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LANDSLIP NEAR CEMETERY HILL, PENGUIN

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The area of the slip is located about half a mile west of Penguin and has affected the Bass Highway and, to a lesser extent, the railway line, which here both run within a few chains of the sea, the railway being the closer. At this point the highway curves round a small hill, but the slope from the sea is not steep and in the slip area is only about 10°.

Geology

Basalt outcrops to below low-water mark, filling in an old river valley which entered the sea west of Cemetery Point, a prominent landmark of hard siliceous Cambrian rocks. On top of the basalt in some places is alluvial material consisting mainly of clays, but containing some pebbles and one small gravel bed. My first impression was of three distinct lava flows with alluvial clay in between but the results of boring seem to indicate at the most two flows and that most of the alluvial material is subsequent to the lava flows. A complication is the area of land, rather like a terrace, between bores 2 and 4, which is the result of an earlier slip.

Causes of Slip

Movement commenced about the middle of June, and the factors leading up to this movement of ground are:—

1. The excessive rainfall of the preceding six months. This was about 50 per cent higher than average and included 8½ inches for April. It is no coincidence that previous bad slips occurred in September, 1931, when the rainfall for the preceding six months was again well above the average, and for June twice the average amount. Thus it would appear that it takes two to three months for this heavy rainfall to percolate through the soil to the slip planes.
2. The recent ploughing of extra land, above and in the slip area, allowed a greater percentage of rain-water to seep through the soil.

The actual main slip itself was caused by the lubrication of a bed of very fat clay just above the road and a few feet below the old surface. This bed is only a foot or so in thickness, but it has a slope towards the sea and sufficient water soaked through the overlying material to cause the upper surface of this clay bed to become very slippery and all the material above it to move. Thus the slip started near the highway and gradually caused more dirt to slip from higher up the hill.

Recommendations

There is only one remedy to prevent or arrest this type of earth-flowage and that is adequate drainage. To this end, several visits have been paid to the area and discussions on type of drainage made with P.W.D. engineers. My first visit was on June 19th,

within a week of the commencement of earth movement, and the site of the top major drain selected. This was sited well above the slip area and also above the old slip and was designed to bottom on an impervious clay bed and the water led off to the western end of the drain. Minor drains were to be dug near the base of the slip and pass beneath the highway.

By my second visit, on the 4th of July, the top drain had been dug. Unfortunately, although it had bottomed on clay at either end, the centre portion had a permeable material for a base and furthermore was at a lower elevation than the ends. Consequently, all the water soaking down the hill was collected on the clay at either end and passed down through the centre of the drain, some of it coming out at the surface a few feet down the hill, and some of it continuing to run below the surface soil. A large storage of water was thus built up behind the old landslide which acted as a kind of dam and further slipping could be anticipated. Further discussion resulted in the suggestion that this top drain should be sunk to clay for its entire length, even though the centre should be much lower than the ends, and the water caught in it should then be piped to below the road. A departmental hand-boring plant had been made available, and a series of holes were suggested, to investigate the depth to basalt, the type of overburden and the amount of water.

On 7th August, when I last visited the slip, the top drain had been completed and filled and the pipes nearly all laid, some junctions being not yet available. I suggested two more bores; one to the east and the other to the west of No. 2. This was the bore which did not bottom on basalt but had to be abandoned because of excessive water and was put down on the top side of the old slip. The object of these bores is firstly to find the depth to rock, but principally to determine if, now the top drain is completed, the amount of water dammed behind the old slip has lessened. If it has not, then there is danger of further minor earth-flowage in the vicinity of the cabbage patch, and some sort of horizontal drain will have to be put in underground. I am inclined to think, however, that when the top drain is finally completed and no more water is allowed to seep from it, then the amount of water dammed behind the old slip will gradually abate and only minor slips will occur.