

(a) Observations of resent debris flow activity on the Cold Spring and Fairmont Creek fans (see photographs; Attachment 2)

(b) The presence of debris flow levees and lobes on the fan surfaces (Attachment 2 and air photographs BC 78147 nos. 149 &150).
(c) The presence of oversized lone boulders on the fan surface.
(d) Steep 'active' slopes in the upper drainage basin .
(e) The presence of several sources of sediment in the upper drainage which could be mobilized into a debris torrent (air photographs).
(f) Methodology developed by Jackson et al (2) suggests that both the Cold Spring and Fairmont Creek fans are affected by debris flow processes (Attachment 3).

LIST OF REFERENCES

1. JNMacKenzie Engineering Ltd., Cold Spring Creek Diversion Hydraulic Feasibility, June, 1988.

2. Jackson, Jr., Lionel, et al, Identification of Debris Flow Hazard on Alluvial Fans in the Canadian Rocky Mountains, Geological Society of America Reviews in Engineering Geology, Vol. VII, 1987.

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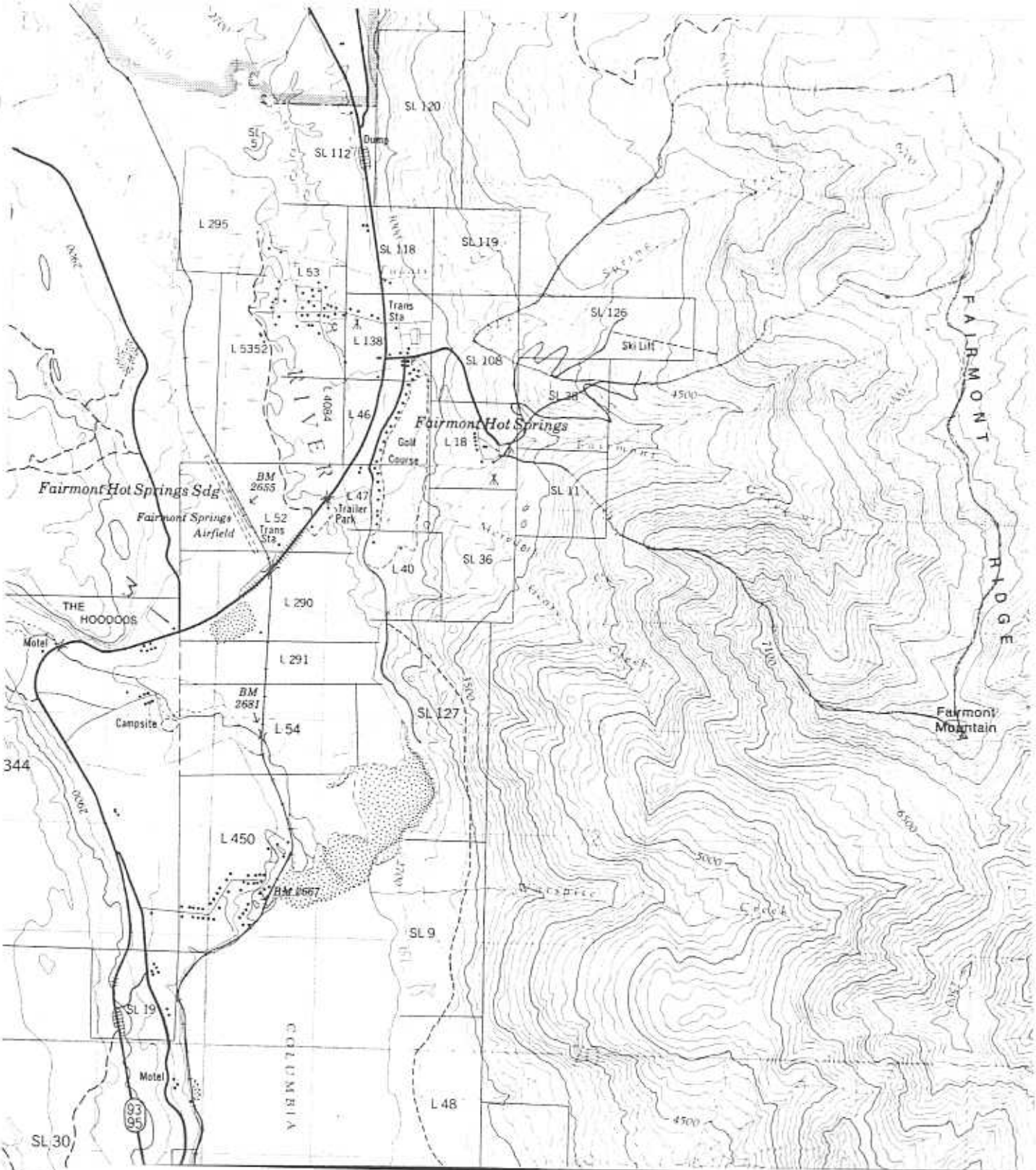
1. JNMacKenzie Engineering Ltd., Cold Spring Creek Diversion Hydraulic Feasibility, June, 1988.

