UR1986_55

1986/55. Stability of land at Glenwood Road, Leichardt, Launceston.

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Abstract

Sediments of Tertiary age underlie a proposed subdivision of part of the property Leichardt on Glenwood Road. Low strength silty clay occurs within the sequence and areas showing signs of past instability and some of the steeper areas are not recommended for development. More gently sloping areas should be reasonably safe to develop with some precautions.

INTRODUCTION

A proposed subdivision comprising 6 lots between Glenwood Road and the railway line [EQ157077] has been examined. Initially seven test pits were dug largely to examine the suitability of the area for septic tanks: five were only to shallow depth but two were extended to 2 m or more. A further three test pits were dug in the northern part of the proposed subdivision to depths of from 2.8 to 3.3 m and samples were collected for testing. The locations of the test pits are shown in Figure 1 and their logs are included as Appendix 1.

RELIEF AND GEOLOGY

The south-east corner of the property along Glenwood Road has a gentle slope. Over much of this area the land steepens towards the railway line. Slopes in the steeper areas are commonly greater than 10° although in the northern part the land is less steep. Apart from the flatter land along Glenwood Road which has an even, smooth appearance, the property is a little hummocky and uneven.

The whole area is underlain by Tertiary sediments consisting of clay, silty clay and sandy clay. These sediments are overlain in the flat area by a gravel capping.

STABILITY

The major part of the proposed subdivision is in class 4 on the landslip zone map - i.e. it is an area of old landslips and adjacent areas. Because of the relatively steep slope and previous instability on most of the land, development could not be recommended without very detailed subsurface investigations (the results of which are unlikely to provide a recommendation for development). The northern part, although it has probably been subject to movement in the past has a lower slope and abuts an area west of the railway line with a long low-angle slope. Further test pits were suggested in this area to examine subsurface materials.

Strength tests have been undertaken on samples from pits 9 and 10. Because of some unusual and undetermined character of the samples these tests were not simple and had to be repeated in one case three times because of the apparent unreliability of the results obtained. The shearing rate had to be reduced, the third test taking about two weeks to complete.

The following results were obtained:

	Liquid limit	*Plastic limit*	*Linear shrinkage*	ø'	c'(kPa)
Pit 9 3.3 m	83	26	19	11°	0.9
Pit 10 2.9 m	74	29	18	10°	2.8

X-ray diffraction tests on these samples showed the following approximate percentages of minerals present:

	Clay fraction		*Total sample*
	Kaolinite (%)	Montmorillonite (%)	Quartz (%)
Pit 9 3.3 m	70-75	25-30	10-15
Pit 10 2.9 m	85-90	10-15	10-15

The testing was undertaken by R. N. Woolley.

X-ray analysis of clay samples from other test pits show that kaolinite is the dominant clay mineral. Minor amounts of montmorillonite occur except for the sample from pit 5 where the montmorillonite percentage is much higher and probably comparable with the percentage of kaolinite.

Using the strength factors determined above, stability analyses (fig. 2) indicate that the slope of 8.5° near the boundary of lots 5 and 6 could become unstable if saturation of the material underlying it approaches the surface.

Development is not recommended on this slope. Slopes of more than 10° in other parts of the proposed subdivision should be excluded from development on the same basis. This suggests that lot 4 and most if not all of lot 5 has an unacceptable risk of becoming unstable. There may be a flattish area on lot 5 near the railway line, or part of the flattish area of lot 6 could be added, where a house may be built but this is unlikely to be favoured by any purchaser.

RECOMMENDATIONS AND CONCLUSIONS

Only the flatter south-east portion of the land can be regarded as being relatively free from the risk of landslip. Most of the remainder of the area has been subject to landslip in the past or is moderately steep. On adjoining land recently-active slips can be seen on similar slopes. Strength tests indicate that there is low-strength silty clay in the area. Development of these steeper areas cannot be recommended.

A northern portion, although probably affected by past movements has a more gentle slope. With extreme care it should be possible to develop this without the risk of movement becoming unreasonably high.

On lots 1, 2 and 3 septic tank effluent and sullage should be dispersed on the flat area around the house sites if possible. If this is not possible (perhaps in the case of lot 3) it should be piped down the ridge and dispersed well away from the house site. Dispersal in valleys or on the sides of valley features is not favoured. Houses on these three lots should not be built on or near the edge of the steep slope to the railway line. There is wide scope to choose a site on lot 1.

