# UNCOVERING THE PAST

## Archaeological discoveries in Chichester Harbour AONB 2004–2007

Counties of West Sussex and Hampshire

June 2007

MUSEUM OF LONDON
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Sept 2007

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National Grid Reference: 472680 105845, 474475 97505, 484020 100890, 484230 104605


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Sept 2007

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*Front cover: The remains of jetties near Rookwood (photo: Maritime Archaeology Ltd)*

# Introduction

Chichester Harbour Area of Outstanding Natural Beauty straddles the counties of West Sussex and Hampshire, enclosing 74sq km of some of southern England's most picturesque and undeveloped coast. The AONB encompasses the major tidal inlets of Chichester Harbour – Emsworth Channel, Thorney Channel, Chichester Channel and Bosham Channel. It is a place where water merges into land, forming salt marsh and mud flats.

Many of the attractive villages have their roots in the medieval period, their names hinting at rich agricultural potential. The Old English derivation of Fishbourne is 'fish stream', and Prinsted means 'place of pears.' The area is rich in history, too, with one of the most important palaces in Roman Britain at Fishbourne, an Iron Age hillfort at Tounerbury and the octagonal tower at Warblington – the only part of the castle there to escape destruction in the Civil War. Harold II is depicted on the Bayeux Tapestry praying at Bosham church before setting off to fight William of Normandy in 1066.

Further back in time, tens of thousands of years ago, the channels in the harbour were formed as river and meltwater channels cut down to the level of the sea, much lower than today. There are hints that our prehistoric ancestors hunted and fished in the area. As climate changed, the prehistoric landscape gradually disappeared underwater as glaciers melted and sea levels rose.

This report summarises the results of three years of HLF-funded archaeological projects in the AONB to uncover more of this hidden past. The *'Rhythms of the Tide'* projects included an assessment of archaeological sites, field- and shore-walking to identify new sites and finds, geophysical survey on land and on water to discover archaeological deposits below the channels themselves, excavation, and coring and environmental analysis to reveal what sort of environmental conditions shaped the lives of past peoples.

Together with its companion 'Technical synthesis', this report complements the Research Framework produced by MoLAS in 2004 which identified gaps in knowledge and formed the basis for the subsequent archaeological projects. The projects were divided up under a number of headings: Subtidal (HA2); Landscapes Under Threat (HA3); Changing Landscapes (HA4); and Palaeoenvironment (HA5).

The story of people's complex inter-relationship with a dynamic landscape so susceptible to change is a major theme in the history of the harbour. Sometimes archaeological remains can only give us a glimpse of these changes, but the projects undertaken as part of *'Rhythms of the Tide'* add significantly to our understanding of the harbour's past inhabitants.

The AONB is administered by Chichester Harbour Conservancy (CHC) that secured Heritage Lottery funding to initiate the archaeological projects. The work was carried out by archaeologists both professional and non-professional from a number of organisations in a collaboration that has built a firm foundation for future management and understanding of the harbour. The report begins with a description

of the archaeological and historical development of the harbour, focuses on significant themes highlighted by the projects and then details the results of the individual projects themselves. The concluding part of the report assesses how the projects have addressed the research aims identified in the original Research Framework. References for the individual projects are listed at the end of this report.

**Dates used in this report**

| | |
|---|---|
| Palaeolithic: | 450,000-12,000 BC |
| Mesolithic: | 12,000-4,000 BC |
| Neolithic: | 4,000-2,000 BC |
| Bronze Age: | 2,000-600 BC |
| Iron Age: | 600 BC-AD 43 |
| Roman: | AD 43-410 |
| Early medieval: | AD 410-1066 |
| Medieval: | AD 1066-1485 |
| Post-medieval: | AD 1485-1900 |
| Modern: | AD 1900-present |

# Archaeological and historical development

## Timeline

### *Palaeolithic – 450,000-12,000 BC*

The landscape processes that took place in the Late Pleistocene formed the shape of the area that was to become Chichester harbour. Towards the end of last interglacial (*c* 125,000 years ago), the high water mark was slightly higher than today and marine sands were deposited, forming a beach above truncated bedrock. At this time, the harbour was not estuarine, but part of the active shoreline (the Pagham Raised Beach). As the climate cooled, brickearth accumulated on these beach deposits. Neither the beach deposits nor the brickearth were observed in the cores obtained in the current project, since they form the islands of higher ground while the focus of the campaign of coring was on the channels that lie between.

It is not yet clear whether the channels of the harbour were formed by erosion in the Pleistocene or Holocene, or both, but current thinking assumes that the deeply incised channels were carved out in the Late Pleistocene as river and meltwater channels cut down to the level of the sea, some 140m lower than sea level today. In interstandial periods during the cold stages of the late Devensian, 'soliflucted' sediment sludged down the valley sides.

### *Mesolithic – 12,000-4,000 BC*

Knowledge about the Mesolithic period in the AONB area is poor. Two possible flint-working sites are known, near Apuldram and at Nutbourne Creek, with other Mesolithic material consisting of stray finds. In neighbouring Langstone Harbour little evidence of early Mesolithic activity has been found, although there was some evidence for later activity of this date.

In the Mesolithic period, the landscape would have consisted of valleys, perhaps about 20m deep in the harbour area, running to the coast some 40km away. Mesolithic people are likely to have been attracted to the harbour area by a number of factors. The valleys would have served well as access routes from the South Downs to the coast, and the valley sides would have made ideal locations for hunting camps and base camps for longer stays. The landscape may not have been intensively occupied, but was likely to have been visited frequently by Mesolithic peoples. Fresh water could be obtained from the springs that drained down the valley sides.

In the earlier part of the period, there would have been an open grassy landscape but by the later Mesolithic this had been replaced by pine forest with the potential for trapping game and gathering other food as well as the use of wood, perhaps for boat building. The forest would have brought with it the associated danger of forest fire.

There would have been good hunting, including of fish in the freshwater streams. Butchery and dismemberment is likely to have occurred at the kill sites, perhaps with

flint knives and scrapers fashioned as they were needed. Most of the evidence for this sort of activity, however, is likely to be buried at the base of the valley, or it may have been eroded away. Exceptions include flint working sites identified at Nutbourne Creek and near Apuldram, as well as stray finds including a barbed and tanged flint arrowhead, microliths and wood-working implements like a flint adze and axe found in the AONB.

The valley sides would also have been particularly attractive since both estuarine and freshwater resources could be obtained. Estuarine environments became better established towards the end of the Mesolithic period, with the valleys silting up relatively quickly (3m of sediment in 300 years at Thorney Island), a factor likely to have been noticeable in human terms. With Mesolithic peoples so dependant on their local environment, such changes are likely to have made an impact on their strategies for survival and perhaps even their beliefs, although there is no direct archaeological evidence for this.

Chichester Harbour may be a prime area for future study of the Mesolithic period because of the good potential for *in situ* archaeology combined with the threat of loss due to erosion.

***Neolithic – 4,000-2,000 BC***

Neolithic peoples would have seen a marked change in the appearance of the harbour as the rising waters completely flooded the valleys and spilled over the valley shoulders to expand across the fringes of the plateau surfaces. This process alone was not the sole cause of the retreat of the oaks and limes with hazel and elm, since there is also evidence from cores that Neolithic people themselves were clearing woodland.

Scatters of prehistoric flint are known from the harbour, and a number of these were identified as stray finds during the shore-walk as part of this project. The number of flints found during the shore-walk was limited, but those that were not flakes consisted largely of scrapers and blades and flakes. In general the flint had the appearance of locally-available material suggesting local manufacture. This supports the hypothesis that the tools were manufactured as the need for them arose, and then discarded after use. The hypothesis fits with the evidence from the important Neolithic site at Chidham, where the assemblage that included scrapers and notched flakes may have been used to prepare osiers for fish traps and arrowshafts and spears for fishing and hunting. Although the Neolithic marks the arrival of agriculture into Britain, hunting was still an important part of Neolithic life.

Since no Neolithic settlements have been identified, the harbour area seems to be one that contributed an important part of the Neolithic economy and lifestyle even though the area was not settled or occupied for long periods. Indeed the very notion of Neolithic 'occupation' in a landscape has come under question – most recently in the Fishbourne and Chichester research framework (reference in Further Reading section) – with a shifting use of the landscape in this time, rather than there being discrete settlement sites. In any case, the AONB seems to have been peripheral but not marginal to the 'occupied' areas that were largely concentrated on the adjacent chalklands.

The fragility of archaeological evidence of the Neolithic period in the AONB is illustrated by a burnt mound of flints at West Wittering that appears to have been lost and could not be located by the Conditions Survey in the current project.

***Bronze Age – 2,000-600 BC***

The harbour in the Bronze Age would have looked much as it does today, although the coastline may have been 1-2km further south of the present foreshore, once land now lost to erosion has been taken into account. Wetland areas would have become more established, consisting of sedge fen and alder carr. The harbour would have had an estuarine feel, with islands of low ground within extensive mudflats.

There may have been a continuity between the Neolithic period and the Early Bronze Age, with the harbour perhaps used for hunting, seasonal grazing, butchering and hide preparation. There is a scatter of Early Bronze Age flint tools across the AONB, including an unfinished arrowhead from Itchenor and flints from Fishbourne Channel. In the Later Bronze Age, there is a significant concentration of activity in the coastal region. On Hayling Island, hoards of palstaves have been found at North Hayling (within the AONB) and at Gable Head. The ritual significance of the burial or placement of bronze artefacts during the Later Bronze Age is now widely accepted.

A rare structure on the north coast of Hayling Island radiocarbon dated to the Late Bronze Age consisted of a number of timbers and an area of wattle and may have been a wharf support or part of a causeway. As part of the current project, three late Bronze Age to early Iron Age stakes were found *c* 150m south of Fishbourne during a watching brief. The stakes, each *c* 60mm in diameter, were made from *c* 26-year old alder wood. Oxford University radiocarbon dated the stakes to *c* 2500BP. The limited nature of the evidence makes it difficult to say what the structure might have been, or whether it was part of a larger structure.

This evidence offers only a tantalising hint at the potential of the AONB to shed light on the Bronze Age. This was a time where social standing was increasingly defined by long distance alliances and the resultant acquisition of prestige goods. The shorelines gave direct access to coastal and cross-channel traffic and are likely to be key in understanding this period.

***Iron Age – 600 BC-AD 43***

The most important Iron Age site in the AONB is Tourner Bury hillfort. Hillforts are no longer uniformly interpreted as central places in the hierarchy of Iron Age settlement, and it seems to be only in the Late Iron Age that status differences can be identified. The function of Tourner Bury hillfort is still unclear. The hillfort has been linked to salt working, although evidence is circumstantial – the industry was important, the hillfort commanded the western part of the entrance to Chichester Harbour at a time when water transportation may have been easier than that on land, and pottery of similar date to that found at the hillfort has also been found at salt workings locally.

The results from the cores show that the pollen of grasses and salt marsh plants increased during the Iron Age confirm the hypothesis that salt marsh environments

became more established at this time. This corresponds with the growth of salt working in the AONB, especially on the west coast of Chidham, at the head of Thorney Channel and on Hayling Island. Salt working would have been an important industry in the Iron Age. A woodland of oak with beech and ash also developed at beginning of the Iron Age.

***Prehistoric – 450,000 BC-AD 43***

The flint blades, flakes and cores found during the shore-walk were not sufficiently distinctive to be closely dated, but were of prehistoric date, possibly Mesolithic or Neolithic. It is likely that many have moved considerable distances from their original sites of deposition. The flints support the hypothesis that the AONB was used for short-term, occasional hunting visits but not settled in these periods.

The Wadeway, running from Langstone to Hayling Island, was previously suspected to be a prehistoric feature, its construction perhaps linked to rising sea levels in the Bronze Age. However, an excavation of the causeway as part of the current project suggested that it is much later in date, probably dating to the Roman and post-Roman period at earliest.

***Roman – AD 43-410***

During the Roman to early medieval periods, the salt marsh may have been at its greatest extent, perhaps due to falling relative sea levels. There is evidence of a possible continuity of salt working sites from the Iron Age to the Roman period, for example at Thornham Boat Yard.

Fishbourne Palace is a unique site in Roman Britain. The southern part of the palace falls within the AONB, including the southern garden and the putative channel that gave access to Fishbourne Channel. The harbour that would have been used to bring in the materials used to construct the palace and for subsequent trade has yet to be located, although the work done as part of this project has produced some useful information. The geophysical survey of the sub-tidal zone found no evidence of a deep channel extending up Fishbourne Channel beyond Copperas Point suggesting that only vessels of a relatively shallow draught would have been able to travel up to Fishbourne Palace. This suggests that materials bound for the palace and beyond – for example Roman Chichester itself – would either have had to be loaded from sea-going vessels onto craft such as barges to continue their journey or to be transferred onto land and taken by road. The only definite buildings discovered so far that might be related to a harbour located near Fishbourne Channel are the two phases of aisled buildings dating from the 1st century AD.

The difficulties of identifying features of archaeological significance using the sub-bottom evidence was highlighted by the current project. For example, it is unclear whether a dredged channel – say up Fishbourne Channel – could be distinguished from a natural channel in a geophysical survey.

The importance of the harbour is illustrated by a number of important sites from the Roman period. On Hayling Island the timber Iron Age temple (outside the AONB) was transformed into one of stone, perhaps reflecting a change in belief. Bosham has produced significant Roman finds, including statutory, and Roman artefacts observed

as part of the current project as eroding out of the eastern bank of the millstream suggests that there is a good potential for further discoveries in the village. A cluster of Roman buildings at nearby Broadbridge Farm includes a villa, a possible amphitheatre and temple. Salt working seems to continue from the Iron Age, with Roman remains of this activity at Chidham and Thornham Boat Yard.

***Medieval – AD 410-1485***

One of the most significant pieces of work that enhances our knowledge of the medieval period is the field-walking west of Apuldram, conducted as part of the current project. The field-walking discovered large quantities of medieval pot and oyster shells that may have derived from rubbish pits associated with a postulated deserted medieval village at Apuldram. The earliest reference to 'Apeldreham' is in the early 12th century, and by the 15th century at least three named streets are known. Although it is perhaps going too far to say that these finds confirm the presence of the deserted medieval village, they do add to our understanding and suggest that further work could be done here either by further field-walking or historic research.

