

1976/29. Examination of landslip areas near Elderslie Main Road.

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In the course of designing the reconstruction of Elderslie Main Road the Public Works Department requested an investigation into the stability of the eastern slopes of Summerfield Hill, between Broadmarsh and Elderslie. Information was required on the potential of landslips, together with any remedial measures that ought to be undertaken.

GEOLOGY AND TOPOGRAPHY

The geology of the area has been mapped by Leaman (1975). The section of road between Broadmarsh and Elderslie is constructed mostly on dolerite. The road follows the base of the eastern slopes of Summerfield and Elderslie Hills, along the boundary between the dolerite to the west and alluvial deposits of the Jordan River to the east. The dolerite has given rise to a fairly steep and locally rugged terrain as evidenced by Summerfield Hill which rises some 220 m above the road at angles between 15-30° on the lower slopes to near-vertical rock faces higher up the slope.

Fairly close jointing has developed in the dolerite. The joint spacing ranges between 1-2 cm and the joints are generally fairly tightly closed.

DISCUSSION OF LAND STABILITY

Landslip problems along the Elderslie Main Road appear to be confined to the Jurassic dolerite.

Aerial photo interpretation and subsequent visual examination suggests that the eastern slopes of both Summerfield Hill and Elderslie Hill, between Andersons Road and Elderslie township have had a past history of instability; a feature which is persisting into the present time. Two periods of instability can be identified.

The more ancient slips appear higher up on the steeper slopes and are typically slump structures exhibiting backward tilting or reverse slopes, giving rise to ponding. The amount and direction of rotation of these slump blocks is probably a function of the discontinuities of the dolerite. That is, the frequency and orientation of jointing with respect to the slope. However, these slipped structures show no signs of recent movement and can be regarded as stable. In addition they are situated at a safe distance from the road and do not present a problem with respect to its reconstruction and maintenance.

Of greater concern is the presence of active earth movements developed lower down on the dolerite talus slopes where brown and black soil and clay containing many dolerite boulders and fragments have developed. They take the form of elongated talus slides or earth flows that either follow pre-existing drainage ways or are the result of the failure of the existing slope.

Two sites where earth movement has occurred are of interest with respect to the reconstruction of Elderslie Main Road. These occur within 150 m of each other on the lower portion of the eastern slopes of Summerfield Hill at the junction of Elderslie Main Road and Cockatoo Gully Road [EN079806].

Area 1

The more prominent area of movement is an elongated talus slide or flow situated in a shallow gully which slopes towards the main road at between

8-10°. It is approximately 200 m in length, 25 m wide at the crown, 55 m across at the toe and rises up to some 4 m above ground level in the toe region. The forwardmost portion of the toe of the slide is currently 45 m from the main road.

The slide can be seen on aerial photographs taken 30 years ago. Subsequent photography (1966, 1974) suggests that for all practical purposes, the deposit has, as a unit, shown little appreciable lateral movement during its recorded history until the winter of 1975, when it was noted by the land owner that the toe region advanced in the vicinity of up to 4-5 m.

Examination shows the slide to be essentially one of a translatory nature showing considerable localised parasitic slumping. The boundary between the moving mass and material in place is sharply defined by a series of en echelon cracks near the crown which have coalesced along the flanks to form relatively linear shear planes on which slickenside surfaces are common. The surface is typically hummocky and fissured, with cracks up to one metre deep by 0.5 m wide. The parasitic failures around the toe have produced 1-2 m scarps and have complicated the original structural simplicity of the slip.

The material exposed comprises grey to brown soil, brown to black firm plastic clay, and boulders of partially weathered dolerite. The soil/clay content ranges between 40 and 60%. Similar vertical profiles are noted at different horizons along the length of the slide, and are repeated in some sections. This suggests considerable over-riding movement within the slip mass.

The excessively high rainfall during the winter months of 1974 and 1975 has undoubtedly been a major cause in the reactivation of the talus slide. As it is situated in a natural drainage course, it receives the majority of the surface run-off of adjacent slopes. Water flows directly into the head area of the slide and together with rain falling into the cracks over the entire slip area, the slip zone becomes readily activated through saturation of the subsurface materials.

The slide appears to be moving forward by a combination of two mechanisms. Firstly, as a whole unit along a slip surface; and secondly by lateral spreading through parasitic slumping off the sides of the main mass in the region of the toe.

Area 2

The second area of interest occurs where the road cuts through the toe region of an old earth slip-slump structure some 120 m on the Broadmarsh side of the junction of Cockatoo Gully Road and Elderslie Main Road. The slip zone is heavily vegetated with 'prickle bush' and no recent signs of movement were noted and it is now apparently stabilised. However old landslip deposits are commonly reactivated by the addition of water and by cutting and filling on these slopes. In short, any new excavation in the toe area of this old slip may upset the current apparent stability.

