

## Stability Investigation of a Proposed Subdivision at Swan Bay.

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## Abstract

Part of an area of land at Swan Bay, East Tamar, presently under consideration for subdivision, is steeply sloping. Proline auger holes have indicated that these slopes are underlain by Tertiary clay and clayey sand often containing weathered dolerite. Some clay has a high moisture content and plasticity. Pore water pressures, as indicated by the rise in water levels after drilling, are low to moderately high. Part of the proposed subdivision area is therefore considered unsuitable for development.

At a request from Investment Nominees Pty Ltd, a stability investigation was conducted on a proposed subdivision at Swan Bay [EQ015300], near Dilston.

## INTRODUCTION

The majority of the area has slopes of between  $2.5^{\circ}$  and  $8^{\circ}$  and is underlain by Tertiary sediments. Some of the 2-3 ha allotments (Fig. 1) are steeply sloping (up to  $20^{\circ}$ ) and the suitability of these areas for development is in question. Six Proline auger holes were drilled on the steeper slopes to determine the nature and condition of the underlying Tertiary clay, four on the proposed subdivision and two on an area to the north which is to be subdivided at a later date. A slope zone map was prepared (Fig. 1) based on contour information from the subdivision plan. The zone map is based on  $2.5^{\circ}$  intervals and outlines the steeper slopes to the north-east. Slope zones less than  $7.5^{\circ}$  are generally considered to be stable.

## GEOLOGY AND GROUNDWATER CONDITIONS

All steep slopes of allotments 22 to 28 inclusive are underlain by Tertiary clay and clayey sand. Borehole logs for the Proline auger holes are given in Appendix 1. Clay encountered in the holes has a moderate to high plasticity and low to high moisture content. Clay from Holes P1, P2 and P3 have the highest plasticity and moisture content; Hole P2, located near the boundary of lot 27, has the highest values. Free water was present after drilling in all holes except P1. The groundwater appears to be present in fissures in the clay, although Hole P2 has a clayey sand aquifer. Water movement is occurring through the clay at a depth of between 4.3 and 6.4 m. Water levels were recorded immediately after drilling and 24 hours after drilling. Closure occurred in Hole P2 at a depth of 3.04 m and in Hole P4 at a depth of 3.58 m indicating the highly plastic nature of the clay.

## CONCLUSIONS

Extensive studies of a number of landslips in the Tamar Valley has shown that slopes of  $12^{\circ}$  to  $20^{\circ}$  may be subject to failure and that failure planes generally develop at depths of between 4 m and 15 m. These landslips are characterised by overconsolidated fissured clay of high plasticity, accompanied by high groundwater conditions. Subsurface investigations on this proposed subdivision indicate that the steeper slopes are underlain by Tertiary clay, which often has a high plasticity and moisture content. Potential slip planes are present in Holes P2 and P4 at depths of between 3.7 and 7.3 m. The information obtained indicates that the more steeply