Other field-walking constitutes useful negative evidence. A field, west of Birdham, failed to yield any convincing evidence of the postulated East Itchenor deserted medieval village.

The Wadeway is a causeway that runs from Langstone to Hayling Island. The date of the causeway was unknown, but surveys and an excavation, conducted as part of the current project, have added considerably to our knowledge.

The first documentary reference to the Wadeway was in 1552 and the causeway first appears on a map in 1759. The nearby settlement of 'Wade' was established by 1086. The excavation suggests that the Wadeway was constructed by cutting away marine clays and backfilling with gravel. The surface was consolidated by long boards laid on edge and held in place by small timber uprights.

The Wadeway could not be dated from pottery or other finds since no artefacts were recovered during the excavation. Instead, a broad date was attempted by identifying types of pollen in environmental samples and comparing it to the pollen that might be expected at different times in the past. This comparison found that the Wadeway dates to historic period and most probably the Roman and post-Roman period at earliest.

Pollen from walnut, hemp and oak and hazel was identified. Walnut is believed to be a Roman introduction into Britain, hemp is diagnostic to some extent to the medieval period, and oak and hazel may have been from managed woodland nearby during the medieval period. An increase in pine pollen towards the top of the sample may represent the establishment of 18th century plantations of such trees. More work is required to obtain an absolute date for the Wadeway, for example radiocarbon dating on samples from the excavation.

***Post-medieval – AD 1485-1900***

An important part of the current project for understanding the post-medieval period in the AONB has been the examination of maritime charts. Even the limited scope of

this work so far – an assessment of the sort of information that might be of use – has revealed important aspects. Much of this information relates to maritime data that can be related to changes in coastline and morphology, but it also illustrates the difficulties of travelling in parts of the harbour, for example the 17th century Greenville Collins chart that advises 'none but them that are acquainted to go in the harbour without a pilot'.

The importance of the salt and brick industry to the economy of the harbour is illustrated by the late 18th century Mackenzie charts that show many of these works. A number of these are shown as foreshore structures suggesting that maritime transport was used. Mills also constituted an important part of the harbour economy, and these are also shown on the Mackenzie charts. A harbour at Emsworth is featured on Sheringham's chart of the mid 19th century and there are numerous other foreshore structures such as jetties. Roads, canals, causeways and land reclamation at the north part of Thorney are shown.

Most of the information on the charts relates to the maritime environment, but there is a limit to other information that is featured – for example ship- and boatbuilding sites are not shown, although historical sources indicate that these were an important part of harbour life.

Fishing was an important activity in the AONB, and oyster farming especially so in the post-medieval period. Fowley Island, off the west coast of Thorney, was adapted for use as oyster beds. A causeway that appears to lead out to the island may have provided access to the oyster beds. Today this causeway is known as Fisherman's Walk, and map evidence suggests it was built sometime between 1826 and 1848. A survey of the causeway identified two landing stages on the east side of the feature, probably also associated with fishing. Construction of the causeway would have presumably been an expensive and labour-intensive venture and underlines the importance of the fishing and oyster industries.

### *Modern – 1900-present*

Work on modern structures within the AONB focused on WWII structures that were assessed for their condition. Many of the WWII structures are located on Thorney Island. The pillboxes and gun emplacements on Thorney seem to be in differing conditions from Good to Fair, but whatever their current state they are a fragile resource in danger of being lost if neglected. This is demonstrated by at least one pillbox on Thorney that appears to have been lost to erosion. Other anti-tank defences on the island are assessed as being in poor condition.

## Themes

### *Human occupation and movement*

It seems likely that the AONB in the Palaeolithic and Mesolithic periods was traversed by early peoples and probably used for hunting (including fishing) and

foraging. Mesolithic people are likely to have used the valleys for access routes from the South Downs to the coastline some 40km away.

By the Neolithic period the incised valleys had become submerged and at least partially silted up. In this period, and in the Early Bronze Age, the AONB may well have been used for short-term occasional hunting visits, for grazing and the exploitation of flint resources. The flint tool evidence suggests that tools were made locally for immediate use and discard and constitute a non-domestic assemblage. In the Bronze Age there extensive evidence of settlement, and farming systems with enclosures, fields, hut platforms and burial grounds on the chalk, outside the AONB. On Hayling Island, at Creek Field (White 1971) also outside the AONB, roundhouses have also been identified. Within the AONB, an excavation at Knapp Farm, Bosham (Gardiner and Hamilton 1997) found Bronze Age pits into which flints and pottery, possibly associated with domestic activity, had been deposited, although no specific domestic areas were identified. If the Late Bronze Age timbers found on the north coast of Hayling Island are indeed the remains of a wharf, then this is evidence that Bronze Age people were using the watercourses for transport.

Iron Age settlements, major hillforts, and cemeteries are all known from the wider area outside the AONB, for example at Chichester, the Trundle and Westhampnett. However, no evidence for Iron Age settlement has been found within the AONB itself. There is much evidence for Iron Age salt working in the harbour, but even short-term and temporary timber structures associated with this industry have not been identified.

In contrast there is a great deal of evidence for human occupation of the AONB in the Roman period. Farming communities would have been clustered around villas, many of which are known in the north part of the AONB, for example at Warblington. Water transport was used – the siting of Fishbourne Palace at the head of Fishbourne Channel would have meant that it was accessible from water (although only by boats with a shallow draught) as well as land via the roads that are known from the Roman period.

Chichester developed into a major town in the 10th century, and an important port. The harbour would have seen much water traffic as trade increased in the medieval period. By this time, the landscape of the AONB would have been one of small villages around parish churches. By the post-medieval period, the harbour would have been a busy place. The many new industries, and the expansion of old ones, would have seen population increase.

### *Land use and development*

The combination of the long time scale and the sensitivity of the harbour to environmental change illustrates how closely land use through time was bound with such change in the harbour.

From the late Pleistocene, valleys were carved out by rivers and meltwater flowing to the sea, some 140m lower than today. Today's AONB would have been some 40km from the coast in the Mesolithic period, and the deep valleys would have been attractive to Mesolithic peoples not only as access routes, but for sources of fresh

water from springs that drained down the valley sides. The estuarine environment would have been used for fishing and the pine forest that became established in the later Mesolithic period would have been ideal for hunting and foraging.

The landscape of the AONB would have changed dramatically in the Neolithic period as rising waters reached the shoulders of the valleys and spilled across the fringes of the plateau surfaces. This caused a reduction of the area covered by forests with oak, limes, hazel and elm; this forest was also being cleared by Neolithic people. The concept of what 'occupation' of the landscape by Neolithic people means is coming under scrutiny, but the AONB may have been used in this time for seasonal, short-term grazing and associated activities, an important part of the Neolithic economy.

Land use probably did not change a great deal from the Neolithic to the Early Bronze Age, but by the Later Bronze Age, the landscape may have had a more ritual use, with the ritual placing or burial of prestige Bronze tools at North Hayling, and a possible urnfield to the west in neighbouring Langstone Harbour. The shoreline that gave direct access to prestige goods from afar would have been important in this period. By the Iron Age, salt marsh plants had increased and salt working was a major industry, perhaps associated with Tourner Bury hillfort. In the Roman period, the hierarchy of sites is encapsulated in the landscape of the AONB. Fishbourne Palace, accommodating a high-status, Romanised individual, standing at the centre of an agricultural landscape with numerous villas and farmsteads. There was a possible temple at Broadbridge Farm and another on Hayling. A tilery was located at Copperas Point, a place that may also have been the off-loading point for Roman ships that could not continue to the palace because of the shallow Fishbourne Channel.

The landscape in the medieval period was also agricultural, with manor houses, and small villages clustered around parish churches. Industries such as fishing, boat building and salt working would have thrived. Most of the landscape would have been taken up with agriculture in the post-medieval and modern periods, but industries such as milling, brick and tile making, salt production, rope making and fishing would also have been well established.

### *Habitats*

The nature of the habitats of the AONB changed over time as the environmental conditions developed. Work done as part of the current project, especially the borehole analysis, provides useful evidence of what sorts of habitats existed at different times.

Work on the cores as part of the current project show that the open grassy landscape of the Mesolithic was replaced by pine forest. Forests of oak and limes with hazel and elm had become established by the Neolithic, but as the rising waters in the valleys encroached across the fringes of the plateau surfaces, these forests began to retreat.

Estuarine wetlands would have become more established by the Bronze Age, consisting of tidal mudflats fringed by sedge fen and alder carr. Grasses and salt marsh environments are evident in the Iron Age, perhaps reaching their greatest extent in the Roman period.

### *The maritime environment*

As part of the current project, an assessment of charts covering the harbour has shed much light on the maritime environment and showed the potential that a more detailed study would have.

Information on changes in coastline, morphology, bathymetry and sea level on can be revealed by the study of historic charts. Two of the earliest charts, by Greenville Collins in *c* 1680 and J. Avery in 1721, depict depth soundings to help mariners negotiate the channels – 'very difficult' in places, Greenville Collins says. Charts and maps of the later 18th century, such as Mackenzie's of 1781-1786, Yeakell & Gardner's map of 1787 and William Heather's chart of 1797 also contain much detail of navigational channels including anchorages, hazards, depth soundings and bottom types, shoals and shallows (including whether these are rock or sandbanks) and tidal periods.

One of the most dramatic changes in the shoreline of the harbour is the reclamation of land north of Thorney Island. Charts before 1848 show the proposed embankment and by the 1880s reclamation is complete and Thorney is no longer detached from the mainland. As well as shoreline change, changes in bathymetric data may help in understanding the geomorphological processes at work that could assist with management of the harbour by highlighting areas where erosion or deposition has been most active. The effect of people may also be evident from such a study – for example showing whether channels have been dredged. The initial study did not identify any shipwrecks within the harbour area. However, these may be revealed by further in-depth research.

### *Sea defences and managed re-alignment*

The problem of protecting the land from the sea in the harbour is not just a modern one. As the pressure on agricultural land grew, so the importance of maintaining that land – and even winning more land from the sea – increased.

By the 12th-13th centuries mixed agriculture in Britain was practised on land reclaimed from saltmarshes. The higher value of the reclaimed fertile land offset the expense of embankment. However, this process does not appear to have happened in Chichester harbour, or indeed Langstone harbour. This may have been because only thin strips of coastal saltmarshes existed rather than the large expanses of the Severn Estuary, for example, making embankment uneconomic. However, increased storminess by the end of the 13th century increased flooding and areas of land – for example land belonging to the Priory on Hayling Island (outside the AONB) – were lost to the sea in the 14th century. This may have increased the pressure to build sea walls.

The vulnerable west coast of Thorney was protected by a sea wall by the time of the 1st edition OS map. Such defences had mixed success, an embankment at Conigar Point, also in place by the late 19th century, did not prevent the loss of irregular area of marsh and a sand bank. An embankment around Chidham Point was later extended north by a sea wall up the northeast coast of Chidham.

An ambitious attempt to enclose the north part of the Bosham Channel with an embankment that was built by 1815 was swept away by a storm in 1825. A more successful attempt to reclaim the north part of Thorney took place later in the 19th century.

Foreshore structures surveyed as part of the current project provide a stark illustration of shoreline retreat in a relatively short period of historic time. A groyne is a method of coastal defence against erosion. The three groynes surveyed in the harbour survive as lines of timber posts running perpendicular to the shoreline into the sea. The effect of a groyne is to accumulate sand which is moving along the coast line because of longshore drift. Near West Itchenor, the landward end of a groyne lies 15m from the current shoreline. The groyne near Ellanore Corner lies 30m from the shore, and the groyne at the Copperas Point 20m.

### *Climate change*

North Atlantic climate has fluctuated over millions of years resulting in environmental change. One of the most significant effects of this in the harbour area has been the impact of sea level change where sea levels rose 140m between 16,000 years ago and the present. This means that evidence Mesolithic activity in the valleys is likely to be deeply buried and submerged; on the higher ground of the islands however Mesolithic archaeology is likely to be close to the ground surface. Mesolithic people are likely to have established camps on what were then the sides of valleys, but today are many metres below the harbour waters and sealed by silts.

But by the Neolithic, humans were beginning to have a discernable effect on the landscape – for example cores taken as part of the current project suggest that forest clearance was occurring around Bosham. The natural processes affected the environmental conditions – with different vegetation adapting to the changing situation. This in turn affected the way people lived in the harbour. An example of this is the establishment of salt marsh by the Iron Age, leading to salt working, an economic change.

### *Archaeology and the historic environment*

Archaeology is useful for examining change in the historic environment. Although records exist for the historic period, archaeology can supplement these records, fill in gaps and often open new avenues for research.

An example of this is how archaeology can give an insight in the changing economic development of the harbour. Changes in trade and transportation of goods can be plotted from historical records, and archaeology can show how these changes resulted in the abandonment of structures such as jetties, wharves and landing places. The large wharf structure near Warblington would have required a significant input of resources, yet it was abandoned. Oyster farming played an important part in the economy of the harbour, and archaeology can illustrate how such an industry functioned.

# The results of the projects

## Maritime charts

One of the first stages of the project was to assess maritime charts to find out what information they might have about the harbour. Archaeologists from Maritime Archaeology Ltd identified 24 charts and maps that covered the harbour area, dating back to the 17th century and held by the United Kingdom Hydrographic Office in Taunton and the National Maritime Museum in Greenwich.

Study of historic charts like these can reveal how the coastline has changed, as well as yielding information about past harbour structures, wrecks (although none so far has been identified on charts of the harbour), bridges and other structures. Water depth was an important consideration for mariners and this is recorded on many charts for the harbour. Comparison between charts of different date helps archaeologists discover how water depth has changed over time. Other useful information can be contained on charts. For example a warning on a 1753 chart by Greenville Collins illustrates how difficult navigation could be: 'To the eastward of the Owers is the going into Chichester Harbour, and very difficult; therefore I advise none but them that are acquainted to go in the harbour without a pilot'.