CONCLUSION

The eastern slopes of Summerfield and Elderslie Hills are subjected to landsliding. Unusually heavy precipitation over the past two winters have reactivated ancient slips and have been the primary cause of two recent earth flows developing on slopes of only 12-14° on Elderslie Hill.

RECOMMENDATIONS

In the case of the talus slide, surface waters should be diverted and stopped from entering directly into the head of the slide area. In addition, the surface of the slip mass could be remoulded during the dry season to eliminate fissures and areas of ponding. In the short term this slide does not represent an immediate problem in the reconstruction of the road. However, regular monitoring should be carried out as a guide to the rate of movement of the slide.

On the other hand, the apparently stable earth slip through which the road has been constructed may present a more immediate problem if there is too much disturbance to the toe area during reconstruction. In the event of reactivation of this slip, the toe area should be drained and a restraining structure installed.

With regard to the stability of the remainder of Summerfield Hill, it is felt that although the slopes are relatively steep, they are simple in form and are well drained. They should therefore under normal conditions, present no concern during the reconstruction of the Elderslie Main Road.

REFERENCE

LEAMAN, D.E.; LEGGE, P.J. 1975. Geological atlas 1:50 000 series. Sheet 75 (8312N). Brighton. Department of Mines, Tasmania.

[1 June 1976]

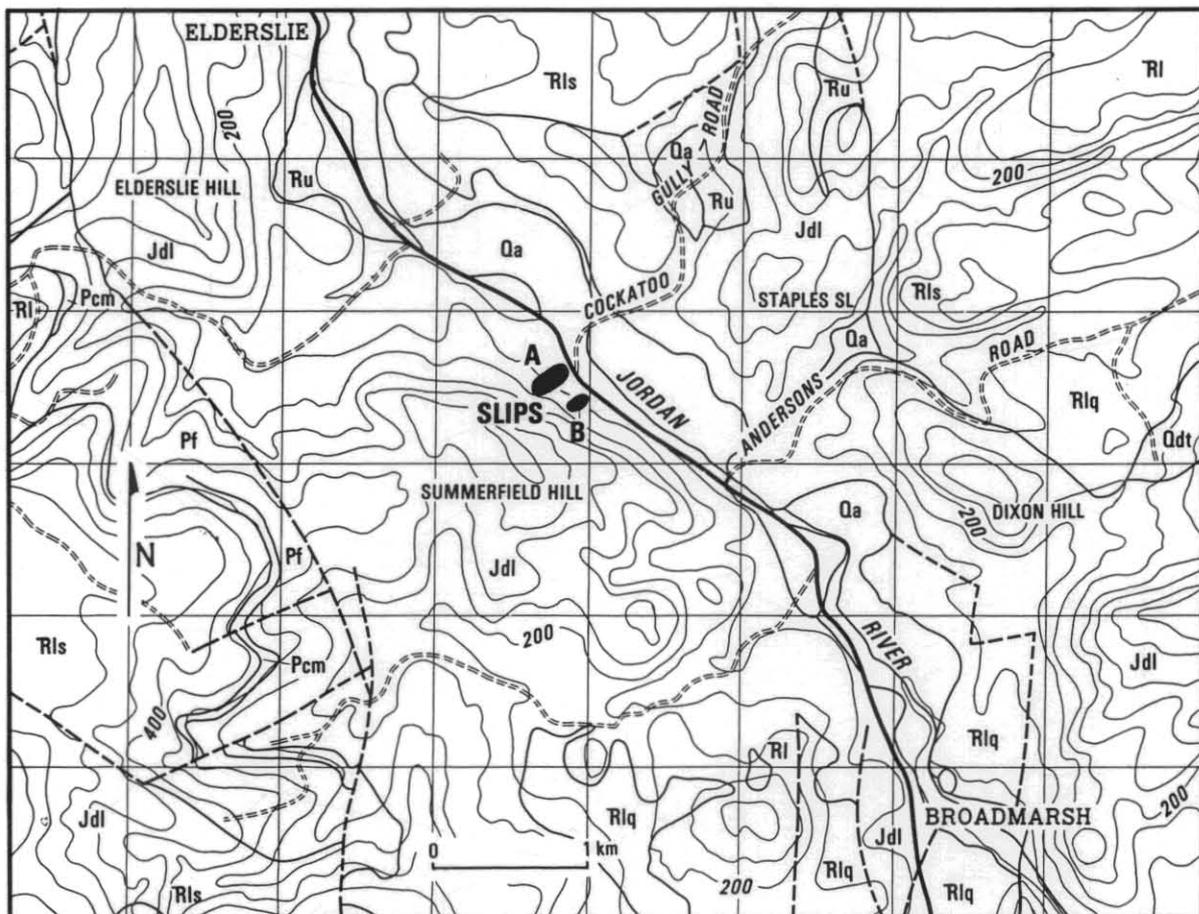


Figure 1. Locality map.