The landslip potential of a proposed subdivision at Penguin.

P.C. Stevenson

The proposed subdivision at Springbrook Rise near Penguin, is on the property of Messrs C.J. and E.E. Dyson, and was examined on 15 September at the request of the Municipality of Penguin. A drawing (G125 dated 2 August 1971) was supplied by B.S. Banks and Associates, Surveyors, of Ulverstone.

During the examination it became apparent that several trial pits would be necessary. These were excavated by back-hoe on 23 September and logged and sampled by B. Cox.

GEOLOGY

Geologically the planned subdivision may be divided at the 225 ft contour into two parts. The northern end of the property lies above this contour with the remainder of the land below it to the south (fig. 1).

The southern part is on the Tertiary basalt plateau which lies behind the coast over most of north-western Tasmania. The 'red soil' is developed on this plateau, and the basalt in this subdivision is approximately 170 feet in thickness. The basalt is very variable in its state of weathering and may be represented by materials from a hard blue rock to a brown and grey mottled clay. Except when in a clay state, the basalt is permeable and carries water freely in its joints.

The basalt is underlain throughout the proposed subdivision by Tertiary clays and sands, but they only crop out in the northern part as defined above. Here the basalt forms the crest of an escarpment, with the face of the escarpment displaying clays and sands. Much of the detail is obscured by rain-washed soil. Low down on the escarpment, but rising to approximately 175 feet in the north-eastern corner of the subdivision is another suite of hard blue basalt rocks of Cambrian age. These rocks form an irregular basement for the Tertiary clays and sands, but do not otherwise enter into the stability problem of the proposed subdivision.

DISCUSSION OF STABILITY

The main concern with respect to the stability of the land centres on the grey clay horizon which crops out at approximately the 150 ft contour on the face of the escarpment, to the west of the present road.

Rainfall on the plateau is absorbed by the soil and penetrates downward through basalt rock until it encounters this clay horizon. It then moves laterally through the rock joints along the top surface of the clay to emerge as springs. This situation is well known in all basalt areas in northern Tasmania, and is commonly used to site farm dams. A spring of this type can be seen just to the south of the clay outcrop described above, and the copse of tea-tree to the east of the road is an indication of the same spring line.

Tertiary clays are a potent cause of landslip where they are exposed to springs. Most of the landslips along the north-west coast can be shown to be of similar origin. The hazard of slips developing on the proposed subdivision is demonstrated by a small slip measuring approximately 30 x 10 feet which has already occurred close to the clay outcrop, and by the very extensive slips that have occurred on neighbouring properties.

RESULTS OF TRIAL PITS

The purpose of the trial pits was to expose the grey Tertiary clay and the overlying weathered basalt. The locations of the pits are shown on Figure 1.

Hole 1

Depth (ft)	*Description*
0-5½	Basalt.
5½-8½	Brownish yellow clay (weathered basalt).
8½-11	Grey clay (sedimentary clay).
	2½ feet of water in 2½ hours.

Hole 2

0-1	Basalt and top soil.
1-7	Brownish yellow clay (weathered basalt).
7-9½	Grey clay (sedimentary clay).
9½-11½	Yellow sand.
	Hole dry.

Hole 3

0-1	Basalt and soil.
1-9½	Brownish yellow clay (weathered basalt).
9½-11½	Grey clay (sedimentary clay).
	Hole dry.

Hole 4

0-3	Basalt and soil.
3-10	Brownish clay (weathered basalt).
10-11	Grey clay (sedimentary clay).
	Very wet hole.

It can be seen from the results that the grey clay and the clay formed by the weathered basalt together measure approximately 8-11 feet in thickness. The occurrence of springs is not constant, and they were observed in only two of the four locations tested. The yellow sand beneath the clay does not constitute a landslip threat other than on a very local scale, and is naturally not rendered plastic by water.

THE SLIP THREAT

Landslip development at this location depends on the presence of clays and the existence of springs. Excavations for road cuts or house foundations have the effect of raising the stress in the clays exposed and thus increase the risk of slip. This process is a complex one and has not been fully elucidated. A combination of actual cutting of the clay, drying and shrinkage due to exposure, easy access of rainfall and surface water, and redistribution of stress by road or house building all predispose clays to lose strength.

The volume of the springs at present depends on rainfall and on irrigation, if any. However garden watering, the concentration of stormwater flow and the effluent from septic tanks, have all been shown in the past to aggravate the landslip situation in the event of subdivision. Whereas rainfall

and irrigation are evenly spread, other man-made additions of water are usually concentrated at discrete points, such as soakaways, pipe leaks, garden plots and table drains. This in turn produces high local concentrations of water in the resulting springs and may produce excessive softening and loss of strength in the clays.

The presence of clays in a sewered subdivision has been seen to allow movement, causing pipe joints to leak with water being introduced into the clay, a situation unsuspected until a slip actually takes place.

