

1976/45. The possible use of pine trees as an aid to stability: Groom's slip, Penguin.

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The owner of the property on which the slip occurs has applied for a loan to plant pine trees on the slip area. The aim is to stabilise the recently active areas.

HISTORY OF MOVEMENT

Movement took place in the early 1900s, and the slip was piled along the shoreline in an attempt to stop further slipping. Tunnels were also driven into the toe of the slip in an attempt to drain the area but collapses prevented these from being dug very far. Extensive movement took place during and after heavy winter rains in 1931 and the Bass Highway and railway line were seriously affected. Surface drainage was undertaken and three tunnels were dug up to 210 m into the slip. These tunnels were backfilled with rock to maintain drainage.

An outline of the area that was moving as a whole in 1931, is shown on Figure 1. The contours on the plan and surface observation reveal large old slips to the rear of this outline. Either the tunnels were successful in draining the area or weather conditions have been such that movement on the slip, as a whole, has not taken place since. Small movements have occurred in the steeper parts of the slip mass and in steepened areas around the heel of the slip.

The slips causing the most immediate concern are those affecting the railway, road and telephone lines in the toe of the old 1931 slip. Toe areas are a common site for further small movements once a large movement has taken place. Areas around the head of the slip have been steepened by vertical displacement of the slip material. This, combined with the loss of the support given by the soil involved in the slip, promotes the formation of slips in these areas also and a number of movements have taken place on the slopes surrounding the 1931 movement over the last few years (fig. 1).

GEOLOGY

The slips have developed in deeply weathered Tertiary basalt which is interbedded with sandy sediments. Ridges to the east and west of the slip area, are underlain by basic Cambrian volcanic rock occurring from sea level to about half way to the plateau behind.

CAUSES OF SLIPS

The slips are caused largely by the occurrence of deeply weathered Tertiary basalt and unconsolidated interbedded Tertiary sediments on steep slopes. Groundwater is directed towards the area by the two ridges underlain by Cambrian rocks, and partly through the sand beds interbedded with the basalt. Once a depression is formed by a slip, surface water is also directed to the area. After a slip has taken place, the soil is weakened for a considerable period, and with water being directed to the area, movement will take place on the shallow slopes.

THE USE OF TREES AS AN AID TO STABILISATION

There is no doubt that clearing of the land in areas used for agriculture has contributed to the development of many of the currently active slips. The aim of planting trees is to return the land to conditions similar

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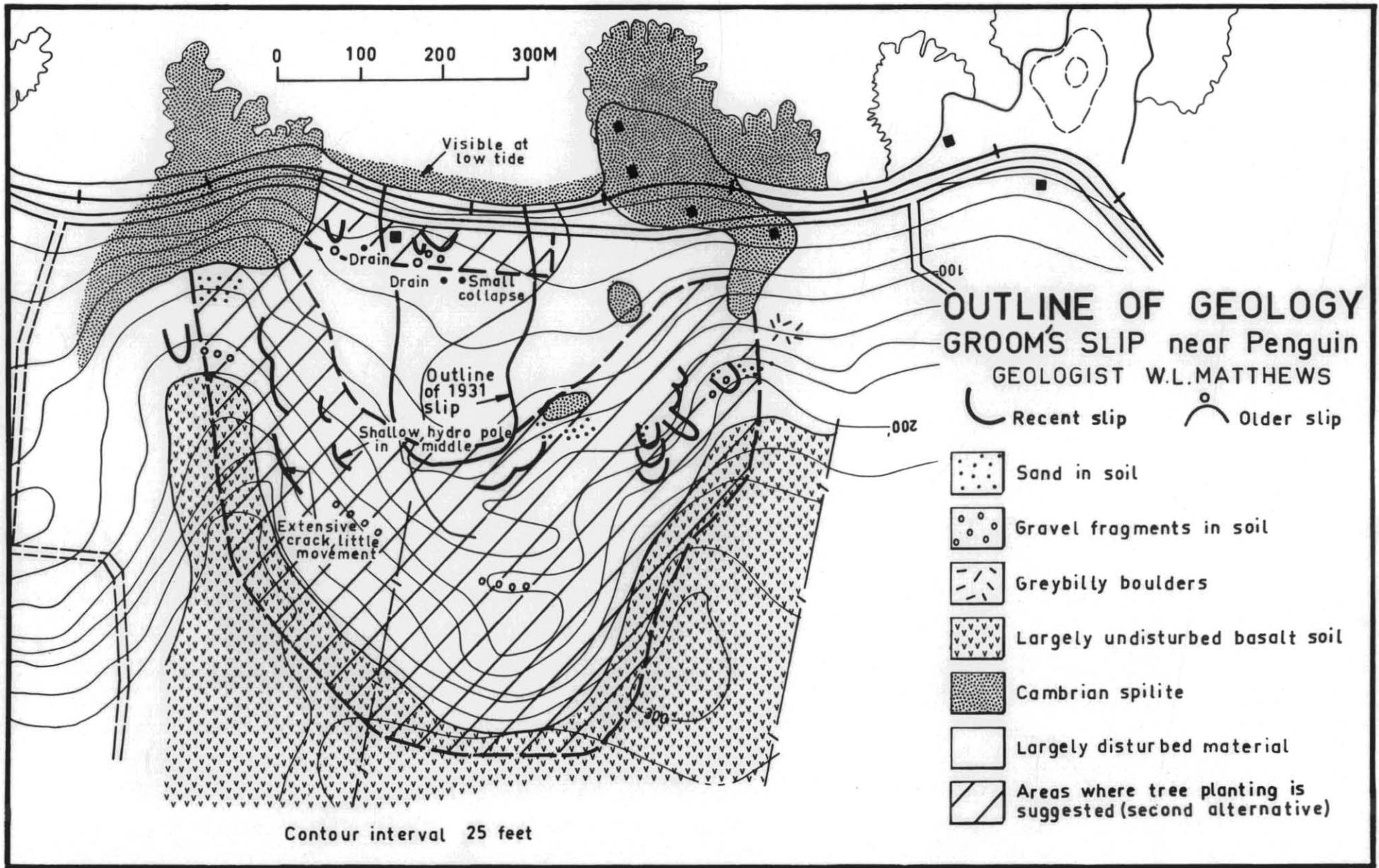
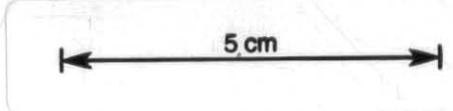


