High Halstow, Kent

[TL 777 756]

Introduction

The area of north-facing hillslope immediately north of Cooling Road at High Halstow in north Kent (Figure 8.3) and (Figure 8.4) is one of very few remaining areas that demonstrate low-angle mass-movement phenomena on inland slopes of London Clay. Many London Clay slopes elsewhere have been stabilized by drainage works in connection with agricultural improvements and forestry, whereas this site remains in a relatively natural condition.

Description

High Halstow demonstrates failure on a slope of about 8°. The physical expression of this is a series of ridges and small scarps running across the slope.

Mass movement on the slope at High Halstow occurs at an extremely slow and irregular rate, responding only to exceptionally wet weather conditions. As landsliding proceeds, the slope naturally degrades to a gentler angle. The slope is undergoing 'free degradation', that is, degradation solely under the influence of weathering and climate, with no removal of material at the toe, a process examined in detail at Hadleigh Castle, Essex, by Hutchinson and Gostelow (1976). In time it will reach the angle of ultimate stability, that is, the angle at which future natural stability is assured (Skempton and DeLory, 1957). Hutchinson (1967, 1973) has shown through detailed study of many slopes that the angle of ultimate stability on inland London Clay slopes is about 8°, and that slipping does not take place on slopes of lower angle than this. The co-incidence of the angle of the slope at High Halstow with this limiting angle of 8° implies that the slope at the site is only just unstable, and that further degradation of the slope is unlikely. Hutchinson (1967) has described the slip as consisting of successive or stepped rotational slips, having some small bare scarps less than 1 m in height.

Interpretation

The scarp features are characteristic of hillsides that appear to represent a late stage in the free degradation of slopes once steepened by marine or fluvial action. The behaviour of London Clay cliffs following cessation of erosion at their toe has been described by Hutchinson (1967) and summarized by Skempton and Hutchinson (1969) and Hutchinson (1973) (Figure 8.2). The cessation of erosion may occur naturally through abandonment of a cliff, or be effected artificially through the building of defences against toe erosion. Immediately following abandonment, the cliff tends to fail by shallow rotational slips. No case is known of a base failure initiated on an abandoned cliff of London Clay. Initially, the shallow rotational slips may encroach upon the cliff-top, but with time their size tends to diminish. As no debris is removed from the foot of the cliff; all of the slipped material comes to rest there. A highly characteristic feature of many abandoned cliffs is thus a bi-linear profile composed of a steeper upper slope on which landsliding is initiated (the degradation zone) and a flatter lower slope (the accumulation zone) of colluvium.

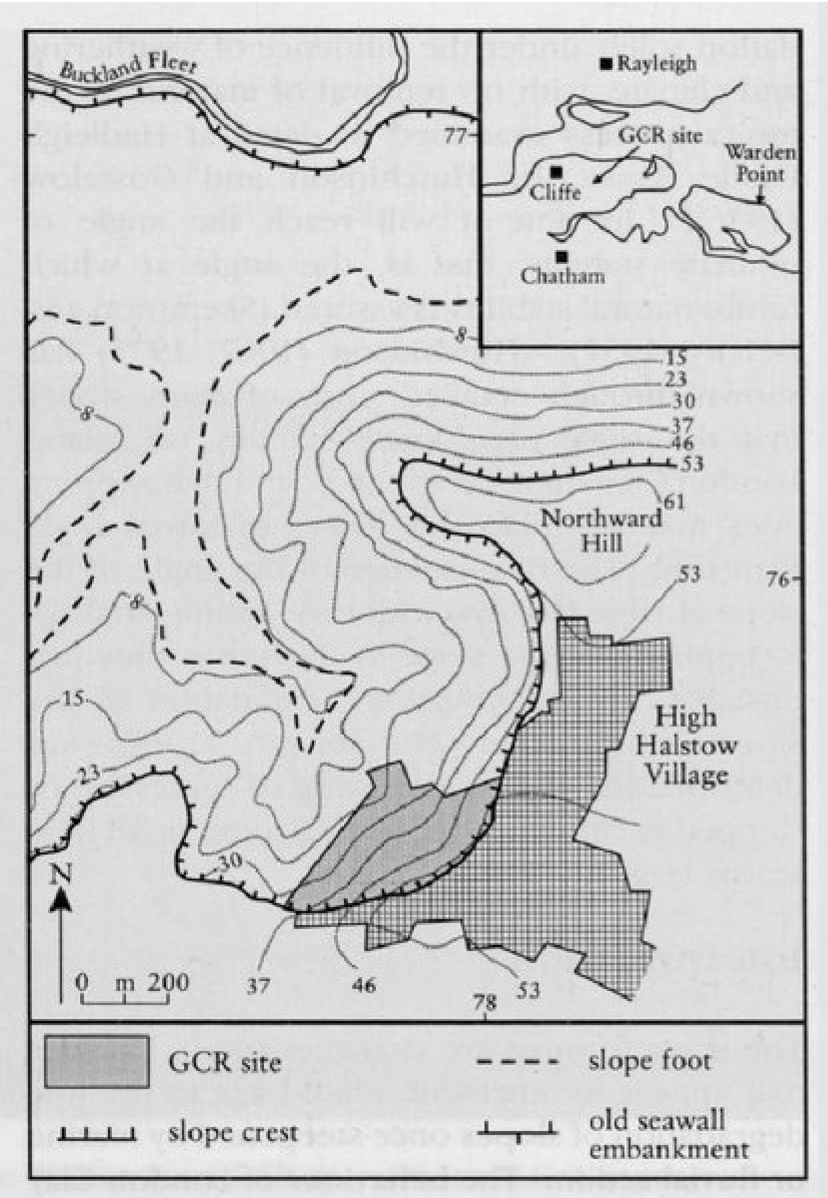
Under the action of shallow rotational slides the slope of the degradation zone is reduced, with time, to about 13°. At about this inclination, the slips occupying the degradation zone and at slopes below 13° are found to be of successive rotational type. These may be either regular (stepped) as at High Halstow, or irregular (mosaic) in plan. The retrogressive succession is probably initiated by a shallow rotational slide at the lower end of the degradation zone. Successive rotational slipping then proceeds until the slope of the degradation zone has been brought down to its angle of ultimate stability against landsliding. The slips then become quiescent and are gradually converted first into undulations and finally into a smooth slope by hillwash and soil creep.

