

Historic Seascape Characterisation (HSC)



Hastings to Purbeck and Adjacent Waters

Section 3: Character Type Text Descriptions

March 2011

In partnership with



MARITIME ARCHAEOLOGY

HSC: Hastings to Purbeck and Adjacent Waters
Section 3: Character Type Text Descriptions

Version 1

March 2011

Submitted by: Maritime Archaeology Ltd
In partnership with: SeaZone Group/HR Wallingford

On behalf of English Heritage

Report Structure

The Project Report for 'Historic Seascape Characterisation: Hastings to Purbeck and Adjacent Waters' is divided into three sections for ease of use. The first section outlines the project's method implementation, the second section outlines an applications review and case studies, and the third section contains printed versions of the Character Type text descriptions from national and regional perspectives.

This document comprises Section 3 of the project report, Historic Seascape Characterisation: Hastings to Purbeck and Adjacent Waters: Character Type Text Descriptions

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i. Document Control

Project name	HSC Hastings to Purbeck
MA Ltd ref	MA Ltd: 1816
EH ref	5736 MAIN
Title	HSC Hastings to Purbeck Character Type Text Descriptions
Authors	Kathryn Dagless and Vir Dellino-Musgrave
Derivation	Deliverable from project tender
Origination date	February 2011
Reviser	N/A
Date of last revision	2 nd March 2011
Version	1
Status	For final approval
Summary of changes	N/A
Circulation	Gareth Watkins, Charlotte Winter, Helen Keeley, Dave Hooley
Required action	Approval
File name/location	MA Ltd\Active Tenders\1816 Seascapes Hastings to Purbeck/Report/Section_3_final
Approval	
<i>This project design has been prepared in accordance with MoRPHE guidelines (English Heritage 2006)</i>	

ii. Acknowledgements

This report was written by Kathryn Dagless and Vir Dellino-Musgrave following comments by Dave Hooley (English Heritage). The project has been managed by Vir Dellino-Musgrave and Olivia Merritt.

Thanks are particularly extended to Dave Hooley, Helen Keeley and Gareth Watkins (English Heritage) who have given particular advice and assistance to this project.

This report and the associated work have been funded by Defra's Aggregates Levy Sustainability Fund (ALSF) administered through English Heritage.

1. Character Text Descriptions National Perspective

The following National Perspective HSC Character Type texts were prepared in February 2011 from contributions by the four 2010-2011 HSC project teams from: Seazone Solutions Ltd; Maritime Archaeology Ltd; Historic Environment Projects, Cornwall Council (HEPCC); Newcastle University, and Oxford Archaeology South. Those contributions were supplemented, revised and edited by Dave Hooley, English Heritage Characterisation Team

1.1 BROAD CHARACTER: NAVIGATION

1.1.1 Character Type: Navigation feature

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Navigation channel (active);
- Navigation channel (disused);
- Navigation channel (disused buried);
- Dredged channel/area.

This Character Type relates to areas created for, and directly relating to, the passage of shipping traffic. This Character Type is found where active management has been undertaken to maintain the accessibility of a stretch of water for safe passage. In relating to active management of material portions of navigation route across hazardous areas, this Type is distinct from the 'Navigation Activity' Character Type which is defined by usage and/or regulation,

Expressions of this Character Type include active, disused and buried navigation channels, dredged channels and entrances to harbours. Increased sea trade, particularly from the 19th century onwards, saw larger vessels in greater numbers seeking access to what had long been hazardous and restricted river or estuary channels. Industrialisation forced port authorities to improve and maintain navigational access by dredging, the spoil often dumped out to sea. Creating estuary channels also often involved the reclamation of adjacent land, including sand banks and saltmarsh, and the construction of retaining walls.

'Navigation channel (active)' includes channels charted or otherwise recorded as in active navigational use by present shipping traffic, whether or not the channel is of historic or modern origin. Time-depth expressed in the HSC attributes will reveal the channel's broad date of origin.

