MANAGING THE CLIFFS AT BARTON ON SEA

INTRODUCTION

The object of this paper is to demonstrate how different patterns of development of the cliff top land at Barton on Sea have created quite separate management strategies for the West Barton (commonly known as Naish) and the East Barton coastlines; and also to show how SSSI designation of the cliffs and the effects of long established protection works updrift have influenced matters.

GEOLOGY AND TOPOGRAPHY

In order to understand the processes and problems a brief appraisal of the geology and topography of the area is necessary.

Barton on sea lies near the centre of Christchurch Bay facing approximately due south. To the south west, the direction of predominant winds, lies open ocean with a maximum fetch of 4000km to the coast of South America, although storm waves are attenuated by refraction and passage through shallow water on entering Christchurch Bay. Nonetheless, this is a high wave energy coastline suffering severe storm wave attack.

The cliffs rise to a height of about 30 metres and generally comprise plateau gravels overlying the Upper, Middle and Lower Barton Clays. At the base of the Upper strata is the Chama Bed which consists of water bearing sandy, silty clays. The Middle and Lower Barton beds comprise stiff clays with mudstone, sand and shell layers, and dip eastwards at a slope of about 1 in 50.

Water percolating down through the sands and gravels is halted by the clay strata and issues from the cliff face as springs, causing slumping and sliding of the saturated material. This results in a tumbled, unstable topography which is accentuated by wave erosion at the base of the cliffs. Before the construction of coast protection works erosion was worse at East Barton than at Naish where the stiff clays below the unstable, waterlogged Chama Bed rise higher above sea level.

Recession of the cliffs due to the combined effects of wave attack and groundwater is recorded as being up to 0.5 metres a year until the 1950's, since then it has accelerated to 1.5 metres or more where cliff drainage and toe protection works have not been carried out.

USE AND DEVELOPMENT OF CLIFF TOP LAND

Land uses on the cliff top at East Barton and Naish have developed quite differently. Ordnance Survey (OS) maps from the late nineteenth century show only scattered agricultural buildings near the coast; the nearest settlement to the sea being Milton, now New Milton, about five miles away.

Current OS maps show a very different situation with intensive residential and commercial development spread in a 2km wide strip from New Milton all the way down to the coast. However, at Naish the cliff top land has been developed as a holiday camp

occupied only by wooden chalets and caravans which are moved back away from the sea as the cliff erodes.

By the 1930's substantial and expensive properties lined Marine Drive at East Barton and the continuing erosion of the cliffs was causing concern. As a result some limited cliff toe protection works were installed but were not properly maintained and fell derelict during World War II when access to the beach was prevented. No attempt was made to halt or reduce erosion at Naish.

DEVELOPMENT OF THE CURRENT COAST PROTECTION WORKS

By 1960 cliff recession had brought the cliff edge at East Barton to within 10 metres or so of the group of shops, flats and cafes on the South side of Marine Drive, and the then Borough of Lymington engaged Sir William Halcrow and Partners to carry out a study and develop a suitable protection scheme. Again the Naish frontage was ignored in favour of the heavily developed east Barton area. Between 1964 and 1968, in accordance with Halcrow's recommendations, 16 timber groynes and a flexible timber piled revetment backed by rockfill were constructed along the whole 1.8km of the East Barton frontage. An extensive cliff drainage system was also installed during this period.

In 1969, in response to accelerating erosion of the Naish cliffs, Halcrows proposed that the East Barton protection works be extended westwards as far as Chewton Bunny on the Christchurch boundary. Cliff erosion in Christchurch Bay became a significant problem following the construction oin 1938 of the long groyne at Hengistbury Head which virtually stopped the natural eastward drift of beach material from Poole Bay into Christchurch Bay, thereby starving the beaches of shingle. Beach recession led to increased wave attack on the cliff base and a faster rate of erosion. The limited amount of beach building material arriving at the western end of Christchurch Bay, together with the material being supplied by erosion of the unprotected cliffs, were not sufficient to maintain a natural stable beach at Naish. This problem was accentuated by the construction of substantial protection works at Christchurch, again in response to the conditions created by the Hengistbury groyne.