2. Jackson, Jr., Lionel, et al, Identification of Debris Flow Hazard on Alluvial Fans in the Canadian Rocky Mountains, Geological Society of America Reviews in Engineering Geology, Vol. VII, 1987.



FAIRMONT HOT SPRINGS

KOOTENAY LAND DISTRICT

BRITISH COLUMBIA

Scale 1:50,000 Échelle

Miles 1 — 0 — 1 — 2 — 3 Milles

Metres 1000 — 0 — 1000 — 2000 — 3000 — 4000 Mètres

Yards 1000 — 0 — 1000 — 2000 — 3000 — 4000 Verges

LIST OF ATTACHMENTS

1. Cold Spring Creek Discharge estimate by WMB
2. November 15, 1988 Photographs; Cold Spring and Fairmont Creeks
3. Plot of tangent of fan slope versus Melton's ruggedness number

Attachment 1

PEAK FLOW ESTIMATE DATA

HYDROLOGIC ZONE 9

STREAM/WATERSHED: COLDSPRING (COOLSPRING) CREEK AT UPPER HIGHWAY

LOCATION: NR. FAIRMONT HOT SPRINGS MAP: 82 J/SW

ASI CODE NO:

DRAINAGE AREA (km^2): 8.05

MEDIAN ELEVATION (m): APPROX. 1 700

ELEVATION RANGE (m): 900 - 2 650

TYPE OF EVENT: SNOWMELT

METHOD OF ESTIMATION: REGIONALIZATION

STATIONS USED: COOLSPRING (08NA030; HOTSPRING (08NA058); SINCLAIR (08NA018) STODDART (08NA020); WINDEMERE (08NA024)

ESTIMATED PEAK FLOW

RETURN PERIOD (years)	DAILY			INSTANTANEOUS		INST./DAILY (estimated)
	m^3/s	$L/s/km^2$	Ratio to Mean	m^3/s	$L/s/km^2$	
Mean	0.525	65.0				
2						
5						
10						
25						
50						
100						
200	1.58	1.95	3.0	2.52	312	1.6
500						
1000						

REQUESTED BY: MURRAY SPRINGMAN - WMB, NELSON DATE: 84-04-10

PURPOSE: STREAM CHANNEL RELOCATION

FILE NO/REPORT: S2104-4 DATE: 84-04-26

AUTHOR: D.E. REKSTEN

FORM COMPLETED BY: L. BARR DATE: 84-05-07

LISTED [✓] MAPPED [ ]

AES:W0090/FORM

Attachment 2

FAIRMONT CREEK - November 15, 1988

Photo #1 - Looking upstream approximately 600 m upstream from the road crossing (see Photo # 6). Note: excessive material in channel available for movement downstream; high bank in the left background confines flow from moving to the north at this point

Photo #2 - Looking upstream approximately 595 m upstream from road crossing. Note gravel and cobble sized material recently deposited behind tree in channel

Phote #3 - Looking downstream from 595 m upstream from road crossing

Photo #4 - Remnants of a debris flow, approximately 610 m upstream from road crossing on the southside of the valley floor. These remnants are in the right background of Photo #1

Photo #5 - Looking upstream at north (right) bank approximately 200 m upstream from road crossing. Note mud marks on trees 1.5 m above the ground

Photo #6 - Looking downstream at road crossing (see attached location map)