'Navigation channel (disused)' includes historic channels no longer charted or recorded as in active navigational use for present shipping traffic, whatever the channel's date of origin. Again, time-depth expressed in the HSC attributes will reveal the channel's broad date of origin and that it is no longer in use in the present. Where there is evidence that the channel is also now a buried feature (if extant at all), it will be assigned to 'Navigation channel (disused buried)'.

'Navigation channel (disused buried)' includes historic channels no longer charted or recorded as in active navigational use for present shipping traffic, and with evidence that the channel is also now a buried feature (if extant at all). As above, time-depth expressed in the HSC attributes will reveal the channel's broad date of origin.

'Dredged channel/area' refers to the removal of accumulated sediments from harbour channels and berths to ensure a safe depth of water for navigational purposes, or similar maintenance works to remove sediment to restore an adequate flow of water to mitigate risk of flooding or protect a sensitive habitat. Maintenance dredging refers to the excavations of material to deepen or create navigational channels and berths to provide additional harbour infrastructure or provide access for deeper draught vessels. The difference between capital and maintenance dredging is that capital dredging reduces the seabed to a level (relative to Ordnance Datum) lower than it has been at anytime during the preceding 10 years (www.mceu.gov.uk/MCEU_LOCALE/FEPA/FEPA-capital.htm).

English waters have been used for navigation since prehistoric times and such activity contributes considerably to the character of the marine landscape/seascape. Despite in themselves leaving no permanent mark on the sea surface, they have a diversity of associated features on and offshore and are responsible for the thousands of wrecks and related materials and debris surviving on the seabed across the UK Controlled Waters.

Navigational channels are found in many areas of English waters. Several navigational channels, especially those that are prone to silting, are dredged or cleared of sediment frequently enough to ensure enough draught for safe harbour (e.g. within the Thames and Mersey Estuaries).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Usual components of this Character Type include active, disused and disused buried navigation channels, dredged channels and entrances to harbours.

Navigable channels have been used since prehistoric times (Cunliffe 2001) but the extent to which they were or could be maintained is unclear. On the Irish Sea, travel was generally characterised by short-haul pottering between beaches on rocky foreshores and islands, and there were (and still are) numerous inshore lakes and narrow necks of land inviting portages. Navigational channels can be constrained by the presence of hazards such as sandbanks and are now often buoyed to avoid these features. Our knowledge of navigation features offshore mainly dates back to the 1800s. The Hydrographic Office was established as a sub-department of the Admiralty in 1795 and issued its first officially published Admiralty chart in November 1800 (<http://www.nationalarchives.gov.uk/records/research-guides/admiralty-charts.htm>). These charts were continually updated and corrected to reduce the dangers from the changing position of channels.

Natural rivers and lakes were used as waterways for the transportation of people and goods. These were often then improved to make navigation more reliable and capable of taking ships of greater draught. Many rivers were dredged from the post medieval period onwards to allow transport to major trading ports and, later, industrial centres. Other modifications included the construction of artificial channels and flash locks (i.e. designed with a single gate). The introduction of the pound lock (a lock almost exclusively found nowadays on canals and rivers) enabled more ambitious waterways to be built.

Industrialisation from the mid 18th century required the transportation of large quantities of raw materials and finished goods. This led to the construction of a large network of canals in England, some of which connected directly with tidal zones via locks as, for example in the Copperhouse Canal built in 1769 at Hayle, Cornwall. The decline of many canals and, in

some cases their abandonment, started with the competition first from railways and later from road transport.

VALUES AND PERCEPTIONS

Navigation channels and dredged areas form an integral part of working ports or harbours but most people are probably unaware of their vital role in maintaining that operation. More obvious are the dredging craft that are often found moored in harbours ready for service, becoming a regular part of the landscape/seascape of coastal communities. For mariners the importance of maintaining a safe draught for vessels is imperative to their livelihoods and safety.

