

Presented to Engineering and Hazards Committee 23/4/09

Decision:

That:

1. *This report be noted.*
2. *This report and accompanying information be provided to each territorial authority and to the New Zealand Transport Agency.*

REPORT

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Prepared For: Engineering and Hazards Committee

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Date: 6 April 2009

Subject: Otago Alluvial Fans Hazards

1. Introduction

Alluvial fans comprise of sediment accumulations deposited at the base of valley slopes, shaped like an open fan or segment of a flattish cone. Formed by streams losing sediment transport potential at the exit of confined valleys, alluvial fans exhibit gentle slopes when dominated by flood processes, and steeper slopes when debris-dominated. Primarily formed by intense, heavy rainfall, the overall development of these features spans time scales of decades to centuries. In Otago, the streams are often ephemeral, creating an impression within the community that flood and debris flow hazard does not exist, or is insignificant. Further, the steep, incised upper parts of the catchment lead to “flashy” flood flows, often associated with concentrated, high intensity convective rainfall (“thunderplumps”) which exacerbate the hazard.

The form and setting of alluvial fans often makes them an attractive location for residential development in Otago. Notable examples of this are Stoney Creek (Wanaka) and Pipson Creek (Makarora). Identifying major fans and understanding the significance of the hazards associated with each major fan is a necessary part of managing the risks associated with human occupation of alluvial fans and avoiding inappropriate development.

2. Background

In 2006, Council commissioned a review of the hazards associated with alluvial fans in Otago, led by Opus International Consultants Limited (Opus) and assisted by the Institute of Geological and Nuclear Sciences Limited (GNS Science). This regional review mapped all alluvial fan features larger than 0.5km² in area throughout the region in a Geographic Information System (GIS) and classified each based on the fan’s activity status, active or inactive, and the primary depositional process, floodwater dominant, debris dominant or a composite of both floodwater and debris.

This initial regional review identified 1920 km² of alluvial fans in Otago, which equates to approximately 6% of the total land area. Of this 1920 km², 2029 areas containing alluvial fans were identified where 1329 were classified as active and the

remaining 700 classified as inactive. These findings were presented to Committee in Report 2007/274 and are described more fully in the report “Otago Alluvial Fans Project” prepared by Opus and GNS, dated March 2009. The GIS datasets from that initial regional review were provided to the territorial authorities in February 2008.

Following completion of the regional review, Council staff closely consulted with each territorial authority to identify active alluvial fan areas that warranted further investigation. Criteria for the identification of these areas focussed on hazard exposure in developed areas and locations where there might be demand for intensification of land use. This process identified 27 areas across the region, which included approximately 119 alluvial fans that warranted further investigation.

3. Otago Alluvial Fan Hazard

In 2008, Council commissioned supplementary work, led by GNS Science and assisted by Opus to provide a more in-depth picture of the nature and characteristics of alluvial fans in the 27 identified study areas, set within a regional perspective of alluvial fan active processes. The key deliverable was an alluvial fan landform GIS data set for each investigation area, to supplement that produced in 2007.

The findings are presented in the attached report “Otago Alluvial Fans Project: Supplementary maps and information on fans in selected areas of Otago” prepared by GNS and Opus dated April 2009. This supplements the report “Otago Alluvial Fans Project” prepared by Opus and GNS, dated March 2009.

Despite the reports focus on particular locations throughout the region, the results and information provided is of regional extent. It does not provide site specific assessments of alluvial fan hazards, hazard zoning, nor does it quantify risk or frequency of hazard occurrences. As noted above, this regional review did not consider alluvial fan features smaller than 0.5km² in area and therefore the work does not identify all fans in Otago that pose a risk.

The results of the supplementary investigation includes an explanatory document for the methodology used and mapping of fans; a summary comparison of fan groups through a regional synthesis; written profiles of individual fan groups with descriptions to provide an indication as to the nature of the alluvial fan hazard and a portfolio of fan group maps showing geomorphic features and the identified activity of each fan area.

4. Assessing Community Risk

As noted above, the form and setting of alluvial fans often makes them an attractive location for residential development in Otago. Further, identifying major fans and understanding the significance of the hazards associated with each major fan is a necessary part of managing the risks associated with human occupation of alluvial fans and avoiding inappropriate development. The next steps are to assess the significance of the risk for each of the 27 study areas having regard to the hazard information that has been prepared and the existing or potential future vulnerability and consequences of the alluvial fan hazards. In the meantime the data sets will be provided to each of the territorial authorities and to the New Zealand Transport Agency.

5. Recommendation

That:

3. This report be noted.
4. This report and accompanying information be provided to each territorial authority and to the New Zealand Transport Agency.



Gavin Palmer

Director Environmental Engineering and Natural Hazards