TASMANIA DEPARTMENT OF MINES
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Inspection of land at Craythorne Road, Rosevears

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A brief inspection was made of land running from north of Craythorne Road, Rosevears, to the West Tamar Highway. Most of the property is sloping, some of it at moderate to steep angles. The surface of a large proportion of the land is hummocky, suggesting that it has been subject to landslip in the past. The area is underlain by Tertiary sediments which are composed of brown clay where exposed by recent excavations. The higher parts of the land have numerous boulders of coarse-grained basalt but these are likely to have moved downslope from higher levels and *in situ* basalt is unlikely to underlie the block at shallow depth.

Much of the lot is in Class 4 on the landslip zone map of the Tamar Valley, i.e. it is in an area of old landslips or adjacent to such areas. An extensive Class 5 area (an active zone or adjacent area) occurs nearby and this has involved movement of the West Tamar Highway over recent times. Some of the lower slopes have a smooth even shape and are in Class 3 on the zone map.

There is some doubt about the future stability of much of the land because of the steepness and previous unstable history. A favoured house site, at the top of the northerly ridge, appears to have slightly more risk of becoming unstable than a slightly lower sloping ridge just to the south. The smooth, even-sloping land lower down probably has the least risk of being affected by unstable conditions. This last mentioned area must be regarded as the most favourable area for development as far as landslip risk is concerned.

It was thought advisable to dig some test pits on any area being considered for a house site to examine subsurface material and groundwater conditions. Depending on what is encountered, this may be only a first stage of the investigation, particularly for the more risky sites.

Test pits

Three test pits were dug near the favoured house site. The approximate locations of these pits are shown in Figure 1, with the test pit logs shown in Appendix 1.

The near-surface material in the upper two pits consists of soil and clay with some basalt boulders. Dominantly clayey material occurs at lower levels. The lower pit (3) consists of clay and silty clay for the whole depth. No free water entered the pits.

Some soil tests have been undertaken on samples from the pits (Appendix 2). This has included Atterberg limits, linear shrinkages, X-ray diffraction and a residual shear strength test.

The Atterberg limits show the clay from the pits to be of high plasticity. The X-ray analysis shows that kaolinite dominates the clay composition but significant quantities of montmorillonite are present, suggesting that the clay will have expansive properties. This is confirmed by the high linear shrinkage values. The strength test resulted in factors of $\phi' = 13$ and $c' = 6$ kPa being determined.

Trial slips have been drawn across the area and the above strength value has been used to calculate safety factors under varying conditions (fig. 2). When a possible large slip of about 200 m is considered, safety factors (F) suggesting high risk of instability are calculated (F values of 1.3 or greater are regarded as reasonably safe). When smaller slip circles are used values of F are fairly high under some conditions. If the water level in the theoretical slip is high (r_u value),

the F value is low; while if the water level is low, high F values are obtained.

The proposed house site appears to be in a relatively well drained situation, i.e. it is on a ridge structure with small valleys on either side and about 100 m apart. This suggests that the area will probably not accumulate water. However groundwater conditions at deeper levels should be examined and drilling to depths of 10–15 m is suggested. If material with similar shear strength to that obtained in the pits is encountered and water levels in the holes are low or absent, then this may be a favourable sign as far as development of the site is concerned. It will not be possible to say that there is no risk of landslip affecting the site, but it might be an indication that the risk is reasonably low. If on the other hand lower strength material is obtained and/or water levels are relatively high, it is probable that the risk would be considered too great for development to proceed.

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APPENDIX 1
Logs of test pits, Craythorne Road, Rosevears

Pit 1

0 – 0.2 m	Brown clayey silty soil, some basalt boulders, slightly moist.
0.2 – 1.1 m	Light brown plastic clay, stiff.
1.1 – 1.8 m	Pisolitic iron oxide gravel with basalt fragments in clayey material, top and bottom irregular (one large basalt boulder extends to 2.2 m on west side of pit).
1.8 – 2.65 m	Brown clay, a little grey mottling, plastic, stiff, moist but no free water, slip surfaces.

Pit 2

0 – 0.3 m	Brown crumby soil, basalt boulders, grass roots, moist.
0.3 – 0.6 m	Brown clay with iron oxide pisoliths, and basalt boulders, crumby, moist, some roots.
0.6 – 1.6 m	Brown clay, plastic stiff moist, some grey mottling towards base.
1.6 – 2.3 m	Grey clay with some brown mottling, stiff plastic, fractured, occasional slightly sandy zones
2.3 – 2.5 m	Brownish clay with impersistent thin layers of fine sandy zones, stiff but moist.

