Introduction
Hengistbury Head is a locally well-known and much-loved promontory, situated at the eastern tip of Poole Bay. The headland stands at the junction of the highly developed Poole Bay seafront to the west, and the less developed seafront of Christchurch Bay to the east. It is an area of exceptional environmental quality due to the wide variety of habitats of the headland, coast and harbour and has a variety of protected status. Yet, it is a popular recreational resource for countryside and aquatic pursuits, playing an important role in being the closest and most accessible green space for the Bournemouth conurbation.

This Factsheet will focus primarily on the erosion experienced at Hengistbury and the strategies for management, in the short and long term, as set out in the local Shoreline Management Plan.

Figure 1 Location, main features and environmental importance of Hengistbury Head.

The importance of Hengistbury Head
- Archaeology: Iron Age settlement at Double Dykes. International importance.
- Designated SSSI for geology, ecology and wildlife
- Special area of conservation (SAC) for its heathland habitats
- EU-designated Special Protection Area for its bird life: it is an important migration route
- Local nature reserve for saltmarsh
- Wide variety of habitats. High diversity, rich in rare species
The formation and geology of Hengistbury Head

It is useful to look back at the formation of Hengistbury Head and its geology to understand the reasons for vulnerability to erosion.

Hengistbury has clearly defined geological strata (see Fig. 2). The base of the headland was formed around 60 million years ago, during the Palaeocene period which marked the end of the Cretaceous era and the beginning of the Tertiary Era (coinciding with the demise of the dinosaurs). This was an unstable period in Earth’s history, characterised by movements in the earth’s crust, which caused successive uplift and subsidence of the land and associated changes in sea-level. The landscape of Britain was generally low lying and rivers formed vast deltas in the area of Hengistbury, which alternatively silted up and flooded again as sea levels changed. This continually disturbed the sediments of sand, silt and clay, making them soft and crumbly. The deposits laid down under the sub-tropical seas and rivers at this time have formed the beds of sediments which make up the solid geology of Hengistbury Head. These deposits are known as Bracklesham Series and include the sedimentary rocks which make up the solid geology of Hengistbury Head and Boscombe Sands, Hengistbury Beds and Highcliffe Sands (see Fig. 2).

On top of these sedimentary rock beds lie superficial deposits known as river gravels and terraces (Fig. 2), which were deposited during the inter-glacial periods of the Pleistocene.

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Figure 2 Geological cross-section along the cliff from Southbourne to Hengistbury Head.

A. Profile of valley between Southbourne and Warren Hill containing low cliff.

B. Sedimentary rock layers at Hengistbury.

- **Boscombe Sands**
  - Protected by debris from cliff erosion. River gravels and natural vegetation from top of cliff are visibly protecting base of low cliff.

- **Upper Hengistbury Beds**
  - Olive-green sandy clays containing plant remains from sub-tropical river environments. The top of this layer is characterised by purple and grey silts, signifying sea invasion.

- **Lower Hengistbury Beds**
  - Contains pebbles and the remains of molluscs.

- **Highcliffe Sands**
  - The sea retreated after the formation of the Hengistbury Beds, depositing this layer of white and yellow sands. Displays severe erosion by wind and rain. Sands contain pebbles and the remains of molluscs.

- **Quaternary deposits**
  - These most recent deposits are not classified as solid geology. These include the river terrace and valley gravels, wind-blown sands deposited over the past few thousand years and a thin soil layer. Much of the surface layers have been removed through wind and water erosion and trampling.

- **Upper Boscombe Sands**
  - Lowest visible bed of sediments. Colour varies from whitish-grey to purplish-brown. Includes bands of rolled black flint pebbles. Lower layers contain remains of plants transported by rivers to the sea.

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Figure 3 The Solent River system of the Hampshire Basin.

- 25 million years ago the Alpine orogeny folded the chalk deposits in Southern England into 2 anticlival ridges.
- The Hampshire basin was a syncline of soft rocks between the 2 ridges drained by the River Solent (see Fig. 3).
- Around 25,000 years ago the southerly chalk ridge was breached allowing the sea to reach and erode the soft rocks of the Hampshire Basin forming cliffs.
- Continued erosion exposed the ironstone ‘doggers’ at Hengistbury Head which form a protective barrier to the headland.
- Without the ironstone doggers on the foreshore to protect Hengistbury from wave attack a breach at the isthmus at double dykes could occur either from a 100 year storm event or rising sea levels so creating an island at Hengistbury and the creation of one bay.