RESEARCH, AMENITY AND EDUCATION

The history of creating and maintaining navigation channels is an important aspect of cultural manipulation of the coastal and marine environment to facilitate economic desires and expansion. Many navigable channels are now lost or buried. Where extant but obscured, they may offer potential for the survival and understanding of closely associated features, such as wrecked craft, wharves, pilings, jetties, artefacts and palaeo-environmental components.

This Character Type provides an enormous public amenity for the commercial shipping and ports that depend on maintained navigational accessibility, but also on a far smaller scale, they enable safer access too for recreational watercraft, small boats and anglers to use these areas and reach their moorings.

The British Marine Aggregates Producers Association (BMAPA) and English Heritage have put in place a Protocol for Reporting Finds of Archaeological Interest (BMAPA and English Heritage 2005). Although generally understood to be relevant to aggregates dredging operations offshore, this protocol also applies to the wharves and vessels of all BMAPA companies and requires that any finds discovered at a wharf, onboard vessel or on the seabed are reported to allow such finds from our common submerged heritage to be better understood.

The educational potential of this Character Type is considerable. For example, the 'Solent Aggregates to Outreach' project has successfully demonstrated the direct educational potential of dredging related subjects and the historic environment (Hampshire & Wight Trust for Maritime Archaeology 2007; also see <http://www.hwtma.org.uk/index.php?page=aggregate-to-outreach>; <http://ads.ahds.ac.uk/project/alsf/>). Further educational tools could be developed to raise awareness in schools about these less visible aspects of our common cultural inheritance and demonstrating the beneficial collaboration between regulators, the heritage sector and industry, in this case the aggregates industry

CONDITION AND FORCES FOR CHANGE

Dredging has much affected the historic character of the waters in the United Kingdom, enabling many ports to develop much further and be accessed by far larger vessels than would otherwise be possible. It is a necessary requirement at the approaches to most active ports and will continue to be so.

In England, dumping of industrial waste at sea has been prohibited since 1994. The bulk of the material eligible for disposal at sea now comes from port and navigation channel operations, as well as coastal engineering projects. Nevertheless, dumping of dredged materials can introduce contaminants to the marine environment (Department of Trade and Industry 2002a, b).

Sandbanks also relate intimately with this Character Type as mobile entities prompting the need for active management to maintain navigation. Besides dredging to keep channels clear, sediment mobility through time can require that the course of channels close to major sandbanks need changing. Reduction in shipping activity and restructuring of navigation routes to serve new or expanded ports can also lead to former channels becoming redundant. This can result in the presence of disused or buried former navigation channels (e.g. in the approach to the Mersey River). The development of lighthouses along the coast can illustrate changing sandbanks and channels. For example a series of lighthouses were constructed in Harwich in the 19th century due to the changing course of the main channel into the port.

In general, the survival of river channels is fairly good even if most components are no longer used or have been developed by industry.

RARITY AND VULNERABILITY

This Character Type has a wide variety of well preserved components from the early modern period onwards. In areas that are continually dredged today, the potential of encountering prehistoric or historic remains could be considered low due to dredging having an intrusive impact on the seabed and river banks. However, in some places, there may be remnants of historic dredging activities.

Navigation channel dredging activities, if new or expanded from previous operations, may alter the historic character of a region although the major effects are more likely to arise from the stimulus for such change, such as port development or expansion.

Climate change may also affect some channel-dredging regimes as increased water turbulence and storm activity changes the environmental influences bearing on the position of sandbanks.

PUBLISHED SOURCES

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WEBSITES

<http://www.mfa.gov.uk/>

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1.1.2 Character Type: Navigation activity

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Anchorage
- Ferry crossing
- Harbour pool
- Navigation route
- Quarantine area

This Character Type identifies areas characterised by human activity directly relating to the passage of shipping traffic, such as navigation routes, anchorages and ferry crossings, including intimately associated areas and features such as buoyage at anchorages, and ferry crossing terminals. Physical demarcation of such areas varies and may be only partial, if present at all: their definition may be largely or wholly by legal designation or custom and usage.