Pit 3

0 – 0.3 m	Brown silty clay soil, fairly dry.
0.3 – 0.8 m	Light brown and grey brown clay, fractured but soft (due to recent rains) and plastic where moulded.
0.8 – 2.65 m	Brown clay, fractured closely near top but more widely towards base, black stain on joints, some silty zones.

APPENDIX 2
Soil tests on samples from test pits, Craythorne Road, Rosevears

Sample	*Liquid limit*	*Plastic limit*	*Linear shrinkage*	*Plasticity Index*	*Clay fraction (XRD) (%)*				*ϕ′*	*c′*
					Kaolinite	*Montmorillonite*	*Goethite*	*Gibbsite*		
P1, 2.3 m	105	27	22	78	60	15	20	5	13	6
P2, 0.8 m	121	24	25	96	65	20	15			
P3, 2.0 m	87	26	21	66	65	15	15	5		

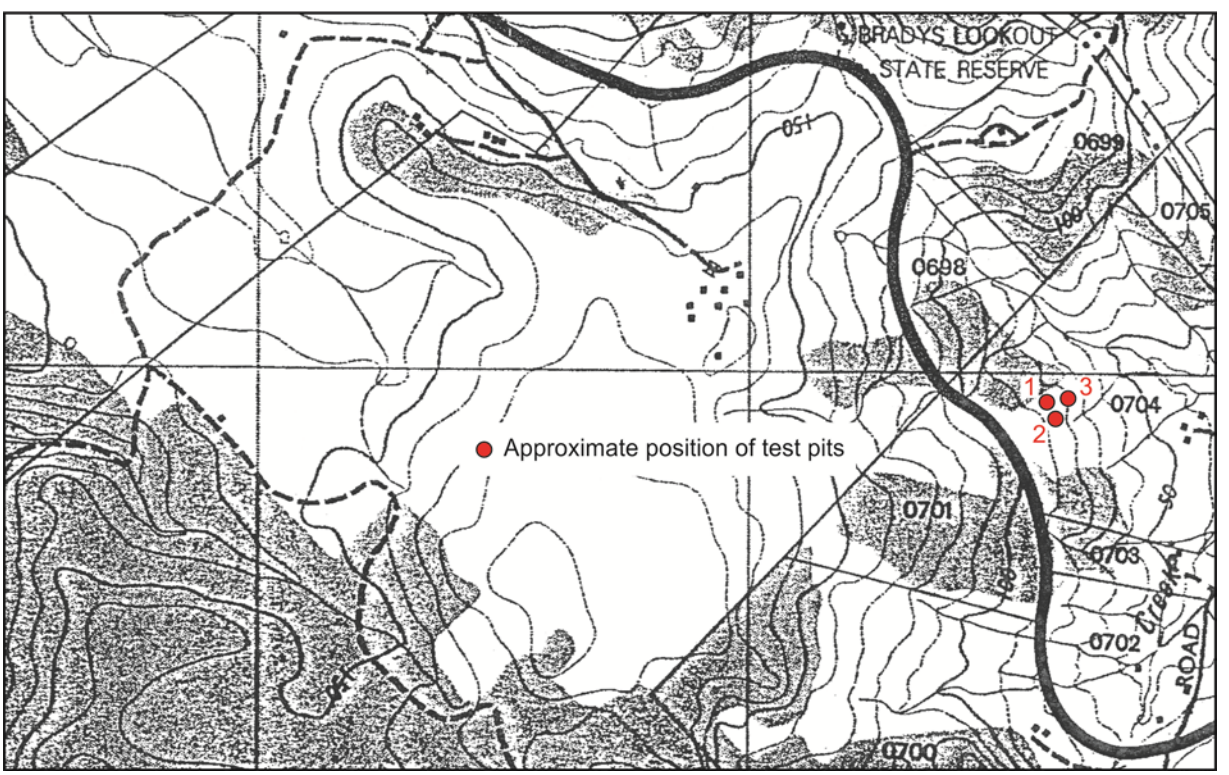

Figure 1

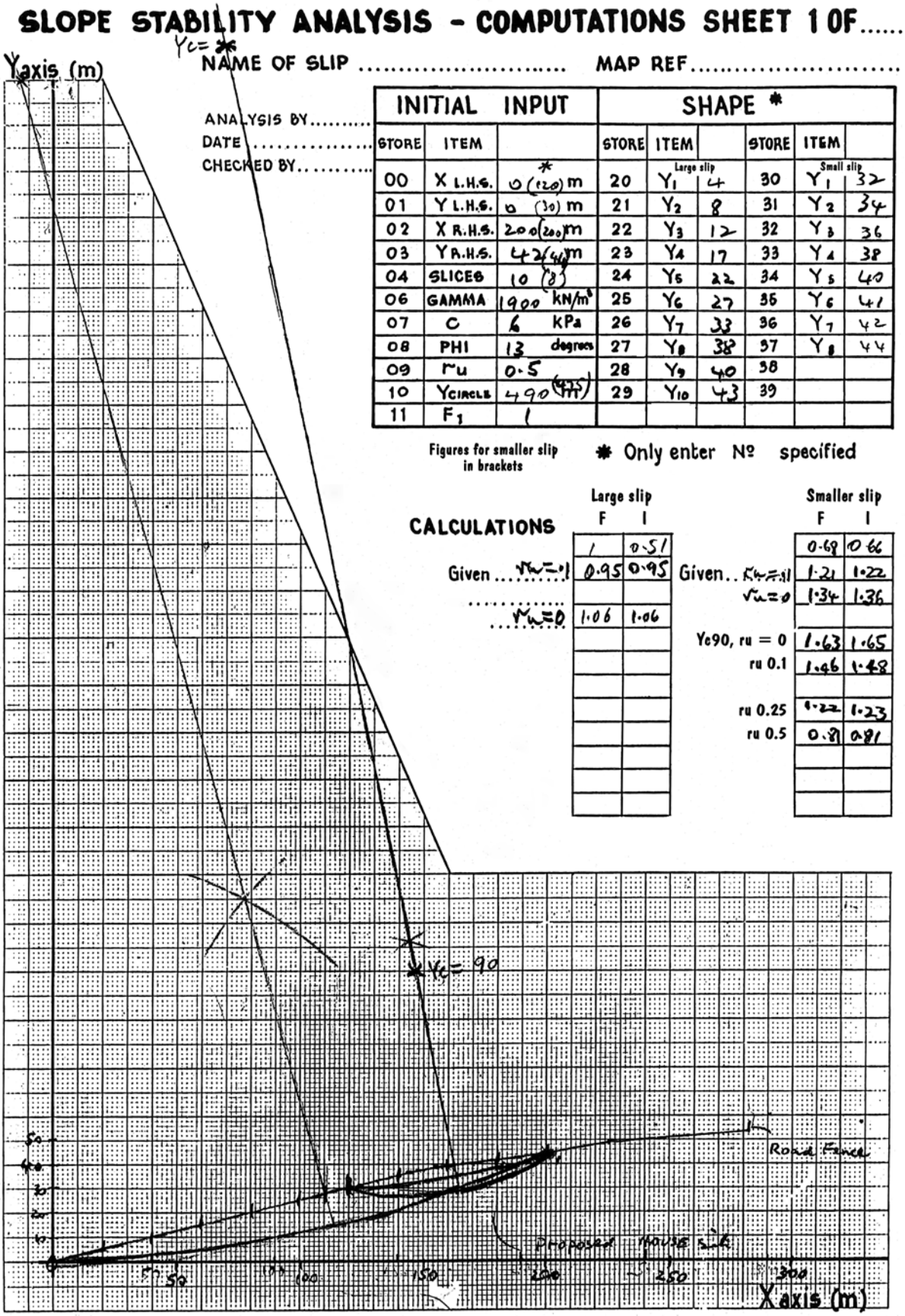
SLOPE STABILITY ANALYSIS - COMPUTATIONS SHEET 1 OF.....
NAME OF SLIP ..... MAP REF.....