Since the site is remote from streams and rivers it is unlikely that it has been subjected to significant post-glacial erosion. It is probable, therefore, that it is mantled by solifluction deposits and hillwash, the thickness and properties of which largely determine the present slope form and behaviour. As both solifluction-mantled London Clay slopes and solifluction-free London Clay coastal cliffs appear to have the same 8° limiting angle, this points to the seat of failure lying beneath the mantle and in the London Clay. The 8° limiting inclination would suggest, using the assumption of Skempton (1964), that the residual angle of shearing resistance o_r', lies between 11° and 15°.

Conclusions

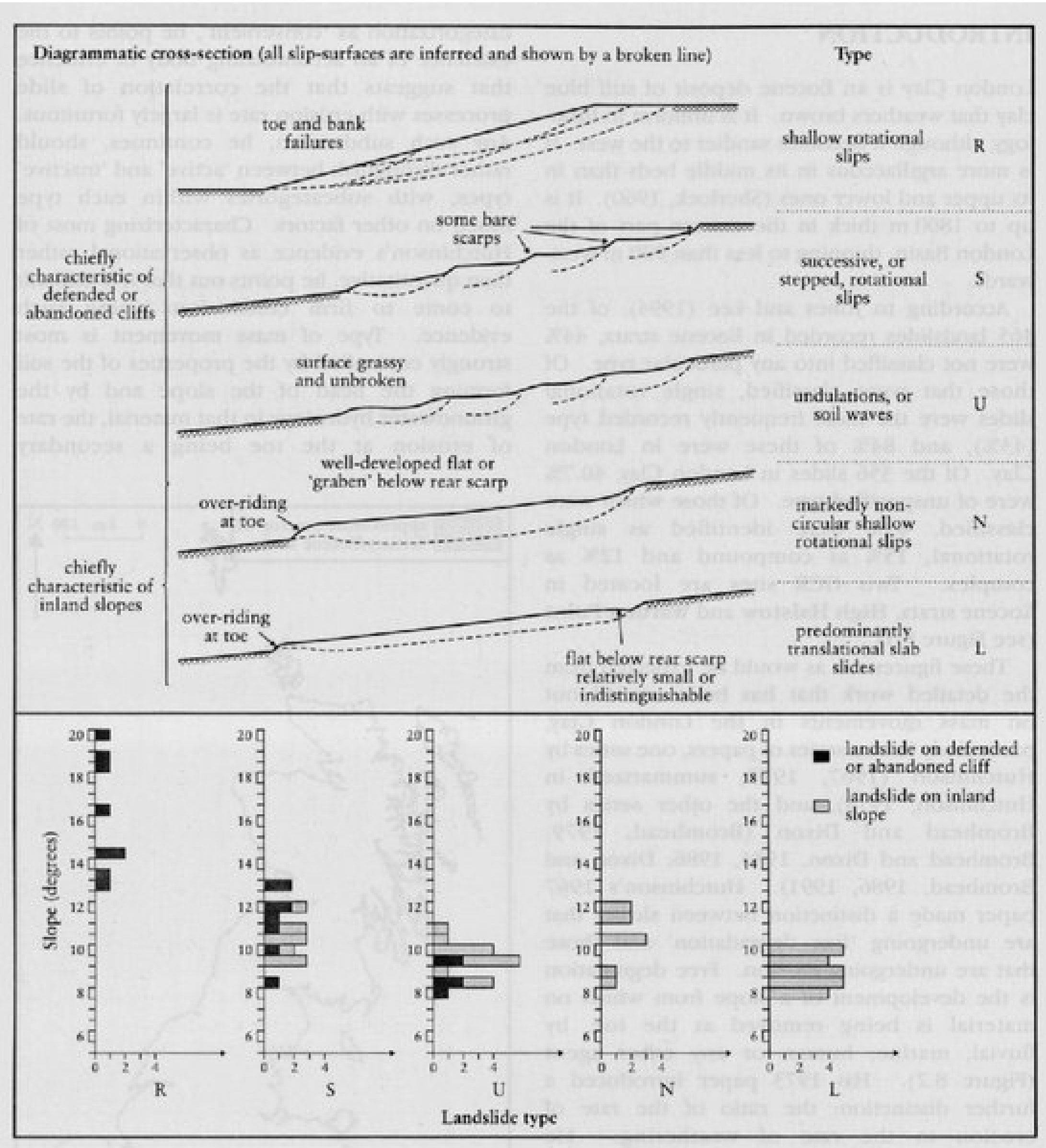
The slope at High Halstow represents a late stage in the process of free degradation, and the slips, although still occasionally active, are liable to become quiescent. It is the lowest-angled slope on which failure is known to be current in Great Britain.

[References](#)



(Figure 8.3) Location of the High Halstow GCR site.

(Figure 8.4) High Halstow in 1938 showing the failure of the lower slopes of the landslide. (Photo: reproduced courtesy of British Geological Survey. IPR/88–06CGC.)



(Figure 8.2) Behaviour of London Clay cliffs following cessation of erosion at the toe. Cross-sections and slope-angle histograms illustrate the types of landslide found on slopes in London Clay as described by Hutchinson (1979).