Six out of the 24 charts (detailed below) were particularly interesting. These were assessed as having high potential for further study of the harbour. Chichester Harbour Conservancy has obtained high quality paper copies of the six charts, and these are referenced in CHC's online bibliographic database (curlew on www.conservancy.co.uk/library).

The earliest of the charts dates to around 1680. The Greenville Collins chart shows the depth of water on approaches to the harbour, as well as details of larger settlements and harbour structures. Charts by J. Avery in 1721 and William Heather in 1797 contain similar information, allowing a comparison of what had changed over a period of more than a century. As well as maritime information the Mackenzie charts of 1781-1786 also reveal the location important harbour industries like salt and brick works. Thomas Yeakell and William Gardner are famous Sussex map makers of the 18th century. Their 1787 topographical survey of Sussex covers the harbour and shows navigable channels, depth soundings, salt works and jetties. This map was made before the north part of Thorney was reclaimed and shows a causeway linking the mainland to the island, annotated 'Causeway for carriages at low water'. Sheringham's 1848 chart shows navigable channels, depth soundings, approaches to the harbour as well as larger towns and farms, major roads, jetties and harbour walls.

There is still much to learn from charts like these, for example more detailed study may reveal how shoreline has changed over time, although it must be borne in mind that all charts and maps are interpretations and all the features of an historic landscape may not be included. For example, we know from other historical sources that ship building was an important harbour industry, yet no ship builders are depicted on the charts described above.

## Landscapes Under Threat

### *Archaeological condition assessment*

The Historic Environment Records or HERs (formerly know as Sites and Monuments Records or SMRs) for West Sussex and Hampshire list about 400 known archaeological sites and find spots in the AONB. These range in date from Palaeolithic tools that are thousands of years old to more modern structures such as WWII pill boxes. The Chichester Harbour Conservancy commissioned an archaeological condition assessment from Archaeology South-East to record the present state of some of the sites as well as how sites had changed and how vulnerable they were. The archaeologists also devised a Guidance Manual so individuals and volunteer groups can assist with future condition assessments.

The Guidance Manual outlines the best methodology to be used, stressing preparation before a site visit is made. Before making a site visit, for example, you need permission from the owners or occupiers of the land and information about the site from the HER or other sources. The information you collect needs to be presented in a way that others can understand, so the manual includes a pro forma reporting form and explains the importance of visual, photographic and measured survey of sites, prioritising visits to the most vulnerable sites and monitoring sites over time.

Often the type of landscape affects the threats to an archaeological site, although all sites are at risk from damage or destruction from a variety of sources. Grassland sites survive best because they are not disturbed by modern ploughing. Livestock, scrub encroachment and burrowing animals pose the greatest threat to such sites. The single greatest hazard facing monuments is cultivation, so sites on arable land are particularly at risk. The principal threats to such sites are cultivation of areas previously under grassland, encroachment on sites within cultivated fields, deeper ploughing and continuation of existing plough depths gradually degrading underlying deposits. Many sites in woodland survive well since they are generally protected from cultivation, although damage can occur from tree root growth, wind throw, woodland management operations and burrowing animals.

Of particular relevance to the harbour, wetland sites are particularly sensitive to change. Organic waterlogged materials can be lost if water levels or water quality change. Fluctuations in sea level, coastal erosion, land drainage and sea defence construction can all potentially threaten such sites. Coastal sites are also threatened by erosion and sea level change, as well as changes in land use, development and the construction of sea defences. Such high-risk coastal sites may need regular monitoring as well as an archaeological recording programme.

Standing structures in the AONB include Warblington Castle (although scheduled monuments were excluded from the conditions assessment). Such structures can be vulnerable to weathering, vegetation growth from species like ivy, and burrowing animals, and to damage from stock if located in a field used for pasture. The best form of management to ensure the survival of standing structures is for them to remain in active use, for example as dwellings or as working farm buildings. Recommendations may include monitoring visits and consolidation or repair of damaged fabric.

Sites that were occupied buildings, Scheduled Ancient Monuments, located in the intertidal zone, single spot finds, not *in situ*, had no surviving remains, or whose locations or interpretations were questionable, were excluded from the survey. This left 41 sites suitable for assessment. Of these, 14 were not visited at the time of writing and six were not found, destroyed or not seen clearly enough for an assessment to be made. The remaining 21 sites were each assigned a number, and assessed as being in good, medium, poor condition. Whether the sites were stable or in slow or rapid decline, and the risk to sites was also assessed.

Overall, a third of the sites assessed were in good condition, and a further third in medium condition. The remaining third were in fair or poor condition or destroyed. About half of the sites were stable, 10% in 'rapid decline' with the rest in 'slow decline'. Almost a fifth of the sites surveyed were at high risk, with the rest split evenly between being at medium or low risk.

Ironically, one of the most vulnerable sites is one of the most recent. A WWII anti-tank wall on Thorney Island is in poor condition and at high risk of coastal erosion. Recent sites like this can often fall into neglect. At least one such site has been lost already: a pillbox on Thorney Island has been destroyed by coastal erosion. A second vulnerable site is one of the most important in the AONB and was partially excavated in the 1980s. The Roman tilery at Copperas Point is likely to have supplied tile to the palace at Fishbourne, but the area where it is located is actively eroding.

A further two sites were also considered at high risk and in slow decline: the site of a Romano-British villa on the south east edge of Langstone, in poor condition, and Roman settlement deposits on west side of Bosham church, in medium condition. The villa remains are threatened by tree growth and the settlement deposits are being eroded by a mill stream nearby.

The findings of the conditions survey will allow the Harbour Conservancy to regularly monitor sites like these and take action to halt their decline.

## Changing Landscapes

### *Field-walking*

This project was undertaken by West Sussex Archaeology who produced a field-walking handbook to guide non-professional archaeologists taking part in the work. Archaeologists also assessed fields across the AONB to work out which have the best potential for field-walking, and three fields were field-walked.

Arable fields are best for field-walking, which means that about half the total acreage of the AONB is suitable – some 200 fields and about 2,050 acres. The archaeologists graded fields according to their priority (Fig 3), with red as the highest priority, orange secondary, and yellow lowest priority. Priority was given to those fields that contained or lay next to known archaeological sites or artefacts.

Twelve fields on Hayling Island and Warblington are prioritised to investigate possible Roman villas, Bronze Age sites and a possible deserted medieval village.

Another deserted medieval village is thought to have existed at Manhood and six fields are prioritised here. Field-walking 19 fields around Apuldram and on the Bosham peninsula will help identify Iron Age and Roman occupation, with a further four fields on Thorney Island and Prinsted will help investigate areas of Roman and prehistoric finds. Field-walking the eight prioritised fields around Chidham will help understand the important Iron Age and Roman salt-working sites known on the peninsula.

Three fields have already been field-walked. The best results came from a field to the west of Apuldram Manor where a large quantity of medieval pot was found, and where patches of ploughed-up oyster shells may represent the remains of rubbish pits. There has been much debate about whether a medieval village used to exist at Apuldram, and the finds suggest that further work could profitably be done here. There are no visible building remains and no crop marks are known, but when Apuldram was surveyed in 1433 by the monks of Battle Abbey it consisted of at least three streets. There is no mention of a village in the 1086 Domesday survey and the earliest reference to 'Apeldreham' appears in the early 12th century.

The deserted medieval village of East Itchenor is thought to have existed near Birdham. Field-walking here south of Westlands Lane failed to recover evidence of the village. The third field to be field-walked lay near Nutbourne, but apart from the occasional flint flake and medieval and post-medieval pot, nothing of significance was found.

### *Shore-walking*

This project was undertaken by Maritime Archaeological Research Consultants Ltd with the aim of producing a shore-walking methodology and provide training for volunteers. Five areas of shoreline within the AONB were also shore-walked after volunteers had been trained: Emsworth to Langstone, part of the east coast of North Hayling, Cobnor to Prinsted, and the east and west coasts of Thorney Island.

As might be expected, artefacts from many periods were found. Brick and tile, slag from industrial processes, metalwork, shell and fragments of clay tobacco pipe were identified and their locations were plotted. The retained finds consisted of two sherds of medieval pottery and 18 struck flints. The prehistoric flints were not sufficiently distinctive to be closely dated, but might have been Mesolithic or Neolithic. Ten flakes were identified, four blades, two scrapers and one core.

Shore-walking over the past two decades or so has produced much interesting evidence. Previous finds of flints from the foreshore – especially those dating to the Neolithic period – suggested that tools were made from locally available material on the spot for immediate use and discard, a non-domestic assemblage. The AONB was not occupied during the Neolithic period, instead the area seems to have been used for seasonal, short-term grazing of animals. The flint finds from the shore-walk do not conflict with this hypothesis.

### *Survey of foreshore structures*

Maritime Archaeology Ltd undertook a desk-based assessment to identify foreshore structures that were then surveyed. The aim of the project was to gather data on the

archaeological potential, state of preservation and possible threats to structures within the intertidal zone. This information would then be used to understand the intertidal cultural resource, particularly in relation to the development and use of the harbour.

The thirty-three sites surveyed give an indication of the changing nature of Chichester Harbour, especially its changing shoreline and economic development. Most of the sites appear to date from the last 200 years. Some structures, such as groynes, lay far from the modern shore, indicating how the shoreline has retreated. A large number of structures surveyed were associated with three industries: oyster farming, salt production and maritime transportation, illustrating the importance of these industries in the post-medieval period.

One of the largest structures surveyed was a large post-medieval wharf at Warblington that consisted of three possibly associated features (Fig 7). The wharf was built of square timber piles, some with bracing timbers and iron bolts, a compacted surface – probably a slipway – and the timber posts of a coastal defence revetment. Another large structure at Rookwood is probably the remains of three jetties forming a small marina (Fig 9).

Three possible groynes were also identified. A groyne is a method of coastal defence against erosion that runs perpendicular to the shoreline into the sea. Such structures can illustrate how much of the coast has been eroded since they were built. The landward end of the groyne west of Ellanore (Fig 8), for example, lies 30m from the current shoreline.

The oyster industry was an important one for the harbour. Most of the oyster beds surveyed were built in a similar way: rectangular, with a breach on one side for a sluice to control water flow (Fig 10). Oyster beds at Chalkdock are an exception and appear to be circular (Fig 16). The oyster bed complex at Prinsted was the largest (Fig 11) and there are ten well-preserved oyster beds at Emsworth (Fig 18). Walkways built of compacted sands and gravels are still visible at both these latter sites.

Causeways were also surveyed, including the Wadeway and Fisherman's Walk causeways that are discussed in more detail below. An Anglo-Saxon (early medieval) causeway was thought to be located near Longmore Point, but could not be found (Fig 13).

Salt working dates back to the Iron Age in the harbour. Three were surveyed, the earliest at Thornham Boatyard. This dates to the Roman period and consists of three small raised areas, built of medium compact sandy gravel (Fig 17).

A seawall or 'cut' was built by 1815 between Chidham and Bosham with the intention of reclaiming land in the northern part of Bosham Channel (Fig 14). The seawall was destroyed by storms in 1825, but the investment in its construction shows how valuable agricultural land was to the local economy.

### *Investigating the Fisherman's Walk causeway*

Fisherman's Walk is a 340m long causeway (Fig 19) snaking from Emsworth to Fowley Rithe but stopping short of Fowley Island. On the first edition Ordnance Survey map of 1866 it is marked 'Westwood's Road'.

Archaeologists from Maritime Archaeology investigated the causeway by examining historic sources, such as maps – a 'desk-based assessment' – followed by a field survey in advance of limited repair works on the surface of the causeway.

The map evidence proved useful for dating the causeway. Sheringham's chart of 1848 depicts the causeway, but Greenwood's map of 1826 does not, suggesting the causeway was constructed some time between these two dates. Fowley Island is featured on Milne's 1791 map and subsequent maps.

The causeway seems to be linked to the oyster industry, although there is no direct evidence of this until 1885 when the Fowley Island Oyster Company was formed. The 1866 Ordnance Survey map shows oyster beds at the northern end of the causeway, and the 1898 OS map shows two oyster beds on Fowley Island. The harbour's oyster industry collapsed in the first half of the 20th century, but the causeway seems to have been used for other purposes: on the 1952 OS map salterns are marked on its western side, and 'Perch' is annotated on its eastern side, perhaps referring to poles to help manoeuvre boats or secure them to.

None of the maps shows the causeway extending all the way to Fowley Island. It may have been possible to traverse the gap between the end of the causeway and the island by foot since it was colonised by eel grass that would have provided enough support to walk on. As the eel grass declined over the last 60 years, erosion of the upper firmer layers of this area increased making such a crossing impossible today.

Oral evidence suggests that fishermen used the causeway to haul their vessels through the Emsworth Channel with ropes ('warping'). This may explain the modern name of the causeway.

The field survey included a photographic record of the causeway that was also mapped with a Global Positioning System. The survey revealed that the causeway consists of a semi-compacted gravel surface with some concrete slab edging, installed in the 1980s, and earlier timber batons held in place by pairs of timber pegs. Erosion has revealed details of construction, including the use of branches to form a surface (Fig 12).

### *Investigating the Wadeway causeway*

Maritime Archaeology Ltd also investigated the Wadeway – a causeway that runs from the village of Langstone towards Hayling Island. No one knew how old the causeway was, and there was speculation that it could be up to 4000 years old.

Archaeologists first undertook a desk-based assessment and consulted maps and other records to get as much information on the causeway as possible. The first written reference to the Wadeway was in 1552 and referred to a toll for crossing the causeway. Norden's map and Speed's map of the early 17th century hint at a crossing

(Fig 20, Fig 21), but the first definitive map evidence of the Wadeway was in Taylor's map of 1759 (Fig 22). The settlement of Wade was established by 1086 on the northern shore. There were hints that a means of crossing from Langstone to Hayling would have been important in antiquity: sea level rise in prehistoric times would have cut Hayling Island off permanently from the mainland, and important Iron Age and Roman sites on Hayling would have required some way of crossing the channel. The decline of the Wadeway began in 1817 when permission was granted for the construction of a bridge linking the mainland with Hayling Island. In 1821, 'New Cut' – part of the Portsmouth to Arundel Canal – severed the causeway.