ANALYSIS BY.....
DATE .....
CHECKED BY.....
Yaxis (m)
Xaxis (m)
Yc= *
Yc= 90
Road Fence
Proposed House
INITIAL INPUT
SHAPE *
STORE ITEM
Large slip
Small slip
00 X L.H.S. 0 (120) m
01 Y L.H.S. 0 (30) m
02 X R.H.S. 200 (200) m
03 Y R.H.S. 42 (46) m
04 SLICES 10 (8)
06 GAMMA 1900 kN/m³
07 C 6 kPa
08 PHI 13 degrees
09 ru 0.5
10 YCIRCLE 490 (475) m
11 F1 1
20 Y1 4 30 Y1 32
21 Y2 8 31 Y2 34
22 Y3 12 32 Y3 36
23 Y4 17 33 Y4 38
24 Y5 22 34 Y5 40
25 Y6 27 35 Y6 41
26 Y7 33 36 Y7 42
27 Y8 38 37 Y8 44
28 Y9 40 38
29 Y10 43 39
Figures for smaller slip in brackets
* Only enter Nº specified
CALCULATIONS
Large slip F I
Smaller slip F I
1 0.51 0.69 0.66
Given ... ru=.1 0.95 0.95 Given.. K4=.51 1.21 1.22
ru=0 1.34 1.36
ru=0 1.06 1.06
Ye90, ru = 0 1.63 1.65
ru 0.1 1.46 1.48
ru 0.25 1.22 1.23
ru 0.5 0.81 0.81

Figure 2