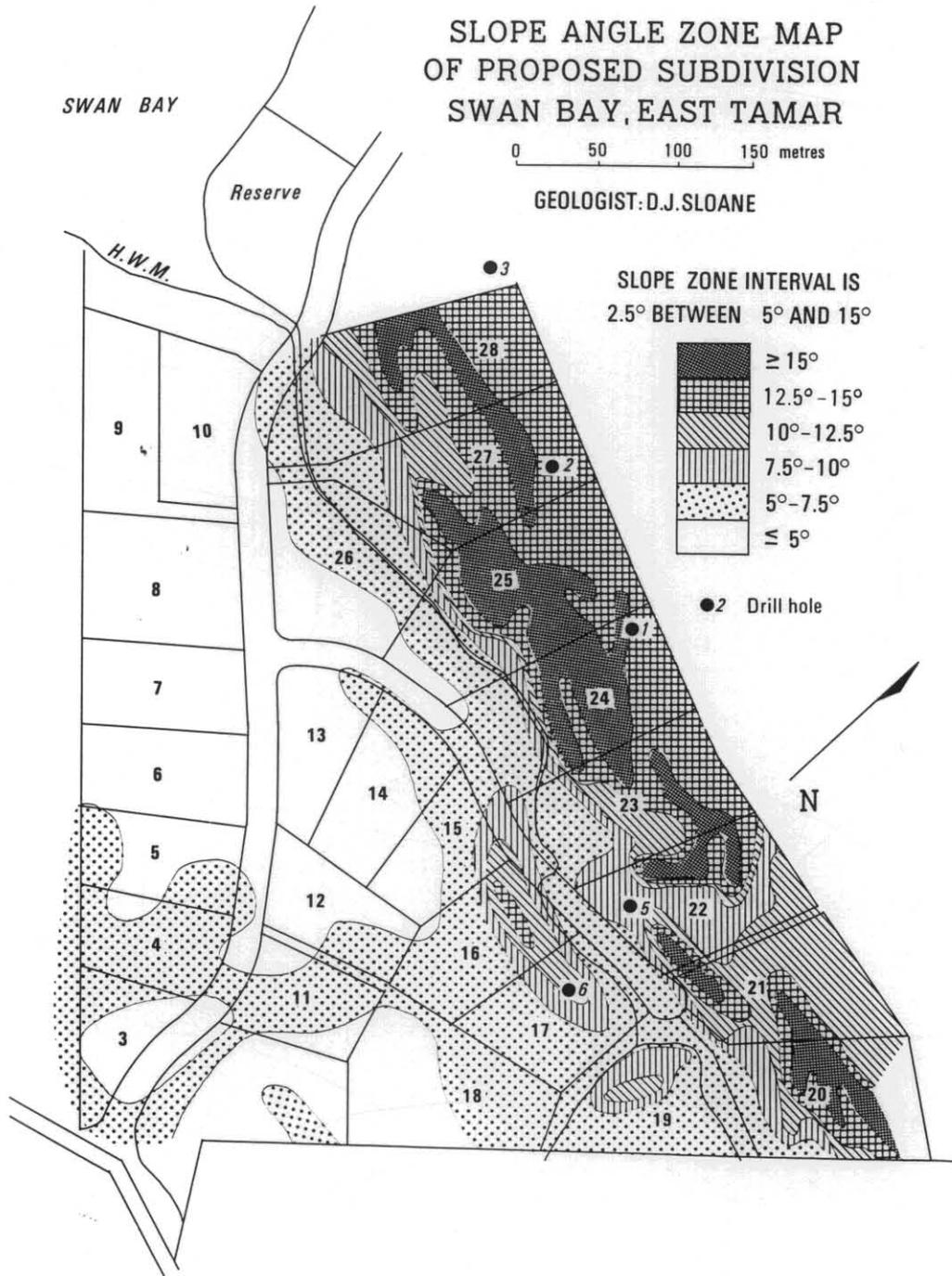


Figure 1.