The next stage of the archaeologists' work was to survey the Wadeway (Fig 23). They found that the causeway survives as three segments, with the northernmost the best preserved (Fig 24) and consisting of gravel held in place with timber boards (Fig 26). The distinctive red-orange colour of this part is due to gravels that have naturally accumulated over time and are not part of the original structure of the causeway. A natural channel separates this part of the causeway from the central segment which is truncated at its south end by 'New Cut'. Large areas of the southern segment are eroded or submerged beneath silts.

A small excavation was carried out on the Wadeway (Fig 28). This showed that clay that had accumulated on the natural groundsurface had probably originally been salt marsh or part of mud flats. The Wadeway had been constructed by cutting away this clay and backfilling the resulting 1.2m deep ditch with gravel. Pieces of timber had been used to consolidate the edges of the structure.

No pottery or other artefacts were recovered that could date the causeway, but pollen taken from environmental samples was compared to the types of pollen that might be expected at different times in the past to give a broad date. The clay, through which the Wadeway was cut, was dated to the historic period – most probably the Roman or post-Roman period at earliest. Walnut pollen was found at the base of the clay, and this tree is widely thought to have been introduced by the Romans into Britain and Western Europe. Hemp pollen was also identified, which is also to some extent diagnostic of the medieval period. Towards the top of the clay, an increase in pine pollen may represent the 18th century introduction of planted pines.

It was only possible to give an indicative date for the gravel from which the Wadeway was constructed. An environmental sample near the base of the gravel did not contain any hemp or pine pollen suggesting the gravel dated some time between the post-Roman period and 1700.

Significantly, the excavation reveals that the Wadeway is not a prehistoric feature, although the broad dating of the causeway to the Roman or post-Roman period at the earliest could be improved using radiocarbon dating. The excavators suggest that the Wadeway could have been built on a topographic rise – so a natural ridge may have been used to cross between the mainland and Hayling that was only consolidated with gravel much later.

### *Fishbourne Meadows watching brief*

Emergency pipe repair works allowed archaeologists from Wessex Archaeology to investigate an area about 150m south of Fishbourne Roman Palace. The area appears to have been waterlogged until quite recently – an area of peat was recorded and the Yeakell and Gardner map of the 1780s appears to show this area as marshland. The clay above the peat may have been deposited as part of land reclamation or by flooding.

Significantly three wooden stakes were recovered low down in one of the trenches (Fig 36). These were radiocarbon dated to about 2500 years ago, the late Bronze Age to early Iron Age. The stakes, which were made from alder trees that were about 26 years old at time of felling, may have been the bases of longer posts. It is impossible to say with certainty what sort of structure the stakes belonged to, but they do illustrate that prehistoric peoples were active in the harbour and that there is a good potential for survival for organic objects – such as those made of timber – in parts of the AONB. Parts of a timber wharf structure or causeway, found some years ago on the north coast of Hayling Island, were also radiocarbon dated to the Late Bronze Age.

## Palaeoenvironment

### *What do boreholes reveal about the early development of the AONB?*

One of the most significant pieces of work undertaken as 'Rhythms of the Tide' was an investigation of the types of environment that existed over the past 10,000 years. Archaeologist Dr Martin Bates, archaeologists from MoLAS and Wessex Archaeology, as well as specialists in marine survey Titan undertook this extensive work.

The Pleistocene is the last 1.6-2 million years, excluding the most recent 10,000 years (including the present) which is known as the Holocene.

The first stage of this part of the project was to undertake a desk-based assessment. Not looking at maps, since none exist for such early periods, but at data from boreholes. The British Geological Survey hold an extensive collection of borehole data from the last 150 years, and there is additional data from other investigations in the harbour.

This work suggested a model for the sequence development of the region in three phases. The first phase for which evidence is available is when the region was an embayed coastline in the Middle Pleistocene (A in Fig 29). Sediments in long-buried ancient channels cut into the Manhood Peninsula are likely to be the last remaining evidence for this phase. In the second phase, the Late Middle Pleistocene, the area was open coastline (B in Fig 29), facing approximately south. Evidence for this phase is likely to consist of the oldest deposits in the AONB, perhaps preserved around Warblington.

In the third phase, the Upper Pleistocene and Holocene (up to the present), the area was a harboured coastline (C–G in Fig 29) that underwent major changes. The climate grew warmer about 8,000 years ago melting glaciers causing the sea level to rise dramatically, transforming the AONB. Much of the region would have remained dry until at least the middle Bronze Age, but the subsequent inundation by brackish water would have transformed the area from one containing a series of low hills separated by estuarine channels to one dominated by larger bodies of tidal water.

An important part of the project was to understand the deposits and topography in the channels. Despite being underwater now, these areas would once have been dry land. In the Mesolithic period, for example, the valleys that now form the harbour channels would have been used as access routes to the coast as well as for hunting and base camps.

### *Geophysical survey of the channels*

A geophysical survey of the sub-tidal zone was undertaken by Titan Surveys Ltd, using a specially-adapted survey vessel. The survey showed that Chichester Channel, south of Bosham Channel, had been active for a prolonged period, with Holocene deposition mainly concentrated downstream in the estuary, with much thinner deposition up the creeks. This implied that the creeks were not significantly deeper

now than at the beginning of the Holocene. In contrast, the survey showed that the mouth of the estuary had silted up considerably over the past 10,000 years and also that the margin of the main channel as it turned southward had migrated west over time. In Fishbourne Channel there was less evidence of sediment deposition than in Bosham Channel.

One of the most significant findings was that there was no evidence of a deep channel extending up Fishbourne Channel beyond Copperas Point, suggesting that only vessels with a relatively shallow draught would have been able to travel further north. In the Roman period, therefore, it is unlikely that ocean-going vessels could have reached Fishbourne Palace. The implication is that there could have been a Roman harbour at or near Copperas Point where goods for the Palace and beyond could have been offloaded.

The survey also highlighted the problems with interpreting data from such geophysical surveys. Excavation can test geophysical surveys on land, but this option is not as easy if the area of survey is underwater. Identifying Roman features in Fishbourne Channel is important because of the relationship with the Palace, yet no one knows what a Roman dredged channel would look like, for example, or what features would distinguish it from natural channel.

### *Geophysical and auger survey on land*

Wessex Archaeology undertook geophysical and auger surveys in the AONB. The geophysical surveys consisted of a seismic refraction survey and a geo-electrical survey. The seismic energy travels through the ground along refracted pathways between different geological layers before returning to the surface where it is detected by geophones. A geo-electrical transect uses an array of electrodes to inject a current into the ground and then to measure the electrical resistance which varies due to the physical properties of the geology. The auger survey used a gouge auger to acquire sediment samples of up to 6m in length.

At Bosham and Bosham Hoe, thick sequences of Holocene alluvium were identified, overlying brickearth in places at the latter location. A palaeochannel feature, an ancient watercourse, was identified at Horsepond, and a possible clay pit, perhaps associated with the Roman tilery, was found at Copperas Point. At Fishbourne Channel, the auger survey confirmed the results from the marine geophysics that this area consisted of thin sequences of silt and gravel above bedrock and so would have been unsuitable for Roman cargo vessels.

### *Coring and environmental analysis*

Further coring, and environmental analysis, was undertaken by MoLAS. Seven locations (Tourner Bury Creek; Coniger Point; Thorney Island; Marker Point; Bosham Channel; Bosham Hoe and Horse Pond) were chosen and at least two boreholes drilled per location. The core samples recovered from each borehole were cut open, logged and interpreted. Microfossils and macrofossils (Fig 34) that reveal information about past environmental conditions were extracted and analysed, and radiocarbon dating undertaken. Core samples from boreholes from Thorney Island and Bosham Hoe were especially interesting and these samples were analysed in

greater detail. Radiocarbon dating of seeds from the earliest estuarine deposits at each coring location was also undertaken where possible.

The aim of these investigations was to examine the evidence for vegetation change, especially forest clearance, landscape disturbance and agriculture associated with the impact of past peoples. The radiocarbon dates allowed correlations to be made between the estuarine sequences examined and enabled the past environmental reconstructions to be related to the known archaeology of the area.

An important caveat to note, however, is that care should be taken when extrapolating the results of sixteen 4cm diameter boreholes drilled at just seven locations around the harbour, with detailed analysis undertaken in only two, to construct harbour-wide models of landscape evolution. The interpretations from the borehole results in the current phase of work must be viewed as preliminary and a first attempt at reconstructing past environment.

The Thorney Island cores preserved the best evidence for **Mesolithic** (12,000-4,000 BC) period environment and landscape. The sea level in *c* 10,000 BC lay at about 35m below today's sea level, although it was rising rapidly. The deeply-incised river valleys of the Solent drained the Chichester Harbour area. The Thorney Island cores show that spring-fed streams drained down the valley sides in an open grassy landscape. Later, the valley sides were colonised by pine forest as the freshwater tributary streams silted up with peat. High levels of charcoal in the pollen samples suggest that the pine forest was susceptible to forest fires.

As the sea level rose in the later Mesolithic period, estuarine environments are likely to have encroached up the valley systems and into the harbour area – at first constrained within the valleys. The inlets filled up rapidly – in the Thorney Island cores 3m of sediment built up in 300 years at about 4,000BC. The rate of sea level rise slowed at around this time and from this period most of the other cores obtained in this study record estuarine incursion. The **Neolithic** period (4,000-2,000 BC) saw estuarine conditions expand to the modern foreshore zone.

Almost all the cores show that the estuarine incursion was associated with erosion and a turbulent depositional environment. This perhaps points to storms rather than a gradual process of waterlogging of a formerly dry landscape. During the Neolithic, the encroaching water reached the shoulders of the incised valleys and by the later Neolithic was expanding across the fringes of the plateau surfaces. The spilling over of the waters would have represented a marked change in the appearance of the harbour that was effectively drowning. As the estuarine environments expanded, areas of mixed woodland of oak and lime with hazel and elm shrank. Neolithic people may also have been intermittently clearing woodland, carbon in the cores showed evidence for this at Coniger Point and Bosham Hoe. Wetland areas of sedge fen, backed by wet alder carr would have become more established by the **Bronze Age (**2,000-600 BC), when the landscape of the harbour would have appeared much as it does today: estuarine with extensive mudflats between islands of low ground.

Many of the borehole sequences appear to show a contraction of estuarine environments by the **Iron Age (**600 BC-AD 43), accompanied by a change from mudflats to a salt marsh environment. At Bosham Hoe, pollen analysis from the core

showed that during the later Iron Age inwashed pollen such as pine decreased and pollen of grasses and salt marsh plants increased. At the Bronze Age / Iron Age transition, the cores show that a woodland of oak with beech and ash developed. The extent of salt marsh may have been at its greatest from the **Roman** (AD 43-410) to **early medieval** (AD 410-1066) periods. Subsequent changes in the harbour in the **medieval** (AD 1066-1485) and later periods – land reclamation in particular – have obscured the impact of relative sea level fluctuations.

The importance of this work lies in the way it has provided a picture of the environmental conditions at the time. This is not just a backdrop to the way Mesolithic people lived, but an environment deeply entwined with their lives in a way that modern people can only guess at.

# Conclusions

The archaeological projects conducted as part of the *'Rhythms of the Tide'* have contributed significantly to our understanding of the harbour and answered many of the research questions posed in the original Research Framework document.

In this section, the original research aims of the Research Framework are revisited together with how well they have been addressed by the current project (in italics).

***Research questions – Geology and coastal change***

Research should be focussed on understanding coastal change through time, building on the work already done. An understanding of coastal change will aid future management of the Harbour by improving knowledge of past and current processes which in turn might aid the prediction of future change.

*Coring and environmental analysis, the sub-bottom profiling and geo-electric and auger work has helped the understanding of coastal change in the past. Further analysis of maritime charts to understand the changes in the coast in the historic period.*

A major contributor to coastal change has been changes in sea level. Investigations into relative sea level change could lead to the production of broad period maps showing major channels, islands, promontories and coasts for different major periods.

*Although maps have not been produced, the coring and environmental analysis has advanced our knowledge of this considerably.*

There is a need to assess the condition of all sites recorded for the AONB on the Sites and Monuments Records (SMR) held by local authorities. This field assessment should be aimed at identifying known and potential risks posed by sea level rise, natural erosion, changing land use and other threats. Such work would ensure that these sites are recorded as fully as possible before archaeological evidence is lost.

*The condition of many sites in the AONB has been assessed by the Conditions survey, which also assessed potential risks, and the Foreshore survey.*

A similar assessment of sea defences could also be undertaken to determine their age and current condition. The position of quays and sea defences is critical to an understanding of the harbour and how these have impacted on the changing distribution of sediments around the area. A full study of the relevant maps and charts could be a topic for future research.

*The Conditions survey and the Foreshore survey have helped achieve this aim. An assessment has also been made of maritime charts.*

Future research should also aim to continue to map and date sand and gravel deposits and to develop understanding of Pleistocene deposits in the AONB.

*This remains an active research aim*.

***Research questions - Palaeolithic***

Future research should aim to build on the recent advances detailed above to improve our understanding of Pleistocene deposits in Sussex river valleys. A key task is to map the distribution of sands and gravels deposited during the Palaeolithic period and to date them, for example using shells, mammalian remains or the sands themselves. This will provide important information on hominid activity and sea level change. Two areas within the AONB are likely to yield good results – at Thorney Island airfield and Conigar Point at Emsworth.

*This remains an active research aim*.

Further work is also needed to understand the age and palaeoenvironmental significance of sediments identified in a recent study of the Palaeolithic archaeology of the Sussex-Hampshire coastal corridor.

*This remains an active research aim*.

***Research questions – Mesolithic***

In terms of research, there is a need to identify (perhaps by survey) and excavate *in situ* Mesolithic sites in the AONB, especially those where environmental, faunal and botanical remains are likely to be preserved. The harbour is a drowned landscape, and Mesolithic sites could survive many metres below the modern low water mark. Stratified sites on the Coastal Plain in general could reveal improved chronological sequences. Important information is also likely to be gained through field-walking of plough-spread sites on the coastal plain. Areas under or adjacent to alluvium in the lower stretches of river valleys would also provide useful information if targeted for investigation. Work in the AONB could complement studies about how raw material was procured, for example from the Downs. Research along these lines would lead to a considerable gain in information in the study of the Mesolithic period.

