A CONCEALED SEA CLIFF AND LOW-STAND WAVE-CUT PLATFORM ON THE ISLE OF PORTLAND, DORSET, UK

R.W. GALLOIS

Gallois, R.W. 2013. A concealed sea cliff and low-stand wave-cut platform on the Isle of Portland, Dorset, UK. *Geoscience in South-West England*, **13**, 222-227.

A topographical feature at the foot of an extensive landslipped area on the Isle of Portland, which appeared at first sight to be the back-face of a small coastal landslide, was proved by continuously cored site-investigation boreholes to be the top of a concealed *c.* 35 m-high cliff in Kimmeridge Clay that is fronted by a wave-cut platform at *c.* -20 m below present-day sea level. The platform is overlain in part by sand and gravel which is interpreted as a beach or shallow marine deposit. The cliff and wave-cut platform are now concealed beneath Pleistocene solifluction and landslide deposits of presumed late Pleistocene age. Comparison of the height of the Portland wave-cut platform with those of submerged wave-cut platforms and raised beaches elsewhere on the Western Approaches and English Channel coasts, some of which have been dated by amino-acid or radiometric methods, does not enable the age of the Portland platform to be determined. Differences in the rates of crustal subsidence and uplift along the English and French coasts during the past 500,000 years make it impossible to determine the heights with respect to global sea level at which the raised beaches and submerged platforms were formed. In the absence of quantitative evidence the simplest interpretation is that the Portland wave-cut platform formed in a cool temperate climate during a still-stand period when sea level was falling, possibly in the early cooling phase of Marine Isotope Stage 5, *c.* 110,000 years ago.

92 Stoke Valley Rd., Exeter EX4 5ER, U.K.
(E-mail: gallois@geologist.co.uk).

Keywords: Isle of Portland, Dorset, concealed cliff, low sea level, Pleistocene, Holocene.

INTRODUCTION

A closely spaced pattern of continuously cored boreholes was drilled to investigate the ground conditions beneath and adjacent to a proposed underground gas-storage site on the Isle of Portland (Figure 1). The Upper Osprey site, formerly Ministry of Defence, on the north east coast of the island is underlain by artificial (Made Ground) and natural (Head and Landslide Deposits) Quaternary deposits (collectively referred to as Drift Deposits on British Geological Survey maps) which wholly conceal the outcrop of the Kimmeridge Clay Formation. The Made Ground consists of waste from extensive Portland Stone quarries on the plateau that overlooks the site, and locally sourced materials which have been shaped into embankments and levelled areas. The Head and Landslide Deposits include large blocks of Portland Stone derived by toppling failures from the cliffs above the site, and laterally and vertically variable landslide and solifluction materials. The site-investigation boreholes drilled onshore and in the adjacent offshore area proved Drift Deposits ranging from 1 to 28 m in thickness. These have been interpreted as four types on the basis of their distribution and lithology (Gallois, 2007):

1) Translational landslide deposits derived from the Portland Group: fine-grained sand and silty sand with angular limestone clasts ranging from granule size to blocks up to 10 m across; well exposed in sea cliffs adjacent to the site.
2) Solifluction and/or translational landslide deposits derived from the Portland Sand and the highest part of the Kimmeridge Clay: sandy and silty clay matrix with mostly small-and medium-sized siltstone clasts.
3) Solifluction and/or translational landslide deposits derived from the Kimmeridge Clay and reworked Portland Group debris: grey clay matrix with common small- and medium-sized siltstone, limestone and sandstone clasts.
4) Solifluction/mudflow deposit derived wholly from the Kimmeridge Clay: grey clay with few or no clasts.

DESCRIPTION

The Quaternary Deposits at the Upper Osprey site can be divided into two distinct groups based on their distribution and thickness. In the middle and upper parts of the site, uphill from a well defined change in slope angle (Figure 1) that is interpreted here as the top of a concealed cliff (see below), the Drift Deposits form a relatively thin (1.0 to 9.5 m thick) undulating sheet-like deposit made up of lenticular layers of drift types (1) to (3) that roughly mimic the shape of the ground. They represent successive mudflow and translational landslide deposits that moved across the top of the Kimmeridge Clay. At their base, they locally rest on a layer of *in situ* complexly folded Kimmeridge Clay with dips of up to 75°. This and similar structures in Lias Group mudstones at Lyme Regis and Seatown in west Dorset have been interpreted as creep folds that formed intermittently in partially frozen, near-surface