An 'Anchorage' refers to an area of sea or coast where ships, vessels and craft anchor, often provided by sheltered conditions afforded by the topography of the nearby coast. Anchorages are known and regularly re-used by vessels for safe anchoring and sheltering from bad weather; they are often located along coastlines within bays or areas sheltered from prevailing winds, strong currents and turbulent waters. They may have enhanced archaeological potential as their regular occupation increases the likelihood of finding vessels that had succumbed to bad weather and sunk despite seeking shelter, together with debris discarded or dropped from ships at anchor.

A 'Ferry crossing' is a regular commercial passenger route across an area of sea, estuary, river or lake, or an area of port, dock or harbour. It often includes associated embarkation and disembarkation areas, together with buildings for passengers and areas for vehicle waiting and customs control. Fixed chain-link ferry crossings are included here too.

'Harbour pool' relates to an area of water including and adjacent to a port or harbour, falling under the jurisdiction and hence, of relevance for characterisation, the activity-controls, of a port/harbour authority. Includes associated traffic-areas and areas of restricted navigation. Depending on the scale of HSC and the area occupied by such a 'pool', it may also be assessed for HSC as one component of an overall 'Harbour' in the 'Ports and Docks' Character Type.

A 'Navigation route' relates to routes regularly used by vessels of any description while navigating between destinations. May be defined by usage or in some areas, formally defined by regulation. Navigation routes are distinct from 'Navigation channels' which are actively managed physical features identifying or securing a navigation route across hazardous areas of sea-floor. They are also distinct from the more specific 'Commercial shipping routes' regularly used by merchant shipping and discussed in the text for the 'Shipping Industry'.

A 'Quarantine area' is an area often linked to a port or its marine approach, where a period of detention was imposed on travellers or voyagers suspected of carrying infectious diseases before they were allowed to enter a country or town. It includes anchorages and intimately-associated shore facilities such as quays and 'pest houses'. Quarantine is also the term for the period of time during which a ship, capable of carrying contagion, is kept isolated on its arrival at port.

English waters have been used for navigation since prehistoric times and such activity contributes considerably to the character of the marine landscape/seascape. Despite in themselves leaving no permanent mark on the sea surface, they have a diversity of associated features on and offshore and are responsible for the thousands of wrecks and related materials and debris surviving on the seabed across the UK Controlled Waters.

The distribution of wrecks is very dense off much of the English coast, especially in inshore waters which probably carried the bulk of historic coastal trading activity. The full extent to which the recorded resource reflects the actual surviving wreck resource will always remain uncertain, and the exact location of most known wrecks is not precisely known, with mapping only to the nearest kilometre grid square, or proximity to its known port. And of the known wreck sites, relatively few have had their original identity confirmed.

Historic anchorage areas occur in many places along the English coast. For example, there have been a number of stone anchor finds around the English coast especially off Dorset, providing some indications of earlier seafaring. Historic anchorage areas can usually be found in sheltered bays or in the lee of headlands. Mooring vessels and craft would have dropped anchor in these areas, potentially disturbing or revealing material remains in, on or under the seabed. Consequently, there is the potential for encountering associated artefacts and debris at these areas. Some anchorage areas are characterised by having been dredged or cleared of sediment to provide enough draught for safe anchoring. One legacy of anchorages is high levels of material remains on the seabed due to artefacts being either lost overboard or deliberately jettisoned. To date there have been few detailed studies of these sites so their full archaeological importance is not always recognised.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type mainly include: shipping routes; wrecks and associated materials; quays and docks; warehouses; landing points, and quarantine stations.

The sea and rivers provided the chief economical means of transporting large quantities of goods for any significant distance before the creation of an effective road and railway system. England's maritime trade and transport links with continental Europe are known to have developed during the prehistoric period. It is believed that log boats (canoes made from hollowed out tree trunks) and skin boats were common, and used during early times

as ferries, fishing boats, trading or war vessels (Friel 2003: 22; McGrail 2001). The distribution of log boats has generally been confined to inland riverine contexts (Van de Noort 2003).