*No* in situ *Mesolithic sites have yet been identified, although the surveys were not focused on areas that might yield such sites. The valleys would have been attractive to Mesolithic peoples and the harbour has a good potential to find such sites. Some field-walking has been undertaken as part of the current project, but no Mesolithic finds have been located so far.*

***Research questions - Neolithic***

A substantial gap in knowledge about the Neolithic period is of the environmental conditions. Systematic coring of the AONB would help to build up a picture of the environment during this period. Work of this nature has been carried out in the neighbouring Langstone Harbour (Allen & Gardiner 2000).

*Our understanding of environmental conditions during the Neolithic period has been significantly advanced by the coring and environmental analysis.*

Research questions should also concentrate on increasing understanding of how the AONB was used in the Neolithic and its relationship to inland sites, particularly settlement sites.

*The use of the AONB in the Neolithic is still largely speculative, and more research is needed before this research question can be answered.*

***Research questions – Bronze Age***

As is the case with other periods, there is a substantial gap in knowledge about the prevailing environmental conditions during the Bronze Age. Systematic coring would address this question.

*Our understanding of environmental conditions during the Bronze Age period has been significantly advanced by the coring and environmental analysis.*
Research questions should also concentrate on increasing understanding of how the AONB was used in the Bronze Age and its relationship to inland sites, particularly settlement sites. There evidence for settlement just outside the AONB and the hint of settlement within the Area. There is also important evidence for well preserved timber sites relating to causeways or wharfs.

*The use of the AONB in the Bronze Age is still largely speculative, and more research is needed before this research question can be answered. The potential for finding well preserved timber sites of this period was underlined by the find of Late Bronze Age / Early Iron Age stakes near Fishbourne.*

There is evidence that an urnfield located to the west continued into part of the AONB. Future research could focus on whether this urnfield continues further into the AONB. Research could also address how wider changes in settlement, economy and material culture in the later Bronze Age was reflected in changes in burial practice and deposition of hoards in watery places such as the AONB.

*No further Bronze Age burial remains were found as a result of the current project. Field-walking continues and this may produce results.*

***Research questions – Iron Age***

Future research should address how the landscape was used in the Iron Age, and whether any evidence of settlement can be identified. Most of the evidence points to the AONB being used for salt making in this period, although there are hints that the true picture may have been more complex – for example the function of Tourner Bury hillfort is not fully understood, or whether the roots of the Fishbourne site extend into the Iron Age, perhaps as a trading post.

*No Iron Age settlement has been identified in the current project. The function of Tourner Bury hillfort is still not fully understood, and there has been no excavation on the (scheduled) site since the 1970s. Important archaeological work continues at*

*Fishbourne Roman palace, with its relationship to the Iron Age acknowledged as an important research aim.*

There are also unresolved questions about trade and supply in the Iron Age. Was the Harbour a major trading route, and was water transport more important than transport on land?

*This remains an active research aim*.

***Research questions – Roman***

The AONB was a major focus in the Roman period. There is an excellent opportunity for future research to compare and contrast the inter-relationships between palace – villas – rural economy and settlement in this period. There is also the opportunity to investigate Roman trade and supply – Fishbourne is likely to have been an important harbour.

*The relationship of the palace to its surrounding settlement and economy is an active research aim for archaeologists at Fishbourne.*

There are also research questions about the harbour itself, particularly charting the deep water channel and understanding its water management and local environment to build a picture of the harbourside environment in this period. Systematic coring would add to an understanding of the environmental conditions and of sea level change.

*Sub-bottom profiling work in the current project demonstrated that the palace could only be accessed vessels of a relatively shallow draught. Knowledge of Roman environmental conditions and sea level change was advanced by the coring and environmental study as part of the current project.*

The AONB was also used for salt making in the Roman period. It is not clear why salt production seems to cease in the 2nd century, just when such production should be increasing.

*This remains an active research aim for archaeologists at Fishbourne.*

***Research questions – early medieval***

Further detailed research into place-names, for example field names, would increase understanding of how the Saxons settled the AONB and may shed light on their interaction with the native Britons.

*No research of this kind was undertaken as part of the current project.*

Trade in the Early Medieval period is not fully understood, and future research could address the question of how the Harbour was used as a port, and what maritime craft were used.

*This remains an active research aim*.

***Research questions – medieval***

The lack of excavation on rural medieval sites is accompanied by a lack of environmental evidence for the period. There is a research need to research rural settlement patterns and their origin. There are both nucleated and dispersed settlements in the AONB, and it is not clear why one or other of these developed. An understanding of the distribution of the settlements – including the deserted settlements – will give insights into social structure and social organisation and into medieval ideas about ordering and planning.

*The coring and environmental work provided some information on the environment during this period. Field-walking produced important information on deserted medieval settlements.*

The basis of any ongoing research into moated sites and their social meaning and position must be based on a full recovery of their location and extent (West 2000). For those moated sites already known, documentary work on Manorial holdings as well as field survey, including using geophysical techniques, may shed light on these monuments. Firm dating of such sites is also necessary. Inspection of map evidence may reveal more moated sites. There is still a question of the motivation for the moat builders. The answer is likely to be more complex than that moats were either for defence or decoration, since not all high-status homes were moated. West postulates that the defensive moat – modelled on the early castles – may have lead to an environment enhancing and food storing water feature in less troubled times.

*No research into moated sites in particular was undertaken as part of the current project.*

There was considerable influence of the Church in the AONB, for example Boxgrove Priory held several advowsons for churches in the Area. Future research could investigate the affect of this influence. Trade in the Medieval period is not fully understood for the AONB. Future research could address the question of how the Harbour developed as a port, as well as its maritime history in this period.

*These remain active research aims.*

There is only the broadest of understandings about the environmental conditions in the Medieval period and how these impacted on land use. For instance, we know that increased storminess in the 14th century led to the abandonment of some arable fields and even the loss of land to the sea, but detail is lacking.

*The coring and environmental work provided some information on this research aim.*

Historical research and survey of the deserted medieval villages near Birdham, Warblington and Apuldram could be undertaken to gain an understanding of the changes in settlement patterns in the medieval period.

*Only limited historical research was undertaken into deserted medieval villages, as part of the campaign of field-walking. The field-walking itself produced important results about the deserted medieval villages.*

***Research questions – post medieval***

In the post-medieval period, much of the work undertaken to date has been of a disjointed nature and the result of chance discoveries when looking for earlier remains rather than actively seeking sites that may answer specific questions. In many instances there has been too little work to enable specific research aims to be formulated, and research aims can only be of the most general kind. Initial fieldwork is needed to test the quantity and quality of the archaeological resource. This would include the systematic location and recording of extant structures of the period to ensure the long term preservation of information and to facilitate a secure database from which to formulate future strategies.

*The Conditions survey and Foreshore survey have gone some way to achieving this research aim.*

Mills have received little archaeological attention. The AONB is especially important for tide mills, of which few are known. Future research could be aimed at surveying and even excavating standing mills where appropriate. There has been little detailed fieldwork into the post-medieval brick industry. Brick and tile kilns should be surveyed, not neglecting the remains of other structures, such as pug-mills and drying sheds that may lie nearby. Research could also be focussed on other industries in the AONB, such as the salt industry and the fishing and oyster industries which have all had important impacts on the economy of the Harbour in this period.

*The Conditions survey and Foreshore survey have gone some way to achieving these research aims.*

Historic boat yards and wharfs are under increasing threat. Quays were once important nodal points of the harbourscape, but are now invisible. Survey of these features is important before they are lost. A number of wrecks and hulks have also been identified which are more accessible from the shore. These should also be surveyed.

*The Conditions survey and Foreshore survey have gone some way to achieving this research aim. Study of maritime charts has also helped in the understanding of these features, although much work remains to be done.*

Current knowledge of vernacular buildings could be synthesised into a cohesive unit before undertaking further research and field survey.

*Study specifically of vernacular buildings was not undertaken as part of the current project.*

***Research questions – modern***

The AONB includes a number of military features, as detailed above. Research into the location of such features and their historical significance would contribute to ensuring their survival.

*The Conditions survey and the Foreshore survey have helped achieve this aim.*

Further investigation of the wrecks known in the Harbour, perhaps through diving, would aid the understanding of these features.

*A campaign of ground-truthing a number of submerged features has taken place.*

***Research questions – features of an unknown date***

The date for the Wadeway is not known, although it could date to the Bronze Age. Further survey to build on the work of HWTMA and a focus on dating the feature perhaps though dendrochronology of well-stratified timbers would add to its understanding.

*A small excavation of the Wadeway suggested it was not a Bronze Age – or prehistoric – feature.*

# Further reading

### *'Rhythms of the Tide'* projects

Bates, M 2005a *HA5 Palaeoenvironment of the AONB – Desk based assessment of borehole and core information*, unpublished report

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McNeill, E 2005 *Chichester Harbour Geophysical Survey: Final Report No: CS0127/R1/V2* Titan Environmental Surveys Ltd unpublished report

Mills, W and Corcoran, J 2006a *Coring and environmental analysis – intertidal: Stage I report*, MoLAS unpublished report

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Rowsome, P 2006 *Synthesis of HLF Archaeology Projects within Chichester Harbour AONB – Tender documents*, MoLAS unpublished document

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Vessey, J Barefoot, L McKewan, L and McKewan, C 2005 *HA4 Changing Landscapes Archaeological Shore Walk 2005 Final Report for Chichester Harbour Conservancy*, Marine Archaeological Research Consultants Ltd unpublished report

Wessex Archaeology, 2006a *Chichester Harbour Conservancy geophysical and auger survey Ref: 6148.01* Wessex Archaeology unpublished report

Wessex Archaeology, 2006b *Chichester Harbour Conservancy Fishbourne Meadows Watching Brief*, Wessex Archaeology unpublished report

West Sussex Archaeology, 2006a *Field-walking within Chichester Harbour AONB: A Handbook*, West Sussex Archaeology unpublished report

West Sussex Archaeology, 2006b *Report on Arch Field-walking within Chichester Harbour AONB,* West Sussex Archaeology unpublished report

**Other reports**

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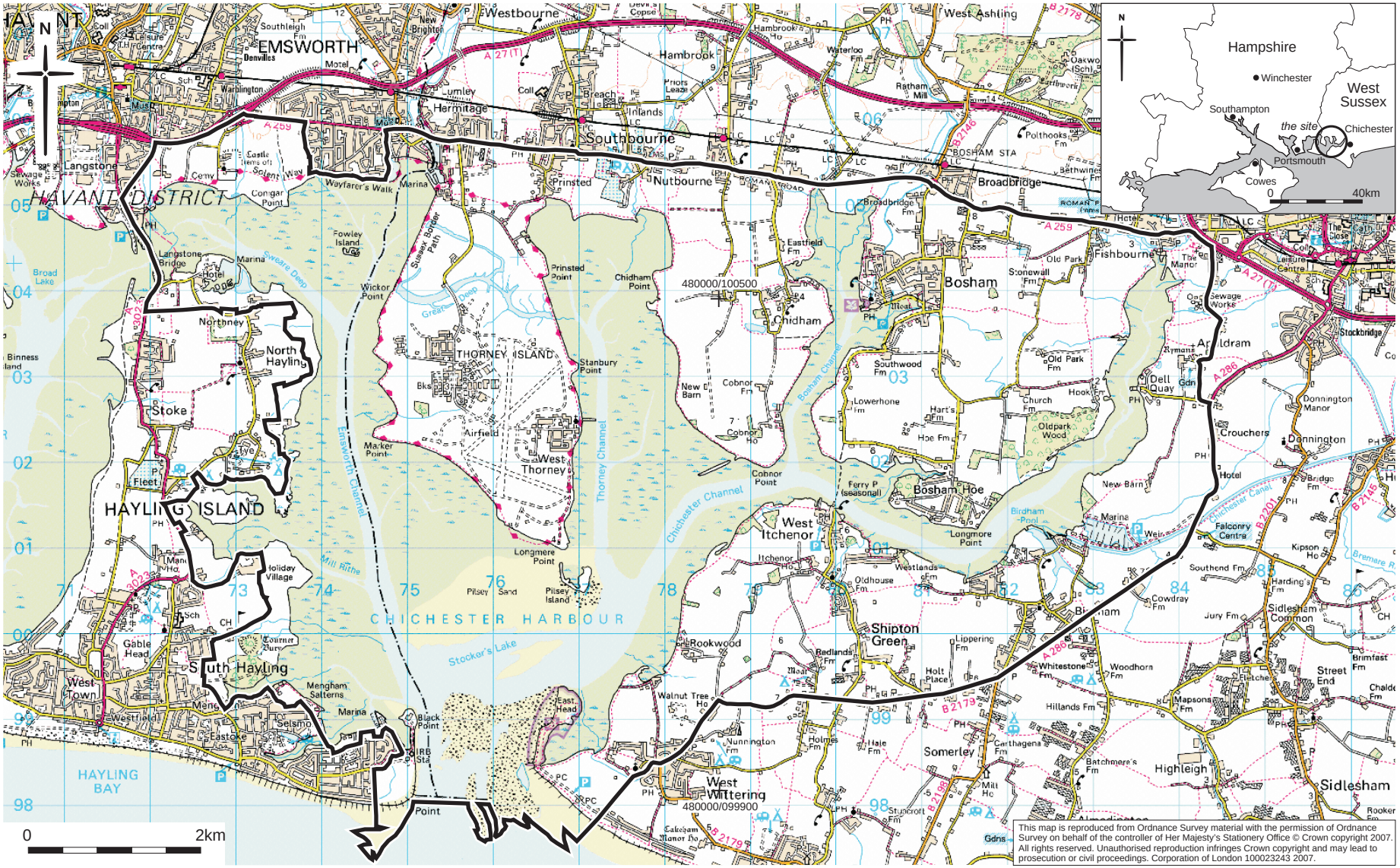