Photo #7 - Looking north of first pond on golf course Fairmont Creek enters the pond from the right side of photo. This and the next pond downstream were filled with sediment during a recent debris torrent

Photo #8 - Photo shows large boulders on land surface and bent trees

COLD SRPING CREEK - November 1988

Photo #1 - View of remnants of a recent debris torrent on the valley floor adjacent ~~to~~ and north of the intake pond

Photo number
Photo
Location Map
Fairmont Creek
LODGE
EXISTING CAMPGROUND AREA
1000
1020
1010
990
1050
1100
1070
1080
1090
1110
1060
1040
1130
1150

Attachment 3

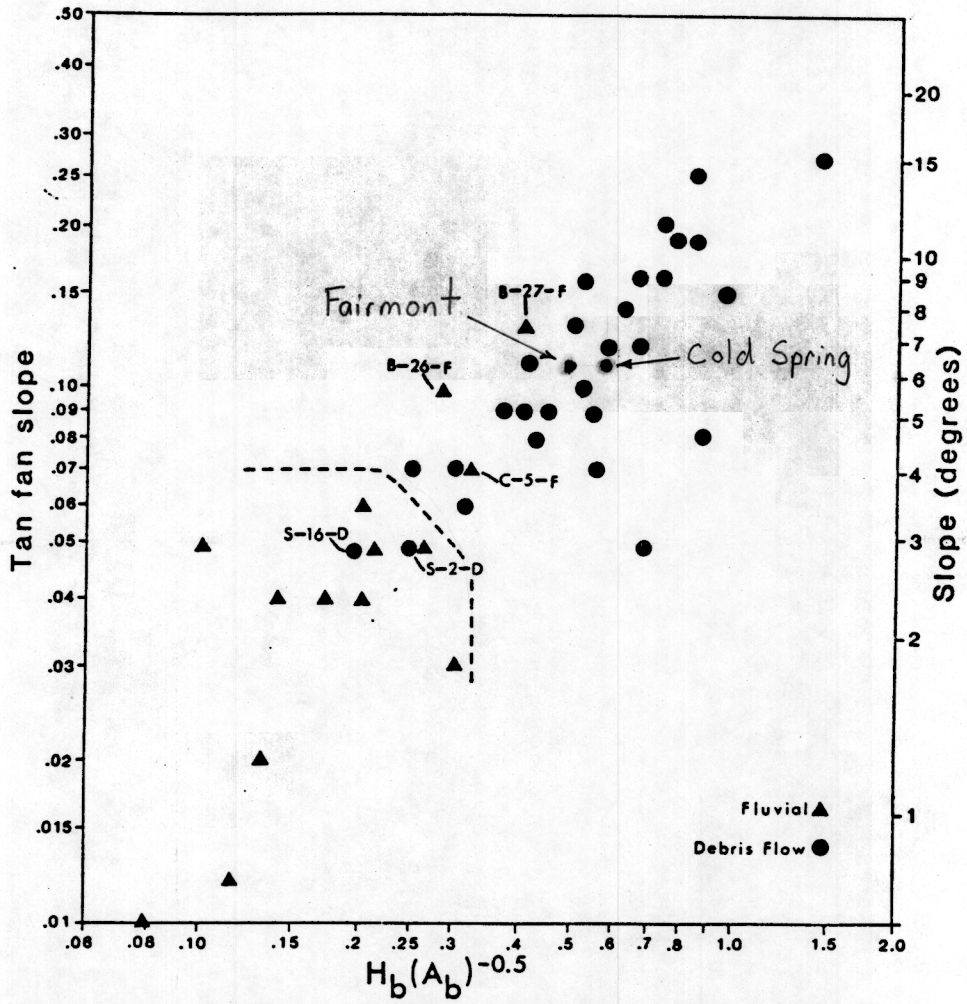


Figure 7. Plot of tangent of fan slope versus Melton's ruggedness number ($H_b A_b^{-0.5}$) for 42 fans from three study areas. H_b is basin height measured from fan apex to basin high point, and A_b is basin area above fan apex. B refers to Bow Valley; S, Kananaskis Valley/Spray Lakes Reservoir; C, Crowsnest Pass. Broken line separates fans presently having and presently lacking debris flow hazard.