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The pivotal role of Hengistbury Head
Hengistbury is at the centre of importance for any coastal protection strategy as it is responsible for the existence of the two bays of Poole and Christchurch. In the mid 1800s Hengistbury mining company bright S Wales coal to Southampton, then took back ironstone doggers to use in the smelting process form the foreshore and the quarry near the top of Hengistbury Head. This led to rapid land loss and the disappearance of 120 metres of coastline, so changing the shape and dynamics of the formerly stable Poole Bay system. Greater littoral drift forced Bournemouth to stabilise its beaches by hard engineering so reducing sediment supply to Hengistbury. Fortunately the removal of the ironstone ceased, so Hengistbury Head maintained some natural protection.

Erosional processes operating at Hengistbury Head
Aggressive wave action, strong south and south-westerly winds and the natural weathering of the soft sedimentary deposits make Hengistbury highly vulnerable to erosion. The sea defences in place are clear to see and constant reminders that marine erosion is a real threat to the headland. However, the subaerial processes are also part of the threat.

1. Sub-aerial processes: weathering, wind, erosion and mass movement Hengistbury Head

• Weathering
  This is the insitu disintegration and decomposition of rock caused by direct contact with elements of the weather, chiefly the presence of water and variations in temperature leading to freeze-thaw. The fragile river gravels and Boscombe sands are especially prone to the agents of weathering and wind erosion.

  Due to the presence of salt, chemical weathering is a potent force at Hengistbury. Sea spray attacks the cliff face; when this salt solution evaporates, it leaves behind salt crystals in the rock, which then expand and weaken the rock structure. Biological weathering also has an influence on the cliffs: sand martin colonies have made burrows in the soft rock of the Highcliffe Sands layers, weakening the rock and causing further disintegration.

  After the weathering processes have weakened the cliff, the erosional processes or corrosion and hydraulic action can effectively erode the base of the cliff further. The sea can then remove the debris and transport it along the shoreline through the action long shore drift.

• Wind erosion
  The nature of the sandy beds of the Highcliffe Sands means that these areas are vulnerable to wind erosion. The sandy material does not retain much moisture and is therefore quick to dry out. Once the sediments have been loosened, they are swiftly removed by the wind. Within the Highcliffe Sands layer, there are also more resistant bands of rock, which show the impact of differential erosion.

• Cliff-top erosion
  The highest point on Hengistbury Head is known as Warren Hill (see Fig. 2). Wind erosion has removed the sands of the infertile podsols down to the hard pan on top of the terrace gravels. Further trampling of soil by today’s visitors further damages this environment making it vulnerable to gully erosion.

• Gully erosion
  Gullies are present all along the cliff face of the headland and constitute the main form of erosion of the cliff face. Gullying is the formation of long narrow channels which are formed due to the action of surface water flowing over unvegetated slopes. Gullies in the upper cliff are fed from the cliff top, where water is unable to permeate the hard pan surface that has been created due to excessive trampling. As the process continues, the gullies erode further back into the cliff face, producing a weakened cliff face prone to slumping.

2. Marine processes: erosion, transportation and deposition at Hengistbury Head

The main forces acting upon Hengistbury are a combination of littoral beach drift (long shore drift) and cliff erosion. On this part of the south coast, the prevailing winds come from the south to south-west for approximately 60-70% of the year, which corresponds with the direction of the longest fetch (around 4000km) and swell waves from across the Atlantic Ocean. The distance of the fetch across the Atlantic Ocean means that this area is a high wave energy environment. The easterly end of Poole Bay and the whole of Christchurch Bay receive the largest waves and therefore the greatest amount of wave energy.

The combination of the soft geology of the area, with this high-energy environment means that Hengistbury has an extremely vulnerable coastline. Such vulnerability was exacerbated with the removal of the protective ironstones. Before the current sea defences were installed, the sea was able to reach the base of the cliffs along Solent Beach. In storm conditions, wave action on the soft rocks undermined the cliff face and caused large sections of the cliff face to collapse.