CONCLUSIONS

Two hazards exist, and both are caused by the clays. Firstly the stability of the escarpment face will be affected by road and any other cutting or excavation. This is a local and not very serious problem. The second hazard is less obvious, but more difficult to counter. Additional and more concentrated amounts of water will increase the flow of water in springs and produce more extensive failure of the escarpment face. Although the effect would still be somewhat localised, the cause could extend to the entire subdivision.

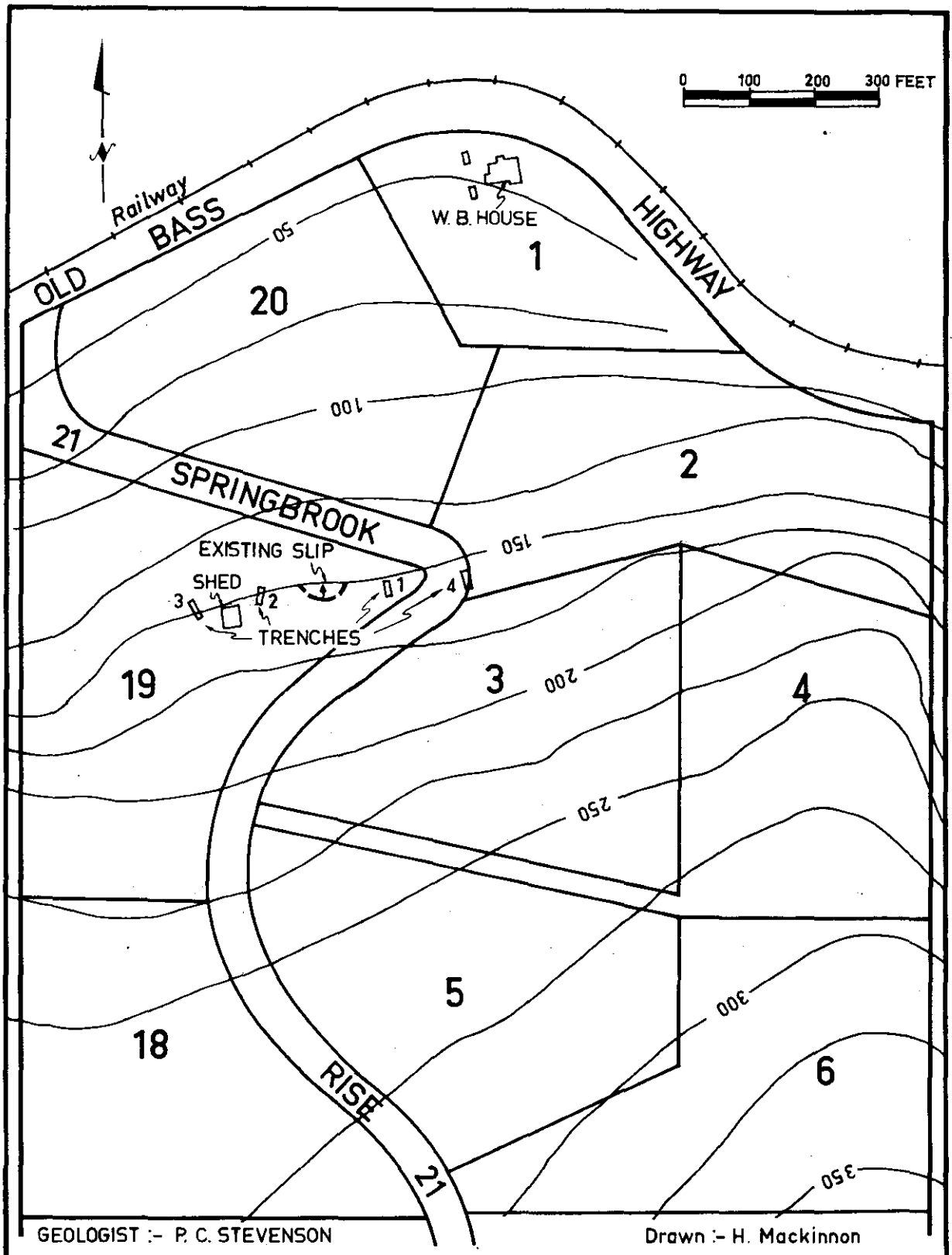
RECOMMENDATIONS

The face of the escarpment between the 100 ft and 200 ft contours, as represented on Drawing No. G125, should not be subdivided, and development in that area should be restricted to the improvement of the road with the stability improved by the planting of trees.

It is further recommended that in the design of the area from the 200 ft contour south to the southern boundary, careful attention be taken to minimise any prospects of increased groundwater flow. To this end septic tanks and stormwater soakaways should not be permitted, and effluent should be conveyed for disposal out of the area in pipes laid so as to resist movement and leakage where they cross the crest of the escarpment.

No recommendation is made for the area below the 100 ft contour as this poses no special problem.

[30 September 1971]



PART OF SUB-DIVISION PLAN – G.J. & E.E. DYSON

SHOWING CREATION OF TRIAL PITS

DEPT OF MINES
3548 – 29

Figure 1

5 cm