In the case of lot 6 a house site should be selected near the middle of the lot where the slope is even and away from the shallow valley at the southern boundary. Septic tank effluent and sullage should be dispersed either to the north or south of the house site, some 25 m or more away, and not downslope of the house.

[5 September 1986]

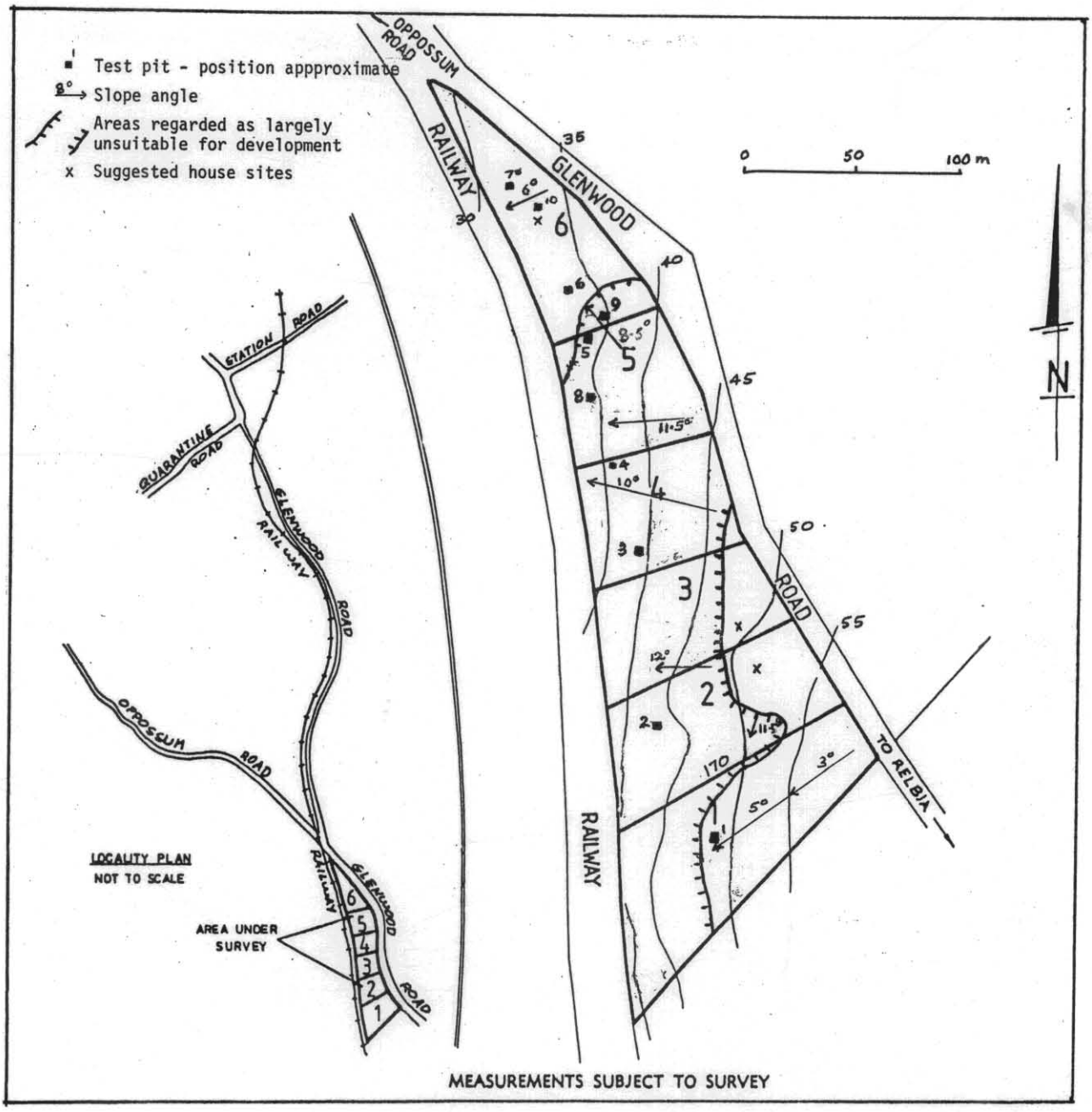

Figure 1. *Sketch plan of proposed subdivision.*

5 cm

SLOPE STABILITY ANALYSIS - COMPUTATIONS SHEET 1 OF 1

NAME OF SLIP ...LEICHARDT... MAP REF..EQ157077.....