Vessels attributable to the Bronze Age, as from Ferriby and Brigg (both in the Humber region), and another found in Dover, were relatively substantial vessels (McGrail 2001: 184-190) which would have required a significant investment in people and resources to build and maintain them. The large size and robustness of these Bronze Age vessels could suggest that in some cases they could have been used for open sea voyages as far afield as the continent, in addition to a more local role on the estuaries where they were found (see Van de Noort 2003: 406).

From Roman contexts, navigational activity is exemplified by the 'County Hall' ship from London, dating to the 3rd century AD. Its typically Mediterranean construction contrasts with Romano-Celtic methods. However, dendrochronological research shows that the ship was built in Britain (Gibbins 1995). It also illustrates that the English society was built on maritime movements of goods, people and ideas, which are also expressed in imagery from coins, mosaics and sculptures of the time.

After apparent sharp decline in maritime trade during the early post-Roman period, Commercial trading activity with continental Europe was stimulated again from the late 6th century, and the 8th and 9th centuries saw the greatest resurgence of European trade since the fall of the Roman Empire. Most of this trade relied on water transport and, as a consequence, urban settlements were revitalised along rivers and near to the coast, changing the character of the landscape/seascape (Clarke 1985).

Between the 8th and 11th centuries, Scandinavian influence spread widely across Europe and beyond, disrupting earlier trade patterns and patrons but creating new ones. This was achieved often through previously unparalleled feats of navigation and endurance, facilitated by their longship design: open, clinker-built vessels which could be propelled both by oars and sail. Modifications of the hull shape and the addition of a sail meant that by the 9th century the Viking ship was capable of sailing long distances on the high seas and was not limited to coasting (Binns 1985). This period of Scandinavian expansion and influence is known as the Viking Age, with huge social, political and economic impacts in England. The material role of their ships in their success was mirrored in their spiritual role in Viking mythology where they often figure as the final transport and resting place in heroes' funerary rites, a role finding expression in the occasional discoveries of Viking Age boat burials.

During the medieval period, trading networks expanded across Europe and trading confederations such as the Hanseatic League emerged. The English Channel became an important artery between Britain and the rest of the European continent, with Southampton, Bristol, London and the Cinque ports of Sandwich, Dover, Hythe, Romney and Hastings being favoured points of transit (Friel 2003: 70). There was also an increase in hostilities which, together with increased seaborne trade, had a large influence on the development of shipping (Friel 2003).

Piracy was endemic in medieval Europe. The divide between pirate and sea trader was often blurred: the people who committed piracy were commonly traders in their own right and usually the same people that governments relied on when waging naval warfare. A similarly blurred distinction was that between piracy and privateers, the latter being those licensed

by a government to attack the ships of state enemies. In practice people moved fairly freely between these distinctions and in England, piracy was a civil and not a criminal offence until the 16th century (Friel 2003: 82-83).

The post medieval and early modern periods in England were a phase of transformation in industrial development, invention and new scientific discovery. Part of this included the expansion of navigation activities on a global scale, accompanied by a large movement of goods, people and ideas. This period saw the foundation of England's role as a world maritime power with profound impacts in English society. England's role in, and reliance on, global maritime trade were accelerated by its industrialisation during the latter half of the 18th century. In the later development of that process from around the middle of the 19th century, technological and economic progress gained momentum with the development of steam-powered ships and railways. Britain was the world leader in industrial production at this period and its shipping along global navigation networks ensured that production was kept supplied with its raw materials and that its finished goods reached their export markets in the British Empire and beyond. Many new demands on transport were made which could be more speedily met by steam-powered vessels, especially from the 1840s when iron hulls and the screw propeller were introduced (Hobsbawm 1999; Pearsall 1985). Steamships gradually replaced sailing ships for commercial shipping, although sailing merchant ships continued until into the 1930s for goods such as grain required over long distances in large quantities where speed was not so vital.