Sediment transfers
For the majority of the time, the drift of sediment is on-shore and off-shore, but approximately 10% of sediment on the beach is lost to long shore drift. There is net littoral drift from west to east, but due to changes in wind direction, this is variable. Due to the protective promenades around Bournemouth, the soft cliffs are no longer being eroded to supply the necessary amounts of natural sediment supply, hence the need for regular beach recharge. At Solent Beach, the soft cliffs do provide some sediment to the foreshore as they are subject to sub-aerial weathering processes and the erosive power of the waves. Sediment is also supplied to these beaches from the nearshore. Moving further east from here, the cliffs at the eastern end of Hengistbury no longer experience wave erosion due to their protection by rock armour groynes, thus no longer provide a sediment supply to Mudeford spit from the east. Whilst some sediment does get transferred around Hengistbury Head, it is much reduced due to the presence of the Long Groyne.

In summary, in light of the loss of sediment from the west, the amount of sediment received by Hengistbury is reduced leading to sediment starvation, thus placing it in need of coastal protection. This also has further repercussions for Christchurch Bay and the soft cliffs of Highcliffe and Barton, which have also suffered large-scale loss of land.
Coastal defences at Hengistbury Head

Fig. 4 explains the coastal protection measures presently employed at Hengistbury Head. Coastal defences at Hengistbury Head are of paramount importance, not only for the preservation of the beauty of this natural environment, but for the wider protection of the Poole and Christchurch Bays. Since the 1930s, Bournemouth Borough Council has been responsible for the stewardship and conservation of Hengistbury Head and is charged with its protection.

It is useful to consider what would happen at Hengistbury if it were unprotected, as this ‘unconstrained scenario’ (SMP2 2010) demonstrates the impact that the processes at work would have on the two bays. With unchecked erosion, the width of the isthmus at the Double Dykes would narrow and eventually a breach would occur through to Christchurch Harbour resulting in ‘Hengistbury Island’. The Southbourne headland would be eroded, and erosion would occur along the shoreline of Poole Bay, placing Bournemouth in jeopardy. Mudeford Spit would also be breached and its further development would mean that it could attach itself to Mudeford Quay. A new entrance to the Harbour would then be created nearer to the Head. As the controlling influence of Hengistbury Head would have been lost, Christchurch Harbour would become a large delta system, with Christchurch itself under great threat. Processes operating at the coastline would be working towards creating a new dynamic equilibrium: allowing the Bay to reach a classic form, placing huge pressure on the shoreline at Southbourne, Boscombe, Bournemouth and Poole. The consequences would post a massive economic risk at the regional and national level.

Shoreline Management Plans (SMPs)

Shoreline Management Plans set out policies for managing the coastline in England and Wales. They are the vehicle through which coastal defence strategies are created, coordinating activities between coastal groups and local authorities. SMPs take a strategic and sustainable approach to coastal management, responding to the threat of coastal flooding and the risks of erosion, considering natural processes and the consequences of climate change. It takes existing defences into account and recognises the needs of people, ultimately ensuring that coastal management in one area is compatible with adjacent coastal areas.

The coastline in the UK is split into sediment cells, based on coastline type and a recognition of the movement of sediments between the seabed and the beach: each sediment cell should be self-contained in terms of the movement of sediment within it. Each sediment cell is split into sub cells and each sub cell has its own SMP. The sub cell for this part of the south coast is entitled Sub Cell 5F – Hurst Spit to Durlston Head. Each sub cell is split into Policy Development Zones, to which Hengistbury Head, as a central point between Christchurch and Poole Bay belongs to PDZ 2 – Christchurch Harbour and Central Poole Bay. Policy Development Zones are then divided into Management Areas (MAs), which are further divided into Policy Units (PUs). There are four management options available for each Policy Unit: Do Nothing, Hold the Line, Managed Retreat and Advance the Line.

Figure 4 Coastal protection schemes at Hengistbury Head.

Regular beach renourishment is a key coastal defence strategy along this coastline. Beaches at this eastern end are recharged with shingle as it is less prone to longshore drift. Sediment used is after dredged from Poole Harbour.

A combination of timber and rock groyne continue westward from here to Alum Chine.

