

UR1973-27

## Stability conditions near Launceston Church Grammar School, Mowbray.

P.C. Stevenson

Advice was sought by the Public Works Department on:

- (1) The type and quality of foundation available for an embankment over the river flood plain at Stephenson's Bend on the Tamar.
- (2) The likely stability of an embankment founded on mud in the river bed on the eastern side of Stephenson's Bend.
- (3) The stability of the existing slope between the river and Launceston Church Grammar School.

The results of this investigation could influence the route to be taken by the East Tamar Expressway.

The area was examined by the writer on 7 March 1973. Most attention was devoted to item 3 above as this could be readily examined visually.

## SLOPE STABILITY (3)

The northern part of the slope is wooded and has thick undergrowth. There are many small paths up and down the slope, but a general view is not possible. The slope lies at 25-30° and the surface soils are mainly sandy. Small exposures of the subsurface material can be found or can be dug and the material is usually gravelly sand (particularly at the top of the slope), clayey sand, or poorly indurated lithic sandstone. Toward the bottom of the slope purer clays are seen, the best exposure being just above the riverside path about 40 m downstream from the school boathouse. Here light coloured clays of high plasticity are fretting out of the slope and where moist are very soft. Because of the soilwash on the steep slope the thickness of these clays is not determinable but may amount to 6 or 8 m from river level upwards.

The southern part of the slope inland from the boathouse is much flatter and the contours and slope profile are both concave. This area is cleared but has been planted with pines to aid the slope stability. The rock materials here are not apparent, but the sandy soil high on the slope and the moist patches which occur even in dry weather would appear to indicate that clay is present in the lower part of the slope here also.

The relationship outlined here, of gravels and sands overlying clays, is known from other areas in the Tamar and generally results in steep slopes or even cliffs, for instance at Legana Cliff. The sands at that locality are not sufficiently stable to support themselves and have failed, resulting in cliff falls on a large scale. The clays can also bring about the failure of the sands, but are not an essential ingredient if the face is steep enough. Where they are effectively present, slopes of 12-20° are failing. At the slope in question at Mowbray no bulk failures either in sands, sandstones or clays are seen, the main mode of movement being slope rainwash of the sands where vegetation is thin or absent. The slope is less steep than at Legana.

The stability of the slope at Mowbray is therefore dependant to a great degree on the proportions of the rock materials present. The control of groundwater exercised by even thin clay bands could be a powerful destructive influence, quite apart from the bulk failure of the clays themselves.

The present vertical slope profile must be regarded as a transient

feature brought about by the balance between rock strength, weathering forces and river erosion. Any disturbance of this dynamic equilibrium by a cutting for a road, and consequent steepening of the slope, must be compensated for by the provision of additional support, drainage, slope protection and river control, and the amount of compensation needed will depend on the 'vulnerability' of the rock materials present. Present knowledge of the materials in the Tamar basin would indicate that this vulnerability to disturbance is high.

FLOOD PLAIN AND EMBANKMENT (1, 2)

It was only possible to make a limited assessment of the material in the river bed and below the flood plain. The Recent surficial deposits of the Tamar are sands and muds, predominantly the latter. Experience from the Gorge Bridge embankment provides a good indication of the material present. The deeper material would without doubt be largely Tertiary clays with an unknown proportion of sands. Drilling on the North Esk flood plain in connection with the Bell Bay Railway showed about 10-12 m of soft or very soft clayey silt overlying firmer clays, sands and gravels. It is not clear whether this is wholly Recent flood plain material or whether part lies within the Tertiary succession below it, but nevertheless the indications are that no substantial foundation can be expected either in the river bed or below the flood plain.

RECOMMENDATIONS

The suppositions as to the rocks present in the steep slope below the river bank and below the flood plain are based on some indirect evidence, and should be tested by a drilling programme.

Three holes are required.

- (1) Near the Junior Boarding House of the school on the crest of the slope, continuously cored to 6 m below river level (about 45 m in all). Water levels should be recorded.
- (2) On the riverside path to determine the thickness and nature of the river deposits and underlying sediments, continuously cored to 20 m.
- (3) On the flood plain to the south of the school and at least as far out into the river flats as the proposed route for the road, continuously cored to 20 m to determine the nature of the river deposits and any underlying sediments.

The results from this programme would clarify the nature of the rocks present and enable the vulnerability of the slope and the problems of the river bank and flood plain to be better estimated.

[16 March 1973]