Fig 1 Site location

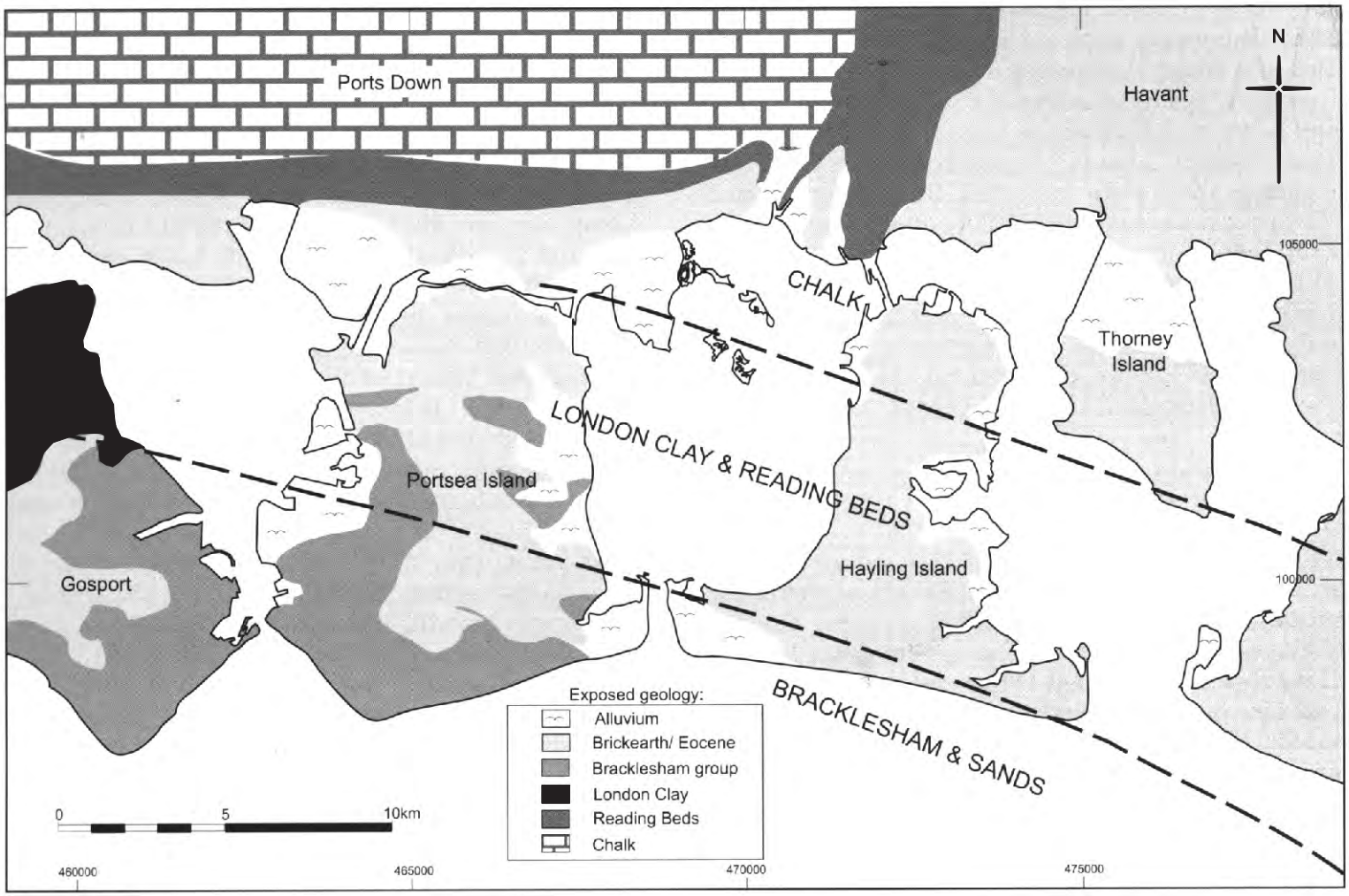


Fig 2 The surface geology of the Chichester harbour area

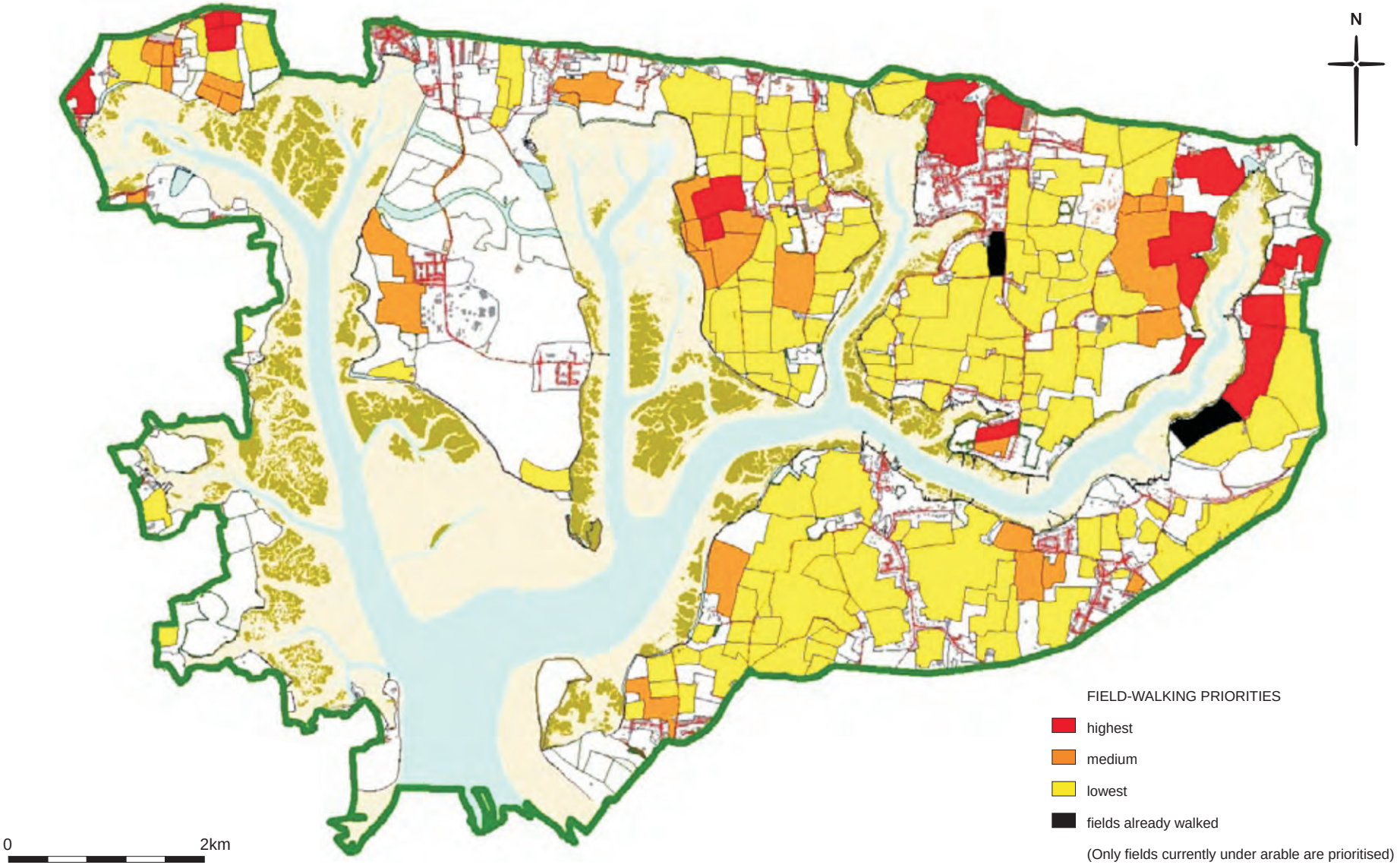


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Fig 3 This map shows the fields that are likely to yield most information from field-walking (West Sussex Archaeology 2006b)

Fig 4 Shore-walking in the AONB (Vessey et al 2006)

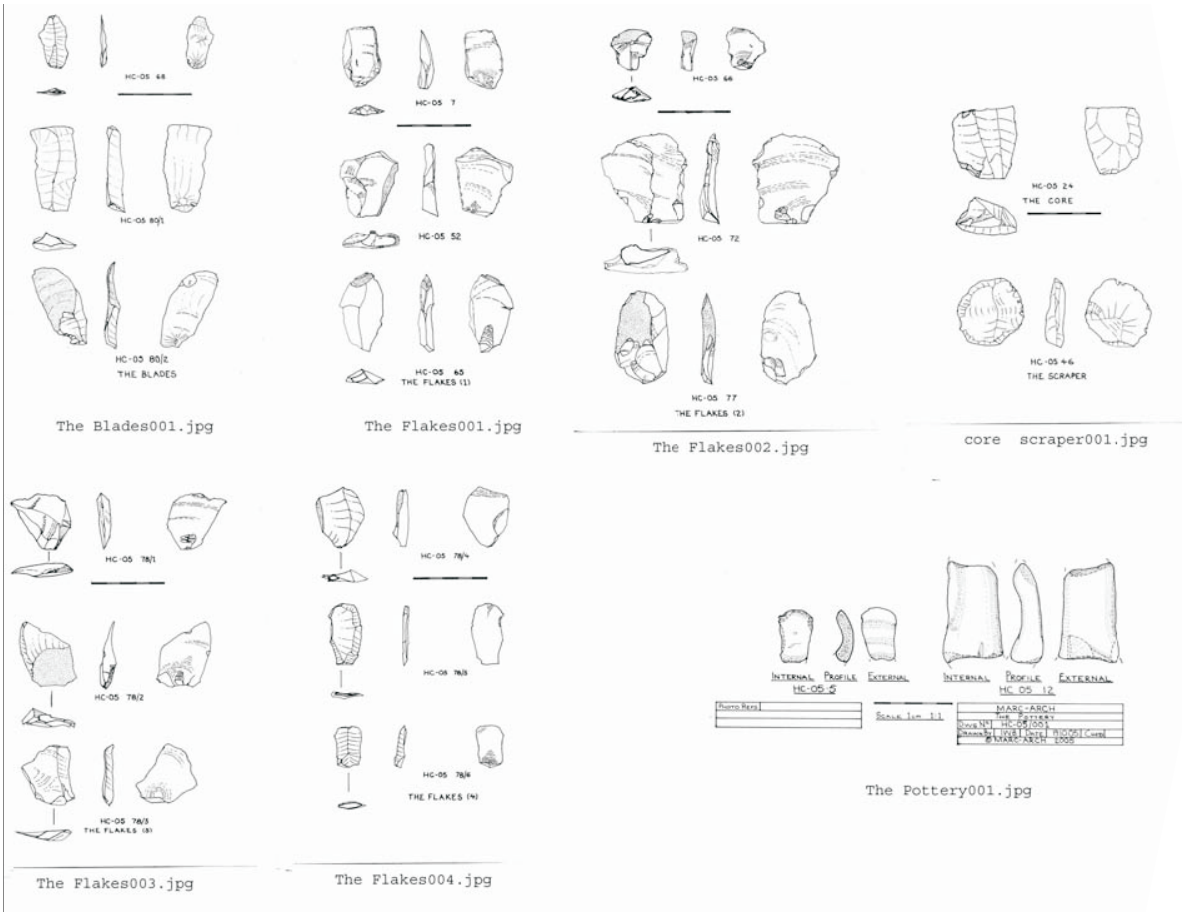


Fig 5 Flints found during the shore-walk (Vessey et al 2006)

Fig 6 The remains of an extensive post-medieval wharf structure at Warblington (CHC0002, Maritime Archaeology Ltd 2006a)

Fig 7 The wharf structure at Warblington, showing parallel piles with cross-bracing timbers (Maritime Archaeology Ltd 2006a)

Fig 8 This row of timber posts west of Ellanore may have been part of a groyne (CHC0009, Maritime Archaeology Ltd 2006a)

Fig 9 These posts near Rookwood may be the remains of three jetties (CHC0018, Maritime Archaeology Ltd 2006a)

Fig 10 The break (centre of the image) in this linear feature near Prinsted is a sluice for an oyster bed (Maritime Archaeology Ltd 2006a)

Fig 11 Some of the oyster beds near Prinsted are clearly defined (Maritime Archaeology Ltd 2006a)

Fig 12 Erosion in the surface of the Fisherman's Walk causeway reveals an older surface constructed from branches (CHC0024, Maritime Archaeology Ltd 2006a)

Fig 13 Six timber posts form a line near the possible former location of an Anglo-Saxon causeway near Longmore Point. No evidence of the causeway itself was found (CHC0047, Maritime Archaeology Ltd 2006a)

Fig 14 This failed seawall was constructed across Bosham channel in the early 19th century (CHC0059, Maritime Archaeology Ltd 2006a)

Fig 15 Remains of a boat abandoned on the seawall (Maritime Archaeology Ltd 2006a)

Fig 16 Some timber structures are only visible at low tides (CHC0060, Maritime Archaeology Ltd 2006a)

Fig 17 This possible Roman saltern at Thornham Boatyard, south of Prinsted, is built of sandy gravel that is eroding (CHC0031, Maritime Archaeology Ltd 2006a)

Fig 18 These oyster beds at Emsworth are some of the best preserved examples in the Harbour (photo looking northwest) (Maritime Archaeology Ltd 2006a)

Fig 19 The Fishermans' Walk causeway, near Emsworth (Maritime Archaeology 2006d)


Fig 20 The Norden map of 1607


Fig 21 The Speed map of 1611


Fig 22 The Taylor map of 1759

Fig 23 Archaeologists survey the Wadeway (Maritime Archaeology Ltd 2007)

Fig 24 View of the Wadeway looking north (Maritime Archaeology Ltd 2007)

Fig 25 Damage to the Wadeway from bait digging (Maritime Archaeology Ltd 2007)

Fig 26 Timber boards used in the construction of the Wadeway (Maritime Archaeology Ltd 2007)

Fig 27 Volunteers take a hand auger sample (Maritime Archaeology Ltd 2007)

Fig 28  Taking an environmental sample during the Wadeway excavation (Maritime Archaeology Ltd 2007)