In the 1900s, the internal combustion engine and gas turbine replaced the steam engine in most ship applications and transoceanic travel came within reach of more people, growing rapidly in popularity, with the new steam powered ocean liners replacing sailing ships. Driven by strong demand created by European emigration to the United States and Canada, international competition between passenger lines and a new emphasis on comfort, shipping companies built increasingly larger and faster ships. Ocean liners were then the primary mode of intercontinental travel (Beveridge et al 2008a, b). Until the 1920s most shipping lines relied heavily on emigration for passengers but by the 1930s, the Great Depression put many shipping lines into bankruptcy.

The impact of U-boats (military submarines) operated by Germany during the two World Wars underlined the importance to England's economic sustainability of keeping its navigation routes open. In this respect, U-boats proved highly effective in economic warfare, enforcing their naval blockade across Britain's transatlantic supply routes.

In the post-war period, air travel captured the transoceanic passenger market, and the shipping companies' passenger liners increasingly relied on the leisure cruise market. Sea transport remains the largest carrier of freight in the world, most of it international rather than between domestic ports.

Today, examples of navigation activities in England include cross channel ferry services such as those from Newhaven to Dieppe, and the transatlantic ocean liners: the launching of *RMS Queen Mary 2* and the increasing number of cruise terminals in Southampton illustrating the growth in this business.

VALUES AND PERCEPTIONS

Generally, people observing the sea from land are unlikely to perceive the scale of navigation and shipping activities that occur offshore, or their own reliance on everyday

goods carried to England along such navigation routes. That reliance often only becomes widely apparent when a freighter drifts off its navigation route and runs onto the coast, spilling its many and varied goods for the media to report, as in the case of the *RMS Napoli* on the Dorset coast in 2007. Distant vessels may be perceived as specific points on the horizon. Inshore fishing and leisure craft are probably seen as more directly linked to coastal communities and the use of the sea.

Ports are often at the heart of large cities so their substantial urban populations get used to seeing shipping traffic which becomes part of the landscape/seascape of their daily lives, for example in Southampton and Portsmouth. There are also related aspects such as ships' horns which sometimes can be heard inland, particularly when it is foggy and these act as a reminder of that local shipping traffic and maritime links.

Many people are engaged in a range of shipping activities, either on board or at the port, so navigation activities are also perceived directly as a source of income and employment for them, while in broader economic terms, their economic impact is immense.

For some people, the sea will always hold special meaning which has inspired many creative and artistic responses. Long-distance journeys have probably long been essential rites of passage for aspiring members of the elite classes, far predating the Grand Tour of the 18th and 19th centuries. The sea may have also been seen as a 'magical' space where, through a long-distance journey, one would disappear from view and enter a different world. The activity of seafaring would have had the power to create specific social identities, binding crews into closely knit groups (Van De Noort 2006: 284).

RESEARCH, AMENITY AND EDUCATION

An important study of navigation routes was undertaken by Wessex Archaeology and funded by the ALSF in 2007: the 'England's Shipping' project used GIS to map shipping movements recorded in historical archives (http://ads.ahds.ac.uk/catalogue/archive/englandship_eh_2007/index.cfm?CFID=3870038&CFTOKEN=64191754).

Wrecks give one indication of navigation and shipping activities and the relationships between navigation routes, wrecks and navigation hazards were explored in the ALSF-funded 'Navigation Hazards Project' (Merritt et al 2007). The distribution of wrecks is very densely recorded along the English coast. In addition to wrecks, distributions of artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites. The potential for anchorage areas, even in what are now busy modern harbours, has been demonstrated by the 'Dive onto Victory' project in Portsmouth, Hampshire (see <http://www.hwtma.org.uk/index.php?page=hms-victory>).

Initiatives integrating into Information and Communication Technologies (ICT) information on navigation networks with developing transport methods, along with historic and present economic data, could be a way of bringing this Character Type into schools to raise awareness about the English maritime legacy and its characteristics.

Features such as long-established ferry crossings in remote or deeply-indented coastlines often still function as valuable public amenities as well as tourist attractions.