5 cm

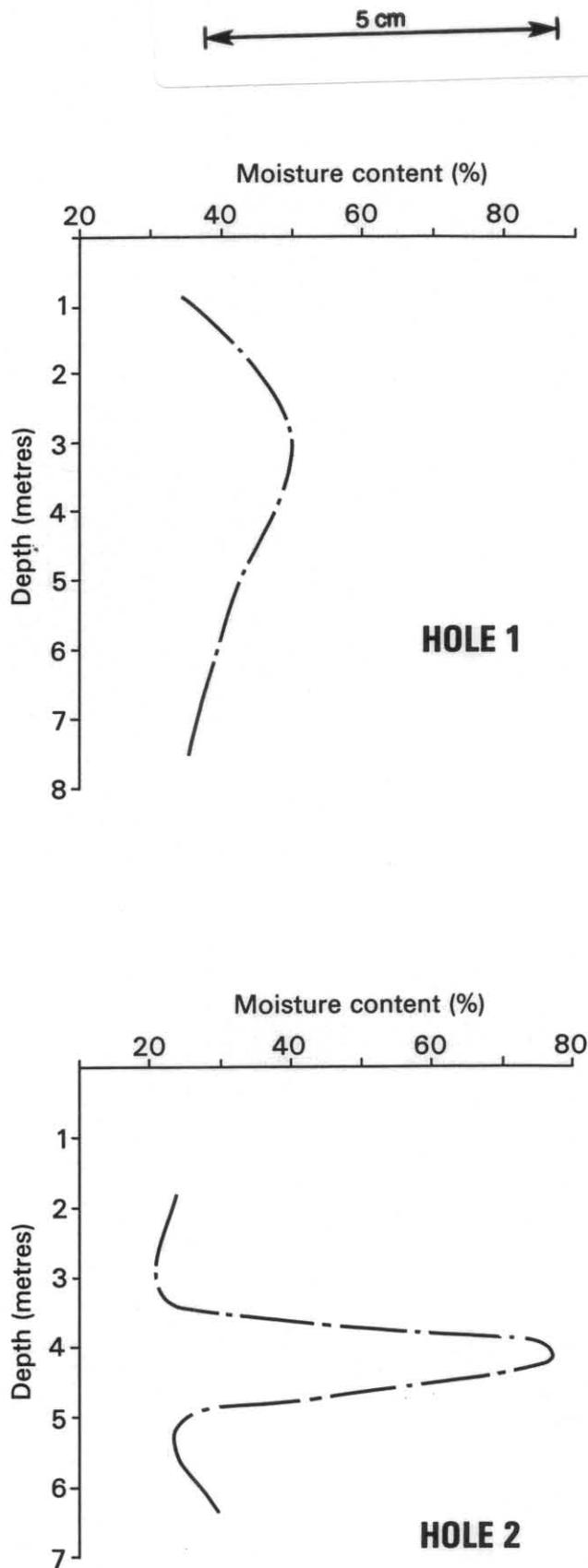


Figure 2. Moisture content expressed as a percentage of dry weight.

sloping segment on lots 22 to 28 should not be built on. The disposal of septic tank effluent in this region should not be permitted. The same conditions are likely to apply for the continuation of this segment to the north, beyond the present subdivision and extending to Hole P4.

Lots 2 to 15 inclusive and lots 18 and 19 can be developed without restrictions. Building and septic tank installation is not recommended on the northern half of lots 16 and 17 and the south-western half of lots 20 and 21. That portion of lots 25 and 26 to the north of the watercourse is also considered unsuitable for development. Lots 22, 23, 24, 27 and 28 are considered unsuitable for development. These allotments could be altered by extending the north-eastern boundary at least 50 m towards the north-east. This additional area would be considered suitable for building development. In view of the lack of a contour map of this region, and also the area to the north-west of the subdivision, any modification of the subdivision as outlined above would require preparation of a contour map and re-inspection.

#### REFERENCES

KNIGHTS, C.J.; MATTHEWS, W.L. 1976. A Landslip Study in Tertiary sediments, northern Tasmania. *Bull. int. Ass. Engng. Geol.* 14 : 17-22.

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## APPENDIX 1

## Logs of Proline auger holes.

## Hole P1

Depth (m)	Description
0 - 0.3	Grey-brown silty organic enriched A <sub>1</sub> soil horizon
0.3 - 0.92	Bright yellow-brown, grey and reddish mottled clay. Some evidence of weathered dolerite.
0.92 - 1.83	Pale yellow-brown clay containing weathered feldspar(?) Dolerite derived. Moderate plasticity and moisture content.
1.83 - 2.75	Pale yellow-brown sandy clay. High plasticity and moisture content.
2.75 - 3.66	Pale yellow-brown clayey sand. Approximately 50% sand. Very plastic.
3.66 - 5.49	Pale yellow-brown gritty, plastic clay. Contains decomposed dolerite pebbles up to 50 mm diameter.
5.49 - 8.85	Firm yellowish-brown clay containing small weathered dolerite pebbles and ironstone concretions 2 to 3 mm in diameter.
8.85	Boulder or <i>in situ</i> dolerite.

## P2

0 - 0.3	Light grey-brown silty organic enriched A <sub>1</sub> soil horizon.
0.3 - 0.92	Brown clay containing pisolitic ironstone concretions.
0.92 - 1.83	Firm brown clay with orange mottles and ironstone concretions.
1.83 - 2.75	Yellow-brown sandy clay. Moderate moisture content and plasticity.
2.75 - 4.58	Yellow-brown clayey sand. Moderate to high moisture content and plasticity. Approaches liquid limit. Quartz grains up to 1 mm in diameter.
4.58 - 8.54	Light yellow-brown clayey sand. Moderate plasticity and moisture content.
8.54	Bedrock or large boulder.