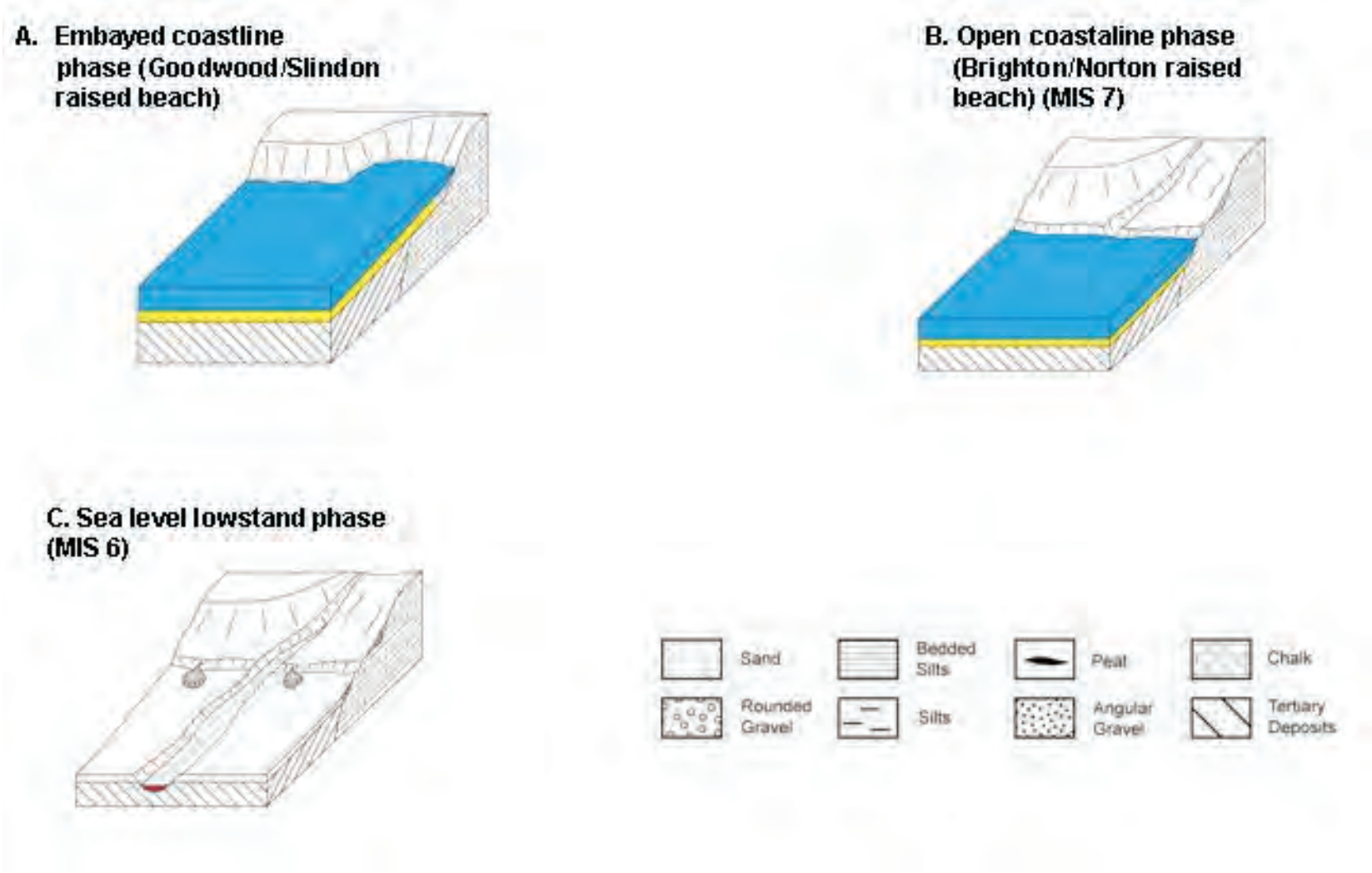


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Fig 29 Schematic development of the Chichester Harbour area through the Middle and Late Pleistocene, part 1 (Bates 2005a)

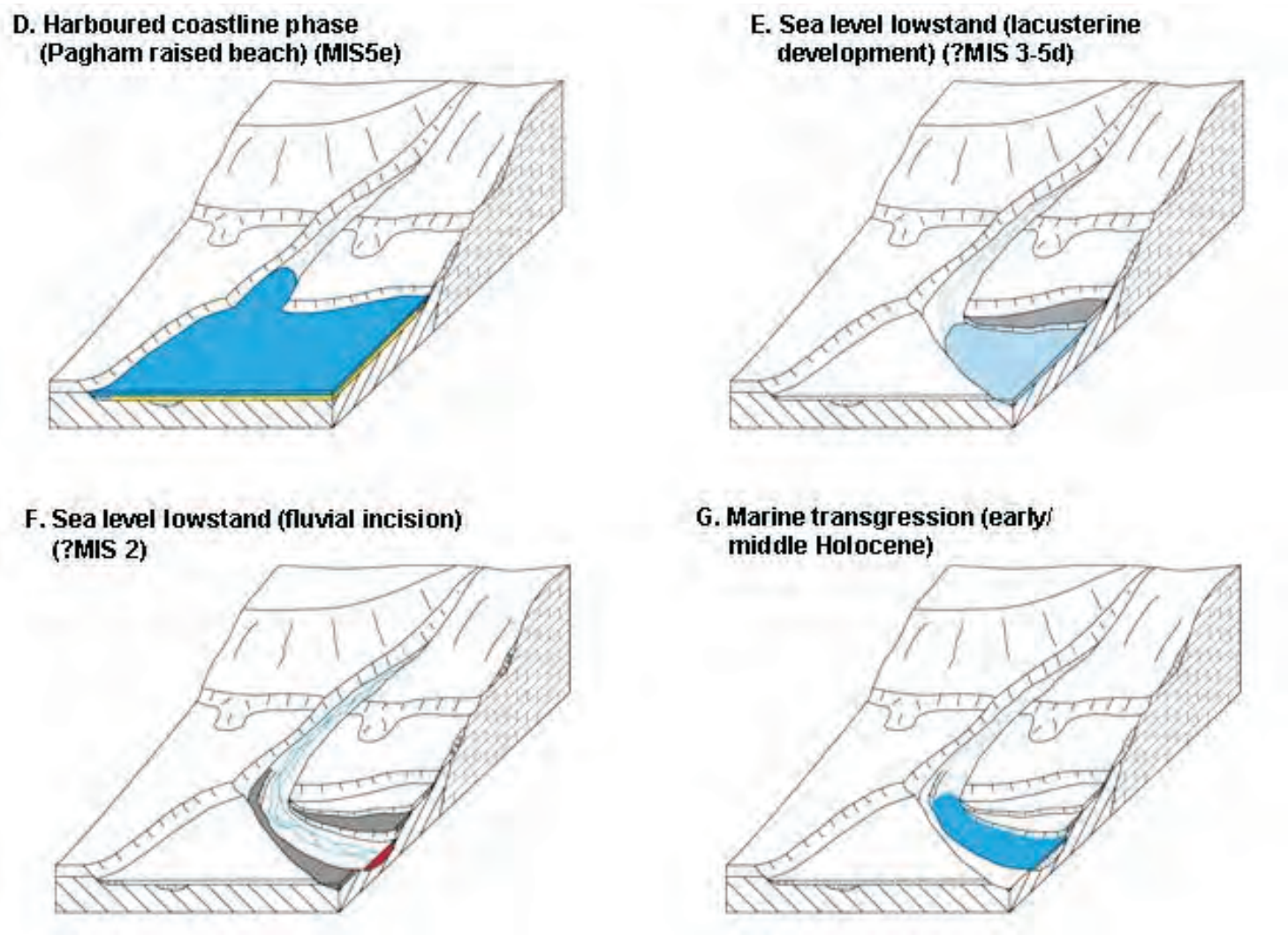
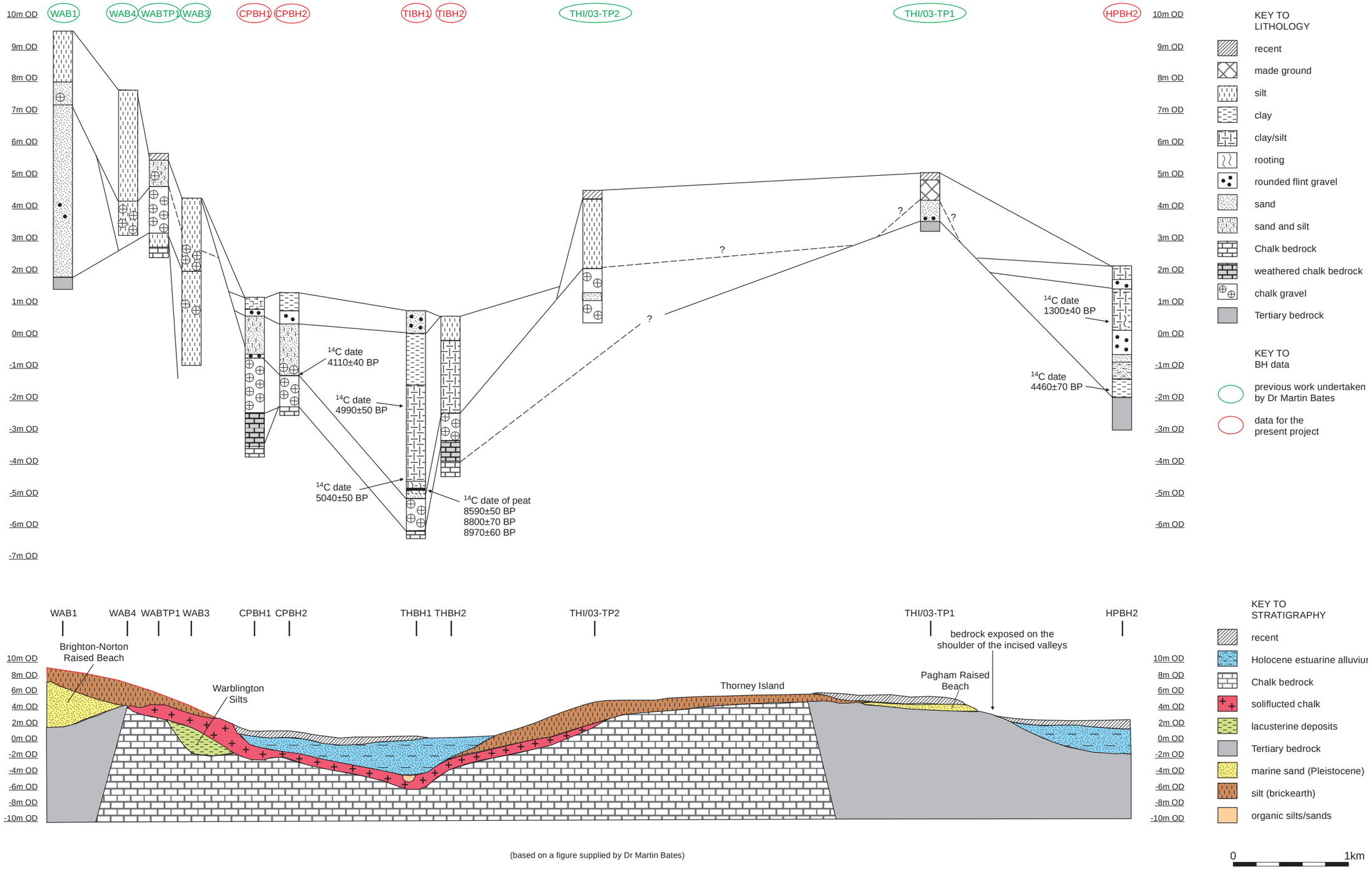



Fig 30 Schematic development of the Chichester Harbour area through the Middle and Late Pleistocene, part 2 (Bates 2005a)




(based on a figure supplied by Dr Martin Bates)

Fig 31 Schematic transect from west to east across the harbour (Mills *et al* 2007b)

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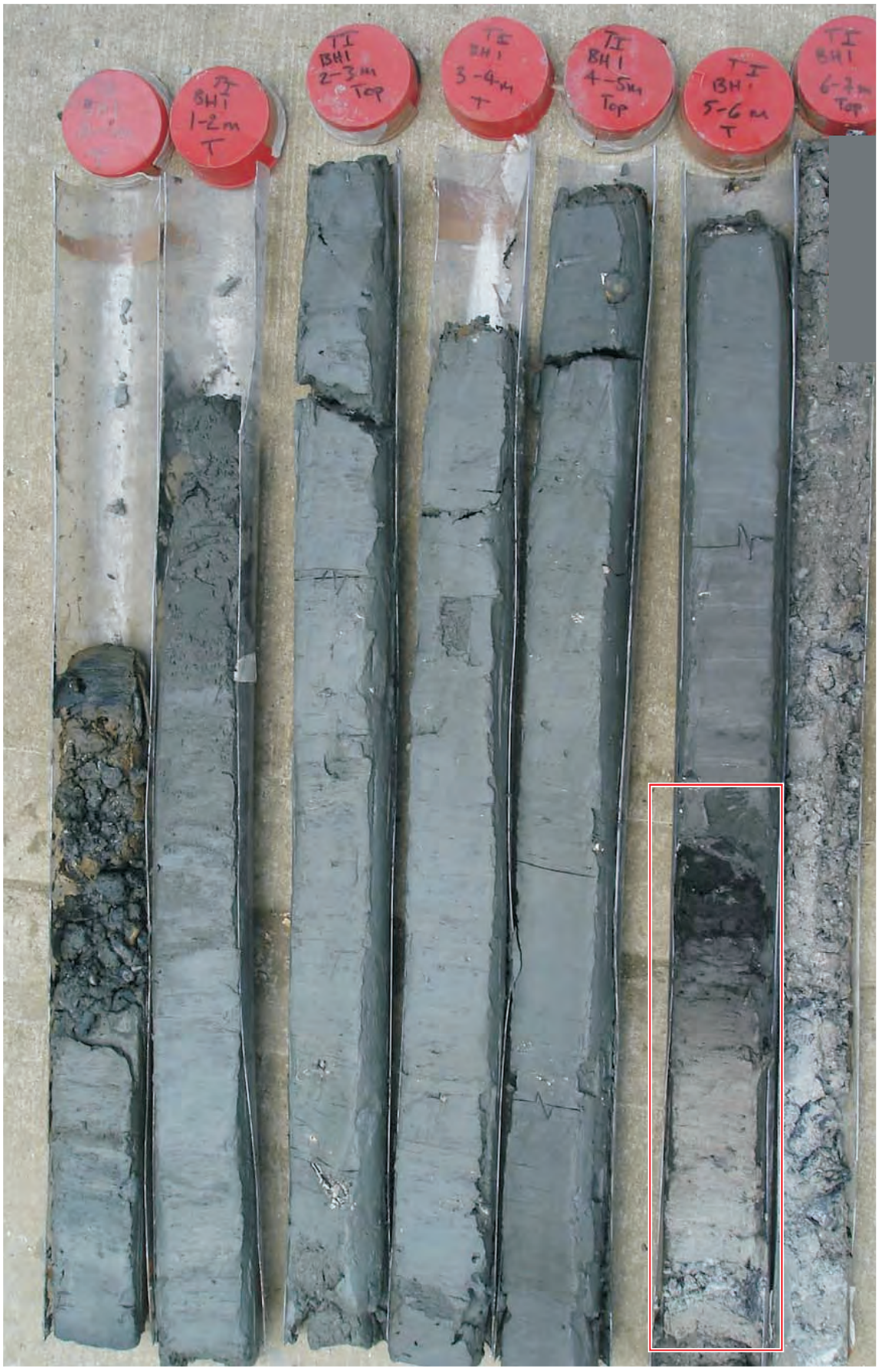