Rock groyne and 200m of gabion revetment to protect the cliff in front of Double Dykes. Gabions are galvanised steel cages filled with important limestone. They are relatively cheap and efficient. Wave energy is dissipated as the water circulates between the rocks.

Clifftop protection: Fences erected at perpendicular angles to cliff to enable people to approach cliff edge for views but prevents them from walking along the cliff - reduces trampling of vegetation.

Long Groyne - 215m from SE corner of headland. Concrete groyne, reinforced with rock armour. Successful; vast quantities of drift have accumulated and a dune habitat now exists. Vegetation stabilises the cliff. Sea never reaches base of cliff, even in severe storms.
**Table 1 Policy plans for Hengistbury Head coastline.**

<table>
<thead>
<tr>
<th>Policy Unit</th>
<th>Policy plan for short term</th>
<th>Comment and long term aims</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mudeford sandbank, Harbour side</td>
<td>Hold the line (HTL) short term</td>
<td>Allow gradual roll back of the spit in line with sea level rise, thus managed realignment</td>
</tr>
<tr>
<td></td>
<td>Managed realignment (MR) long term</td>
<td>in the long term (100 years)</td>
</tr>
<tr>
<td>East of Hengistbury Head</td>
<td>Managed realignment (MR) long term</td>
<td></td>
</tr>
<tr>
<td>Hengistbury Head and Long Groyne</td>
<td>Hold the line (HTL)</td>
<td>Maintain the position and influence of Hengistbury Head as a control feature of sediment</td>
</tr>
<tr>
<td>Solent Beach</td>
<td>Managed realignment (MR)</td>
<td>Maintain beach levels as main defence, also linking to the influence of the Long Groyne.</td>
</tr>
<tr>
<td>Southbourne</td>
<td>Hold the line (HTL)</td>
<td>Managed Realignment in the long term to accommodate changing shape of coastline between</td>
</tr>
<tr>
<td></td>
<td></td>
<td>main Bournemouth beaches and Solent beach.</td>
</tr>
</tbody>
</table>

**Poole and Christchurch Bays Shoreline Management Plan**

The first local SMP was produced by the Poole and Christchurch Bays Coastal Group (www.twobays.net) in 1999. This has now been reviewed and SMP2 was published in October 2010. The objectives set out by the SMP recognise that the developed seafront, especially that of Bournemouth and Poole Bay, is an important ‘driver’ in the economic well-being of this area. The management plan recognises that Hengistbury is a control point in ensuring the stability of the two bay systems, so it intends to ‘sustain the overall influence of this section of coastline’ (SMP2 2010). There is no doubt that it must be protected. Furthermore, the SMP also acknowledges the importance of the area in terms of varied land use, nature conservation, landscape variety, history and recreation. Fig. 5 provides the location and detail of the policies for the future coastal management of this area. Note how as with many SMPs protection is targeted to key areas as there is a need for greater sustainability with reduced reliance on hard defences.

**The future of Hengistbury Head**

In the language of economics and cost/benefit ratios, the cost of protecting this area of coastline yields few benefits in the short-term. However, as the SMP states, relatively limited investment will result in much wider long-term benefits for this area. Ultimately, there will come a time when the fate of Hengistbury is to succumb to the dynamic forces of our natural world and crumble into the sea. Today, our more holistic understanding of coastal processes can delay that eventual fate. Our recognition that Hengistbury is an important control point for the existence of Poole and Christchurch Bays, will ensure that we as humans can have a positive impact on lengthening the life of this area of outstanding environmental and ecological value.

**Further reading**

- www.twobays.net for the Poole and Christchurch Bay Shoreline Management Plan (Poole and Christchurch Bays Coastal Group)
- www.hengistbury-head.co.uk – interesting website with an overview of issues affecting Hengistbury Head

**Acknowledgements**

This Factsheet was researched by Jennifer Cox who is a geography teacher who lives in the Hengistbury area. Curriculum Press, Bank House, 205 King Street, Wellington, TF1 1SU. Tel: 01952 273138. Geopress Factsheets may be copied free of charge by teaching staff or students, provided that their school is a registered subscriber. No part of these Factsheets may be reproduced, stored in a retrieval system, or transmitted, in any