HSC itself is designed to be a resource to assist in raising public awareness about offshore activities that often go unnoticed from onshore: one aspect of that will be to engage people with the scale of navigation and shipping activities in their local areas.

CONDITION AND FORCES FOR CHANGE

The effects of this Character Type on today's landscape/seascape are both historic and ongoing: navigation and shipping activities have and will always play key roles for our lives which change through time as our societies, their maritime links, technology and transport methods, and shipping techniques evolve. The use and range of navigation routes in operation now and in the future strongly reflects economic vitality and global levels of trade. In UK waters, those routes will also alter as new container ports are planned and built as, for example, will result from completion of the DP World 'London Gateway' Container Port begun in 2010.

RARITY AND VULNERABILITY

The rarity and vulnerability of this Character Type reflects people's changing economic activity through time. Navigational activity itself is both historic and ongoing: its patterning has much to contribute to our perceptions of our roles and relationships with the wider world. Evidence for past navigational activity is relatively rare, vulnerable to disturbance from modern developments to accommodate new navigational needs, and perhaps under-researched, but there is little evidence that maritime freight is in decline or under threat globally or in its transit using UK navigation routes.

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1.1.3 Character Type: Navigation hazard

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Navigation Hazards includes the following Sub-types:

- Wreck hazard
- Drying hazard
- Maritime debris
- Rocky outcrops
- Shoals and flats
- Submerged rocks
- Water turbulence
- Hazardous water

This Character Type relates to areas that contain serious risks to shipping or smaller craft which could lead to damage or complete loss of a vessel. Such risks may be directly related to sea-floor features such as wrecks and other debris and obstructions, drying areas, submerged rocks, shoals, banks and sandwaves, or they may be indirect, including the implied hazardous water in the water column and surface above such seafloor risks. Strong marine currents and their responses to seafloor and coastal topography can also pose serious hazards from water turbulence.

In marine levels, some care is needed to distinguish the location of the hazard from its implications at other levels. As an example, submerged rocks and wrecks pose direct hazards on the sea floor but they also imply 'hazardous water' in the water column and sea surface above and around them. Some rocks and wrecks will project well into the water column in their own right, and some will break the surface, again with hazardous water around them.

Wrecks become dangerous in shallow water when they are either exposed and/or found less than 10m below the sea-level (based on UKHO definition). Therefore, wreck hazard focuses on the area of the hazard, which may include a single wreck or a cluster of wrecks. From the perspective of HSC, wrecks have greatest relevance from their roles as hazards to navigational activity, or as indicators of areas and routes of past navigational, naval or trading activity.

Drying hazards are areas variously submerged but also subject to exposure above the sea surface at various states of the tide, thus forming a grounding hazard to safe passage of shipping. On modern charts these may be indicated by heights shown above chart datum. Historic charts commonly show detail of drying areas or sandbanks as surveyed at the time the chart was produced. Historic drying areas include sandbanks exposed in the past but the location and extents of such areas' exposure at low tide levels are highly susceptible to change due to the mobility of sediments.

Maritime debris refers to an area deemed hazardous due to a predominance of recorded obstructions and fouls not known to be associated with a wreck.

Rocky outcrop refers to an area dominated by rocks rising from the general level of the seabed and breaking the sea surface at some or all states of the tide, posing a risk for navigation.

Shoals and flats are shallow areas of sandbanks, shoals, bars and spits as surveyed at the time the chart was produced. These areas are highly subject to change and they are generally exposed at low tide due to the mobility of sediments.

Submerged rocks are areas dominated by rocks rising above the general level of the seabed, but not breaking the surface of the water at any state of the tide, posing a risk for navigation.

Water turbulence refers to areas of the water column and/or sea surface characterised by heavy swell, strong currents and tidal races which pose a risk for navigation.

Hazardous water refers to areas of the water column and/or sea surface above various sea-floor hazards and in a buffered zone around them. Such hazards may include wrecks, submerged rocks, shoals and flats.