However, due to the lack of permanent development and the consequent low value of the land on the cliff top at Naish, the cost of groyning the beach, protecting the cliff toe and draining and regrading the cliff face in a manner similar to East Barton could not be supported. Halcrows then proposed an alternative scheme to limit, but not stop, erosion by forcing a stable bay to form between two artificial headlands, one at each end of the Naish cliffs. This was accepted and in 1972 the first timber groyne of the Barton works near the Naish boundary was converted into a rock headland or "strongpoint"; the Chewton Bunny outfall structure forming the western headland.

In theory a substantial stable beach should have formed which would protect the cliff toe against storm wave attack, leading to a diminishing rate of erosion as the cliff face approached a stable angle. Unfortunately, in practice, Naish beach continues to suffer significant seasonal variations in volume, and though substantial storm beaches do build up they remain a transient feature.

In 1985 a further scheme was proposed for constructing three rock strongpoints and a rock revetment along the cliff base, and for drainage and regrading of the cliff face. The theory being that if a single stable bay would not form between Chewton Bunny and

Barton then a series of small stable bays should form between additional headlands or strongpoints built along the Naish frontage. This was based on monitoring of the East Barton works where five strongpoints, built in the 1970's to replace eroded timber groynes, were successfully controlling the movement of beach material.

This scheme was not constructed for three reasons:

Firstly it was impossible to show a positive benefit/cost ratio for spending £1.3 million to protect low value land used for holiday accommodation. The benefit cost analysis showed a ratio of about 6 to 1 against this particular scheme.

Secondly, since the East Barton works had been constructed, the whole Christchurch Bay coastline had been designated a Site of Special Scientific Interest (SSSI) because of its internationally important geological formations. Natural England, therefore, raised an objection to the proposed works on the grounds that they would cover up parts of the lower Barton Beds and, by regrading and stabilizing the cliff face, prevent the exposure of fresh fossil traces by natural erosion.

Thirdly, because of the very limited volume of beach material arriving at the western end of the Naish frontage, due to the conditions created by the Hengistbury groyne and the Christchurch works, the naturally eroding sands and gravels from Naish cliff form an important source of supply not only to Naish beach itself but also to Barton beach. If this supply was completely cut off then regular recharge of the Naish and Barton beaches with imported shingle would be necessary at considerable expense.

CURRENT AND FUTURE STRATEGIES

At Naish quarterly monitoring of the changes in beach and cliff profile combined with volumetric analysis by means of a digital ground modeling program, are helping to provide a better estimate of the contribution which eroded cliff materials make to the sediment budget of the whole Naish and Barton coastline. In tandem with this work, Natural England have been asked for advice about the location of the more important and vulnerable geological features in the cliff face, and the cliff top landowner and the Council's planning department are being consulted about future development strategies and constraints, and possible changes in land use and value. Naish foreshore is leased by the District Council as an amenity beach and a contingency valuation study is planned to determine the recreational value of it to residents and visitors.

The future strategy for Naish is, therefore, dependent upon the outcome of the investigations and consultations outlined above, but will be based on the following principles:

- Any proposed scheme will be designed to reduce the rate of cliff erosion rather than halt it altogether

- It will seek to maintain a more stable beach without resorting to costly structures or shingle recharge

- It will aim to complement protection works carried out adjacent to Chewton Bunny by Christchurch Borough Council

- It will avoid causing damage to important geological features and will, therefore, be very unlikely to include cliff drainage or regrading works

- It will aim to improve the recreational value of the beach

At East Barton the protection and drainage works described above have completely destroyed or obliterated all features which were of geological interest and importance. However, they have been very effective in halting erosion of the cliff toe and generally successful in stabilizing the undercliff. (The area of cliff between the near vertical rear face and the toe). However, the oversteep rear cliff face continues to recede due to unraveling of the sand and gravel matrix by aerial erosion, and also because of block sliding caused by tension cracking.

There is no practical method of preventing tension cracking or aerial erosion and these will continue until the rear face reaches its natural angle of repose.

The timber groynes and revetment at East Barton have never controlled shingle movement along the beach as effectively as anticipated because wave reflection off their almost vertical faces causes localized scouring of the shingle from the beach. However, the rock strongpoints mentioned above have dramatically improved the retention and control of shingle compared with the timber groynes, but are too widely spaced to create a continuous stable beach.