1976/60. Investigation of a proposed subdivision at Bonnet Hill

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Mr R. Kile, Surveyor, acting on behalf of his client Mr P. Forrest, requested the Department of Mines to investigate and report on the stability and suitability of 4 ha of rural land in the vicinity of Bonnet Hill [EN 270430], for subdivision. The area proposed for subdivision is an elongate block bounded by the Channel Highway to the west, and by Taronga Road to the south (fig. 1).

TOPOGRAPHY AND GEOLOGY

In light of its proposed residential use, the land is considered to have moderate slopes. The land slopes east from the Channel Highway and north from Taronga Road at between 16° and 19°, with a maximum difference in elevation of approximately 65 m between the SW and NE corners of the proposed subdivision. The average difference in R.L. between Taronga Road and the proposed northern boundary is about 30 m.

Taronga Road marks the boundary between the massively bedded Triassic sandstone exposed along the crest of the ridge to the south, and Jurassic dolerite, exposed in test pits on the slopes north of the road. Both rock types crop out along the length of Taronga Road.

Several test pits excavated by the landowner at the request of the Department of Mines, show the nature of weathering of the dolerite. A mantle of up to 0.4 m of black soil, exhibiting very little textural differentiation, is typical of the black clays seen in the Hobart district - sticky plastic black clays when wet which crack severely when dry. The black clay overlies a yellowish clay horizon, grading downwards to extremely weathered rock with associated thin bands of carbonate. In its dry state this material is friable. Highly-moderately weathered jointed dolerite was encountered in all five test pits at depths of between 0.9 and 1.3 m.

DISCUSSION OF LAND STABILITY

There are three basic factors which require consideration: the degree of slope, the soil profile, and the effect of water.

Two distinct soil movement processes have developed on the slope adjacent to, and on the land in question. These are especially evident on the eastern slopes of Bonnet Hill below the Channel Highway, on which 'Acton' estate is situated. A shallow planar earth slip has formed immediately to the north of 'Acton', while soil creep or suface movement is prominent adjacent to the house. The severity of the rates of displacement and the type of process which predominates is influenced by gradient and moisture availability and to a lesser extent by soil texture.

Soil creep is evident on slopes in excess of 16°. The creep has been emphasised by the tread of animals utilising the small platforms or steps running transverse to the slope. As a result, the creep shows as a series of animal tracks contouring the hillside. In addition, cracks upto 2 cm wide have formed across the slope, and are due mainly to the expansive nature of the soil, thus aiding downward movement by soil creep.

The shallow earth slip to the north of 'Acton' is situated in an area of soil creep similar to that described above, but on a slope of 23°. It formed between 2-3 years ago as a result of excessive surface water penetrating the transverse cracks formed during the dry season, saturating and over-