ANALYSIS BY..RCD..
DATE ..1 SEPT '86..
CHECKED BY..WRM..

INITIAL INPUT			SHAPE *					
STORE	ITEM		STORE	ITEM		STORE	ITEM	
00	X L.H.S.	0 m	20	Y_1	0·5	31	Y_{12}	
01	Y L.H.S.	0 m	21	Y_2	1	32	Y_{13}	
02	X R.H.S.	50 m	22	Y_3	2	33	Y_{14}	
03	Y R.H.S.	7·5 m	23	Y_4	2·5	34	Y_{15}	
04	SLICES	10	24	Y_5	3·5	35	Y_{16}	
06	GAMMA	19 kN/m³	25	Y_6	4	36	Y_{17}	
07	C	0·9 kPa	26	Y_7	5	37	Y_{18}	
08	PHI	11 degrees	27	Y_8	5·5	38	Y_{19}	
09	r_u	0·5	28	Y_9	6	39	Y_{20}	
10	Y_{CIRCLE}	65 m	29	Y_{10}	7			
11	F_1	1	30	Y_{11}				

* Only enter Nº specified

CALCULATIONS

	F_1	F_2
Given as above		
Find F.O.S.	0·81	0·81
$r_u = 0·25$	1·17	1·17
$r_u = 0·25, Y_c = 100$	1·18	
$r_u = 0·5, Y_c = 65, C = 2·8$	1·04	

Given.....