Fig 32 Thorney Island BH1 core samples (Mills *et al* 2007b)

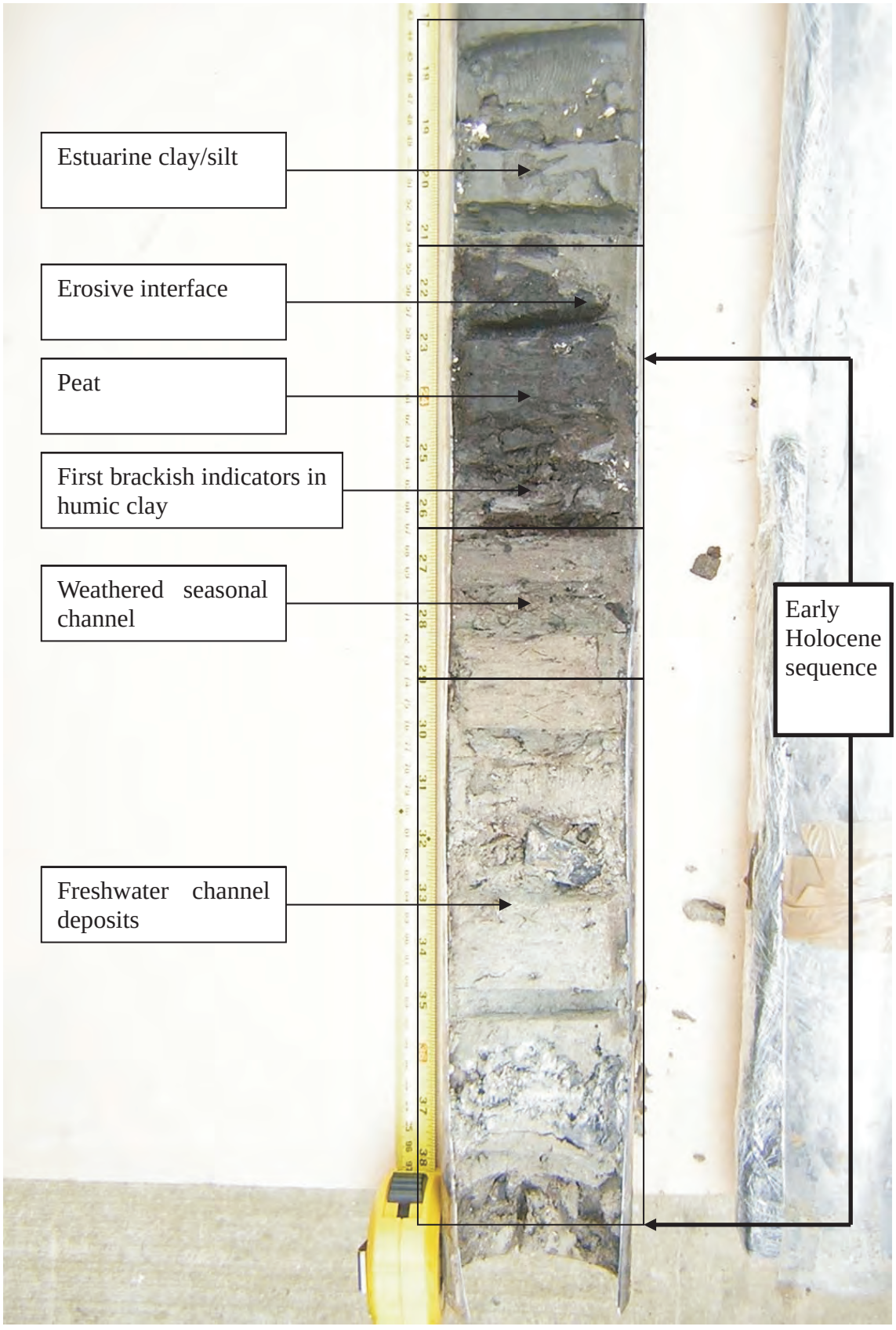
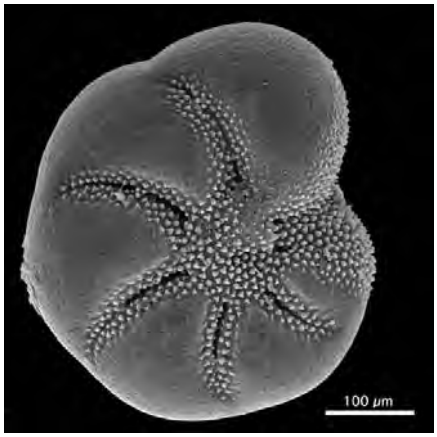
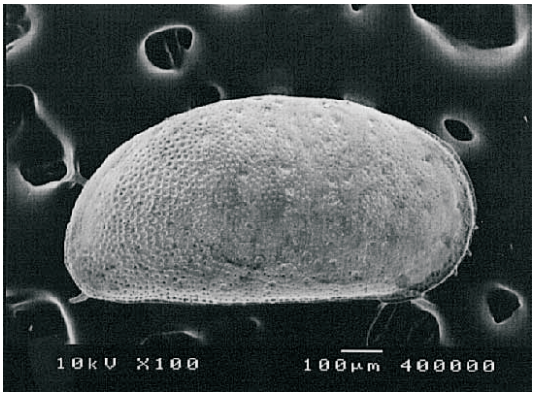



Fig 33 Thorney Island BH1 core sample, the Early Holocene sequence (Mills *et al* 2007b)

*Fig 18 Indicators of estuarine environments*




Example of a Foraminifera found in the study:*Elphidium excavatum*




Example of a tidal creek Ostracod found in the study: *Cyprideis torosa*

Example of a brackish diatom and plant of origin found in the study: N*itzschia compressa*

Example of a marine/estuarine mollusc found in the study: *Scrobicularia plana*

Fig 34 Indicators of estuarine environments (Mills *et al* 2007b)

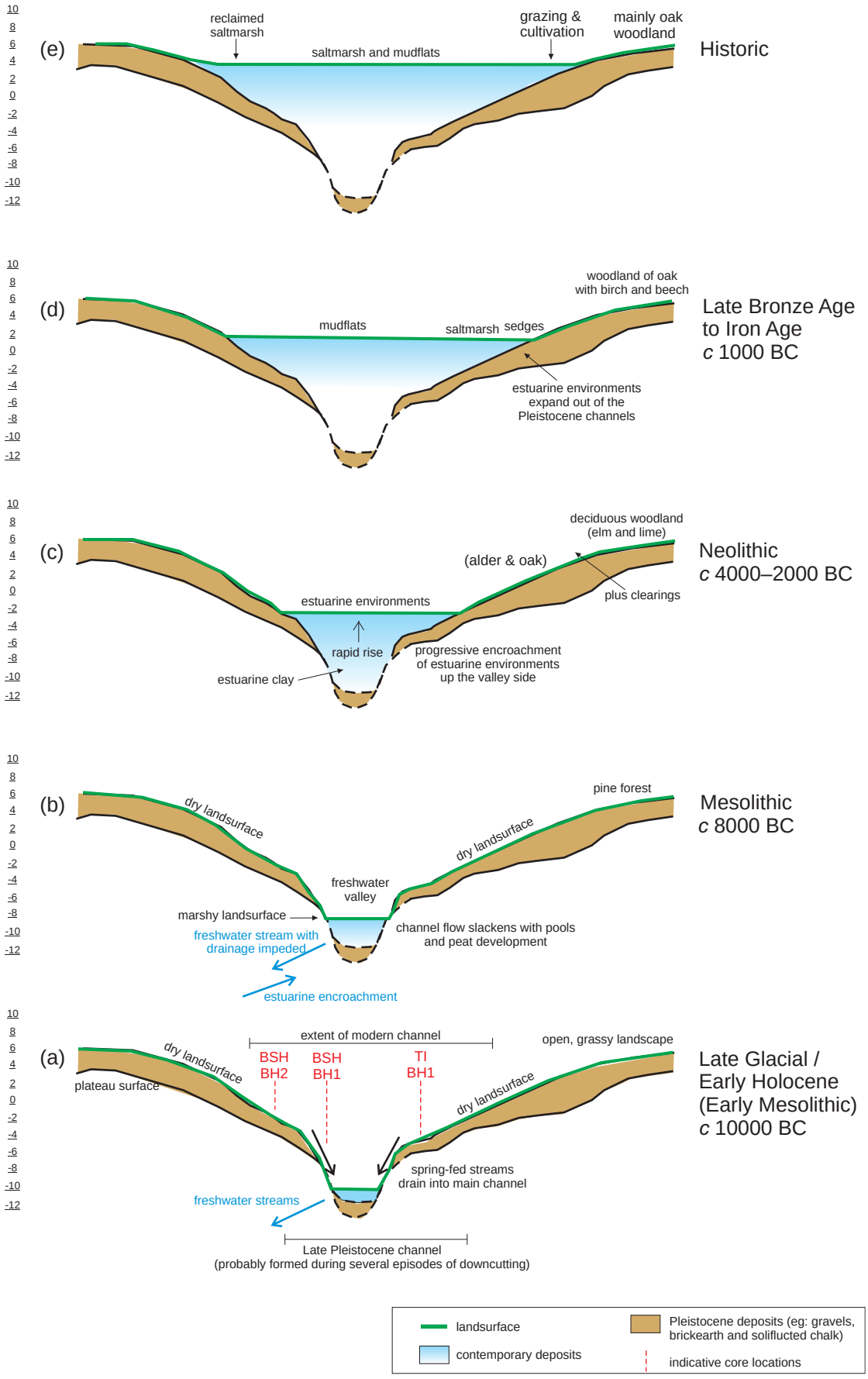



Fig 35 Schematic cross sections to illustrate the distribution of archaeological evidence within the harbour (Mills *et al* 2007b)

Fig 36 Recovering the Late Bronze Age to early Iron Age stakes

Fig 37 A Terrier rig recovers 1m long core samples which are then logged (Bates 2005a)

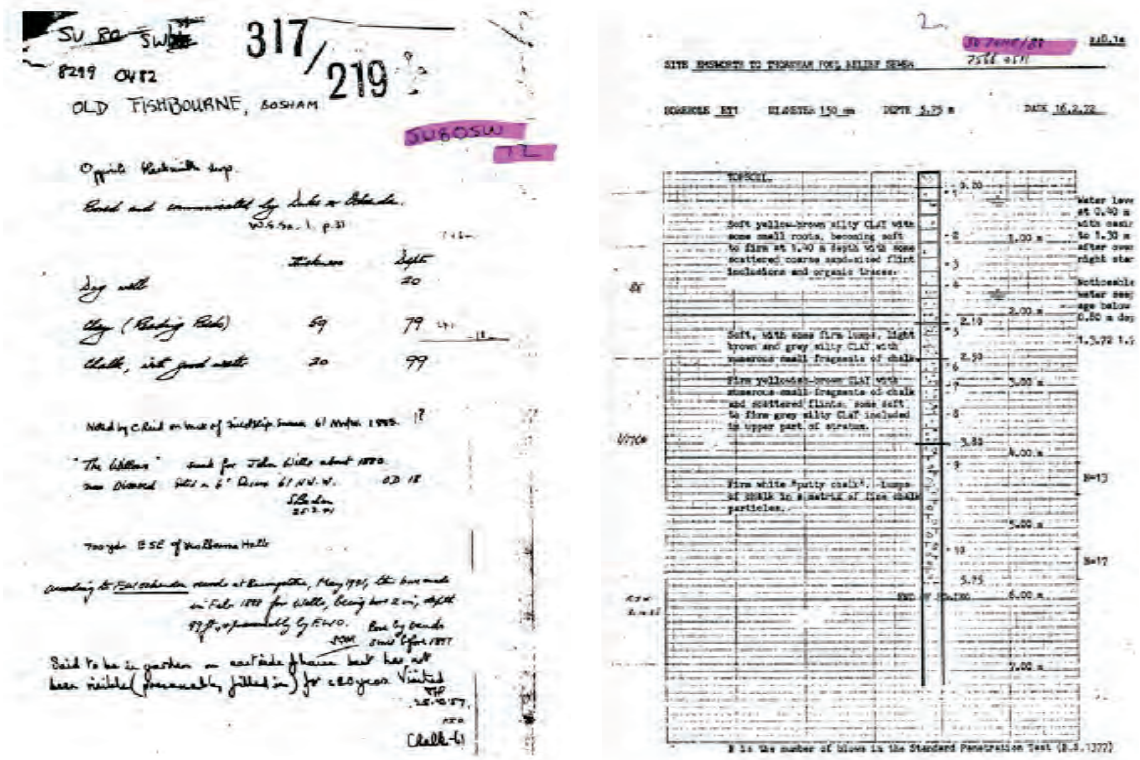



Fig 38 Example of British Geological Survey logs (Bates 2005a)