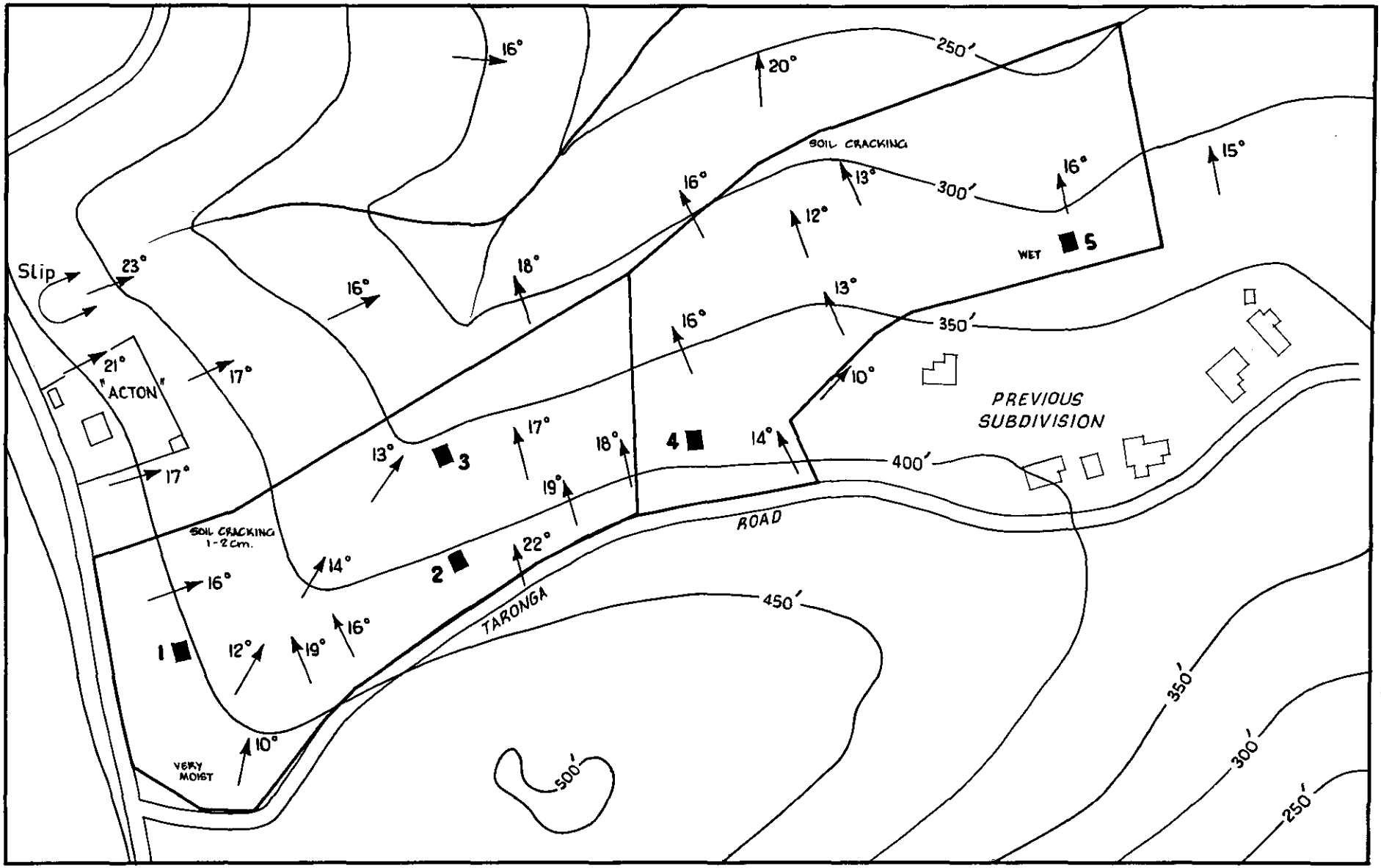

Figure 1. *Location of proposed subdivision.*

coming the shear strengths of the soils in the lower horizons and allowing material to be transported downslope. The slip was reactivated following rain in early August this year and the amount of material transported has more than doubled. Large tension cracks around the head of the slide suggest further movement is imminent.

Soil creep in itself cannot be regarded as an engineering hazard but its formation can be associated with slumping in similar circumstances, producing areas of unstable ground.

'Acton' homestead is sited on a slope of 17°, a common slope angle for the majority of the proposed subdivision. Structurally the exterior sandstone walls show considerable cracking, probably due to movements typically associated with foundations on expansive soils. However, weathered bedrock exists at approximately 1.0-1.5 m below the surface and provided proposed dwellings are adequately keyed in, structural movements should be minimal.

The effect of water on earth movement is clearly demonstrated by the slip discussed above. The discharge of sewage effluent, stormwater and sullage, if not carefully regulated may, when added to the natural rainfall, produce minor slumping in the soils downslope from the point of discharge. Recent rains have shown the soils to be relatively impermeable, increasing the probability of minor mass movements. It is perhaps relevant to note that inadequate disposal of effluent etc. into the subsurface, downslope of the existing subdivision off Taronga Road, has resulted in saturated soils in the vicinity of test pit five. Water was noted seeping into this pit, giving an indication of the problem of ineffective water disposal systems.

CONCLUSIONS

Both soil creep and the expansive nature of the soils will present problems. Residential buildings on moderate slopes in this material cannot be regarded as desirable. However, provided foundation conditions are considered adequate by an engineer, and if provisions are made to ensure that the drainage of effluents etc. can be successfully undertaken, so as not to add to existing mass movement, there is no danger to dwellings from major slumping. Minor mass movements, small scars and locally hummocky ground will occur where the subsurface is continually saturated.

[14 September 1975]