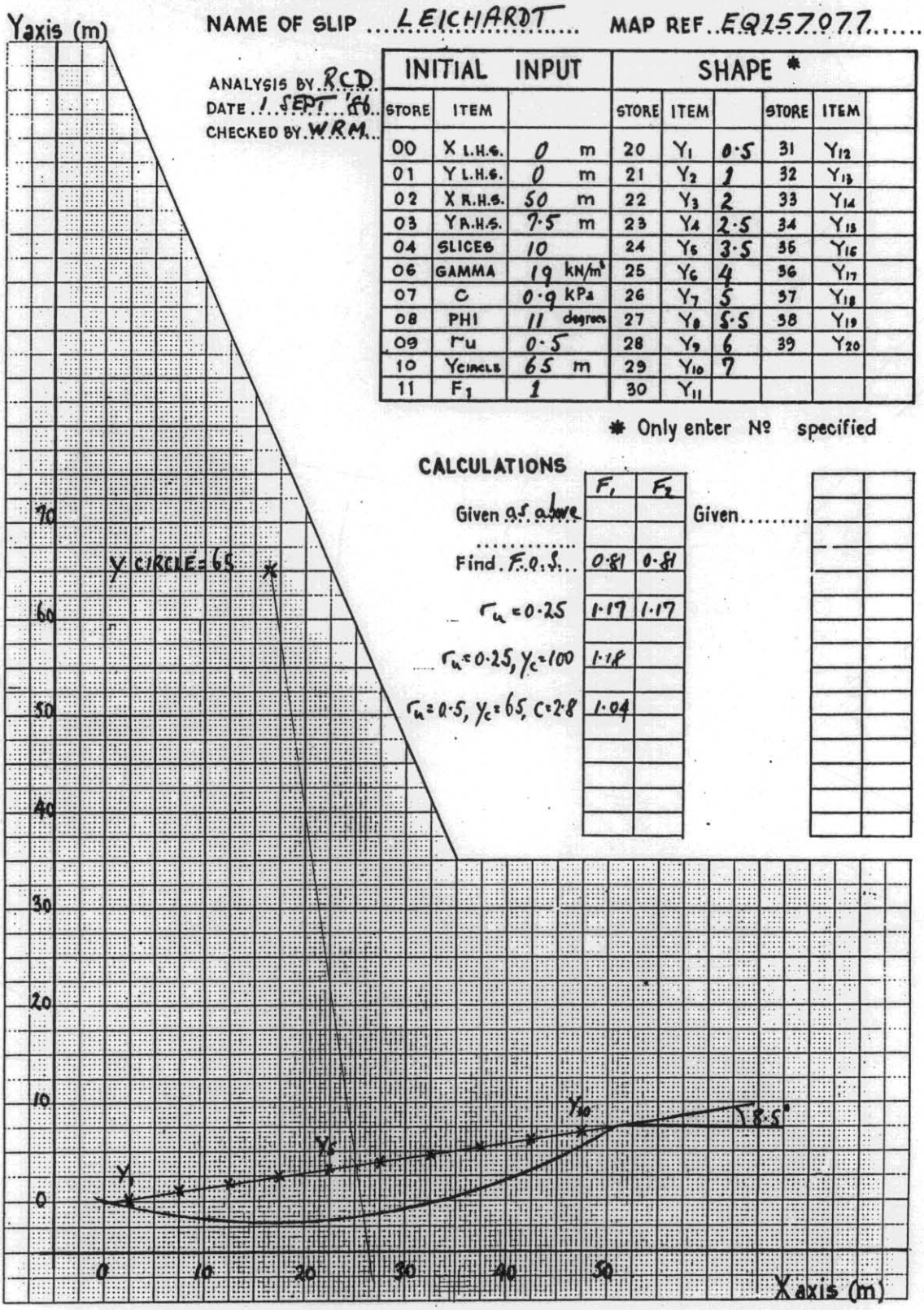

Figure 2. *Slope stability analysis.*

5 cm

APPENDIX 1

Logs of text pits

Depth (m)	*Description*
Pit 1	
0.0-0.7	Compacted quartz gravel with silty sand matrix, fragments up to 50 mm, quartz and iron oxide.
0.7-1.3	Brown, fissured clay, plastic, medium strength.
1.3-2.0	Brown and grey plastic clay, fissured.
Pit 2	
0.0-0.3	Gravelly sandy silt, quartz and iron oxide fragments.
0.3-0.6	Mottled red and grey sandy clay passing into more clay-rich material.
Pit 3	
0.0-0.4	Sandy soil followed by sand with a few grit sized fragments (quartz).
0.4-0.6	Brown plastic clay.
Pit 4	
0.0-0.5	Variable thickness of grey sandy soil with a few grit fragments.
0.5-0.8	Gravel made up of quartz and iron oxide fragments.
0.8-1.0	Red and brown mottled clay, soft patches.
1.0-1.05	Light brown plastic clay.
1.05-1.6	Grey and red mottled clay, soft zones.
1.6-2.8	Reddish sandy clay, fragments of iron oxide in zones on beds dipping east.
Pit 5	
0.0-0.4	Clayey gravel, dolerite and quartz fragments up to 120 mm across.
0.4-0.5	Soft grey clay.
Pit 6	
0.0-0.2	Brown and grey silty soil.
0.2-0.5	Black plastic clay.
Pit 7	
0.0-0.7	Light brown clay, fractured, soft towards bottom.

Pit 8

0.0-0.3	Chocolate brown sandy clay soil, roots.
0.3-0.9	Pebbly gritty and silty sand, friable, quartz pebbles up to 50 mm, dolerite boulders up to 100 mm.
0.9-1.8	Brown plastic clay, hard, small slip surfaces.
1.8-2.8	Grey and brown clayey grit with rounded quartz pebbles up to 70 mm but usually much smaller, easterly dip.

No seepage

Pit 9

0.0-0.3	Brown silty soil.
0.3-2.4	Bouldery gritty sand, some clay, large rounded dolerite fragments up to 150 mm, quartzite up to 70 mm. A 70 mm thick
2.4-3.3	Grey and brown plastic clay passing into red and grey plastic clay, fractured, moisture on joints and fractures in clay, dips east.

Pit 10

0.0-0.2	Brown clayey soil
0.2-0.8	Brown plastic clay, fractured
0.8-3.2	Pink, brown and grey mottled clay, some fractures, slip surfaces, moisture on surfaces, fairly stiff, 30 mm wide iron oxide band at 1.8 m on east side of pit dipping at about 30° towards west.