Figure 1.



to those occurring before clearing. Shallow tree roots will bind the surface soil together while the deeper roots will act as a set of small piles, supporting the soil on slopes. In addition to mechanical support of the soil, the trees will aid in maintaining a lower water table through transpiration. Lowering of the water table will increase the factor of safety of the land. The extent of the increase in stability due to these effects is unknown, but some increase will almost certainly occur.

The slip surface of the area that moved in 1931 is too deep (being in the order of 10-15 m deep) for tree roots to reach, but the lowering of the water table, however little, would be an aid to maintaining stability. The steeper areas around the slip as well as the steep parts within the slip mass (e.g. the area involved in the disruption of the road and railway line) would be more greatly influenced by the planting of trees and it is important that these areas be stabilised. In the case of the slip near the road, further movement could result in loss of support to a section further inland, thus involving the movement of a larger volume of material. The slips that have formed around the steep slopes bordering the 1931 movement are not a sign that this large slip has reactivated. However, material from these slips is loading the soil involved in this older movement and if sufficient loading takes place, the main slip could recommence movement as a whole. If trees are established around these slopes they should have a stabilising effect. They may not have a significant effect in the geological time scale as further landslip movement is inevitable but they could have an important delaying effect in the human time scale.

The planting of trees is only one of several aids to stabilisation of land available, and it is usual to use several of these available methods in conjunction, for example, the drainage measures as suggested in a previous report (Matthews, 1975) could also have an important influence on the stability of the area.

CONCLUSIONS

The establishment of trees in the slip area should have a stabilising influence. The biggest influence would accrue if:

- (1) The whole of the amphitheatre shaped area (about 20 ha, fig. 1) were planted.
- (2) Failing this, planting of the area marked on Figure 1 should have almost the same effect.
- (3) If smaller areas are planted then the steeper areas should be selected, particularly those involved in active movement at present, and adjacent areas.

Some difficulty may occur in establishing trees on parts of the recently active areas and replanting of small areas may be necessary. Where permanently damp areas occur it might be impossible to establish trees. If drainage of these areas is not undertaken, willows or similar water tolerant trees could possibly be planted.

It is unknown to what degree, the planting of trees on all or some of the land, will alter the stability. However, if combined with other measures such as drainage, the effect on stability would be greater.

REFERENCE

MATTHEWS, W.L. 1975. Examination of Groom's and Lonah slips, near Penguin. *Unpubl. Rep. Dep. Mines Tasm.* 1975/66.

[30 July 1976]