

1980/10. Examination of a landslip at Blackwall

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Abstract

A small embankment failure just north of Blackwall Post Office occurred after a period of heavy rain. Tertiary sediments with a very high liquid limit and plasticity index and containing montmorillonite with moderate amounts of kaolinite and quartz overly weathered dolerite. Possible remedial measures include placing a wedge of gravel or boulders against the slope or moving the road away from the embankment edge. This should be combined with some drainage measures.

INTRODUCTION

Gutteridge, Haskins and Davey Pty Ltd, consulting engineers to the Beaconsfield Municipal Council, requested an examination of a landslip about 200 m north of the Blackwall Post Office [DQ964273]. The slip occurred on the embankment between the road and the River Tamar and the heel cuts the edge of the road.

RELIEF AND GEOLOGY

The road is situated on the edge of a flat area about 100 m wide above the River Tamar. At the site where the slip has taken place, the bank to the river is about seven metres high and the slope angle is about 45° or greater. West of the flat area, the land surface rises to a low ridge.

Jurassic dolerite underlies the ridge west of the road and is also exposed at some points along the foreshore. Weathered dolerite is exposed along the shore at river level south of the slip; north of the slip it is exposed in the embankment to within about two metres of road level, but is not exposed on the foreshore. Overlying the weathered dolerite just north of the slip is about 0.6 m of bluish brown plastic clay, which is in turn overlain by soil derived from weathered dolerite and road fill material containing some quartz gravel. In the heel of the slip there appears to be at least 1.5 m of plastic brown clay which is overlain by 1.2 m of sand below the road level. The debris from the landslip covers the lower part of the slope, so it is not possible to determine the position of the clay/ weathered dolerite contact. It is apparent that the thickness of the Tertiary sediments is variable and that at the slip at least, it is a little thicker than to the north.

A stone wall along the base of the slope appears not to have been disturbed by the movement, suggesting that weathered dolerite extends to at least the level of the top of the wall. Further south, debris from the top of the slope covers the slope from top to bottom, and none of the underlying material can be seen.

A sample of clay from the slip was subjected to X-ray analysis (mainly the fine silt and clay fraction of the sample). A large percentage of the sample was montmorillonite with moderate amounts of kaolinite and minor amounts of quartz. Atterberg limits on the clay involved in the slip indicate very high liquid limit and plasticity index.

These limits were; LL = 152.6 PL = 32.4
PI = 120.2 LS = 25

(Atterberg determinations by R. Woolley, Department of Mines)

DESCRIPTION OF SLIP AND SURROUNDING AREA

The slip is 3-4 m wide along the embankment and involves only a few cubic metres of material. However its heel just encroaches on the edge of the road and further movements, either adjacent to or behind it, could seriously effect the road. The slip is a small slump on the steep slope and apparently occurred during or after very heavy rain in late November, 1979. It is likely that much of the slope became saturated with water due to runoff and groundwater percolating to this area. On the west side of the road there is an open drain with an unsealed base which allows ponds of water to form just behind the slip. From the appearance of the water, it is apparent that a large proportion is sullage from nearby houses, and if this can seep under the road it would ensure that the slope from the road to the River Tamar is kept in a moistened and soft state.

REMEDIAL MEASURES

Although the slip is small, further movement could be aggravating. As a first step, the drain along the west side of the road should be altered to ensure that water does not accumulate at particular points (e.g. just behind the slip area). If, as suspected, much of the water in this drain is sullage, it may be possible to redirect it so that a much smaller proportion reaches the drain along the road.

If it can be shown that weathered dolerite extends up the embankment above the shoreline, as suspected, a wedge of gravel or rock fill could be packed against the embankment. To determine this would require some excavation of the slip material, preferably in a dry period. If there is no weathered dolerite on which to found the wedge, it may be necessary to fill the area from the shoreline up to road level. An alternative to these would be the moving of the road inland away from the river, which would allow flattening of the slope from the road to the river.

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