## P3

0 - 0.3	Grey silty organic enriched A <sub>1</sub> soil horizon.
0.3 - 0.91	Yellow-brown clay.

P3

Depth (m)	Description
0.91 - 3.66	Grey clay with bright brown and reddish brown mottles. Occasional completely decomposed dolerite pebble and sandy lenses(?). Moderate to low moisture content and plasticity.
3.66 - 4.57	Pale grey clay. Low water content and plasticity. Some minor iron 'spotting'.
4.57 - 6.4	Brown clay containing dolerite pebbles and pisolitic ironstone concretions. Low moisture content and low to moderate plasticity.
6.4 - 10.0	Very gritty yellow-brown clay. Abundant weathered dolerite pebbles. Clay derived from weathered dolerite.

P4

0 - 0.3	Reddish-grey silty organic enriched A <sub>1</sub> soil horizon.
0.3 - 1.83	Plastic grey clay. Light grey and orange-brown mottles.
1.83 - 3.66	Light grey clay. Low plasticity and moisture content. Weathered feldspars apparent(?)
3.66 - 5.40	Brown clay derived from weathered dolerite. Low moisture content and plasticity.
5.40 - 5.70	Grey clay containing pisolitic ironstone concretions and weathered rock fragments.
5.70 - 6.50	Yellow-brown clay. High moisture content. Clay is close to liquid limit.
6.50 - 6.71	Yellow-brown clay. Moderate moisture content and plasticity.
6.71	Boulder or <i>in situ</i> bedrock.

P5

0 - 0.3	Grey-brown silty, organic enriched A <sub>1</sub> soil horizon.
0.3 - 0.92	Firm yellow-brown sandy clay containing weathered dolerite pebbles.
0.92 - 2.44	Friable brown clay containing pisolitic ironstone concretions and dolerite pebbles. Low moisture content and plasticity.
2.44 - 3.66	Grey plastic clay with yellow-brown mottles.
3.66 - 4.58	Dark grey fissured(?) clay containing some plant fragments.

P5

Depth (m)	Description
4.58 - 6.41	Brown plastic clay. Mottled pale grey and yellow-brown. Moderate plasticity and moisture content.
6.41 - 6.71	Firm brown clay. Low moisture content.
6.71	Clay hard-pan(?).

P6

0 - 0.3	Grey-brown silty, organic enriched A <sub>1</sub> soil horizon.
0.3 - 0.92	Yellow-brown clay containing pisolitic ironstone concretions.
0.92 - 2.75	Yellow-brown clay mottled reddish-brown and dark grey. Some fine sand present. Low plasticity and moisture content.
2.75 - 3.66	Brown sandy clay. Moderate plasticity and moisture content.
3.66 - 4.58	Light grey silty clay containing plant fragments.
4.58 - 6.41	Brown fissured(?) clay. Firm and containing pisolitic ironstone concretions.

## APPENDIX 2

## Summary of groundwater conditions

S.W.L. = Standing Water Level

Hole	Depth (m)	Standing water level (m)		Depth of Closure (m)	Aquifer depth and type
		14/12	15/12		
P1	8.8	-	-	-	No water
P2	8.5	4.3	2.0	3.1 on 15.12.77	Very sandy clay - high plasticity and moisture content 3.7 m to 7.3 m.
P3	10.1	6.7	5.9	-	Brown gritty fissured (?) clay 5.5 m to 6.4 m and fissured grey clays 4.3 m to 4.6 m.
P4	6.7	4.1	3.5	3.6 on 15.12.77	Yellow-brown clay - high plasticity and moisture content 5.5 m to 7.3 m.
P5	6.7	6.4	5.3	-	Grey fissured clays 3.7 m to 4.6 m and plastic brown clays 5.8 m to 6.4 m.
P6	6.4	-	5.8	-	Fissured brown clay 4.6 m to 5.5 m (?) Brown sandy clay 2.7 m to 3.66 (?)