Navigation hazards, past or present, are often difficult to map with precision despite this essentially being the prime purpose of nautical and maritime charts. Major navigation hazards have figured on the earliest Admiralty charts and are often mentioned in historic sailing directions. Early charts inevitably contain less detail and use less accurate survey methods, focusing instead on highlighting approximate areas of the most notorious hazards and those most easily identifiable. However, some early foreign charts (e.g. the Portolan charts and *Waggoners*) contained a high level of navigational detail, allowing a more comprehensive characterisation of this Character Type. Modern charts depict more accurate and precise information. The majority of areas associated with this Character Type are typically found along the coast or close inshore. Although wrecks have a much wider overall distribution, their highest densities are also found in inshore waters.

The accuracy of the charts evolved along with improvements in surveying and charting techniques and the frequency of their application. Before the creation of the Admiralty as an official hydrographic branch in 1795, only a small number of independent surveyors such as Greenville Collins and Murdoch Mackenzie undertook surveys covering substantial areas of English waters in a standardised manner (Merritt *et al* 2005).

Throughout English waters, some areas are themselves typically characterised as 'hazards' for navigation such as Goodwin Sands (off the coast of Kent in the English Channel), the Needles (Isle of Wight) or the Western Rocks of the Isles of Scilly. Historical navigation

hazards were represented in nautical and maritime charts, showing the mobility of sandbanks and how they significantly changed through time.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Historic and modern sandbanks and sand ridges
- Bars, shoals, scars and scarps
- Wrecks and obstructions
- Rocky areas, including exposed rocky coastlines with rocky outcrops, underwater/awash rocks, and maritime debris
- Wreck clusters
- Areas of heavy swell and breaking waves, prevailing winds, and tidal range amongst others

Historically, the sea has been perceived as a dangerous place, with good reason, due to being a relatively alien environment for human survival and with sometimes unpredictable behaviour nature but also due to various human factors. Sea voyages have often resulted in ship losses. Some of the factors contributing to these losses, including some deliberate sinkings, are:

- poor design or failure of the ship's equipment or excessive pressure on the hull
- instability, due to poor design and improperly stowed cargo, amongst others
- navigation errors and other human errors, leading to collisions (with, for example, another ship, rocks and icebergs) or running aground
- bad weather
- warfare, piracy, mutiny, or sabotage including: guns, fire, torpedoes, depth charges, mines, bombs and missiles
- accidental fire
- overloaded with cargo
- intentional sinking (scuttling) to form an artificial reef
- use as a target ship for training or testing weapons
- as a blockship to create an obstacle to close a harbour, river, etc. against enemy ships
- scuttling to prevent a ship from falling into an enemy's hands (e.g. the *Graf Spee*)
- to destroy a derelict ship that poses a menace to navigation
- as part of an insurance fraud

Especially from mid 18th century onwards, the development of shipbuilding techniques has contributed to reduce some of the unwanted occurrences listed above. The creation of nautical and maritime charts has helped enormously to improve and keep updated the knowledge of previously poorly areas as well as their 'hidden' hazards, providing tools to enable safer navigation.

Navigation hazards were more frequently charted after the 1800s as the Hydrographic Office was established as a sub-department of the Admiralty in 1795 and issued its first officially published Admiralty chart in November 1800 (<http://www.nationalarchives.gov.uk/records/research-guides/admiralty-charts.htm>). These charts were continually updated and corrected to avoid navigational hazards.

VALUES AND PERCEPTIONS

Navigation hazards have always been a preoccupation for sailors, but it took experience to fully recognize the character of many such hazards. Whether the hazards were exposed or hidden depended on the time that sailors approached the harbour (i.e. either at low or high tide). These hazards became visible in people's consciousness due to the danger associated with them. Very often, tales and myths were associated with them, evoking rhymes and songs. For example, the area around Harwich Haven is particularly notorious and Nelson is reputed to have said that in terms of navigation the Thames estuary is one of the worst areas around the UK, being as "tricky as a tiger" (Bowskill 1998, 159). The reputation of Gunfleet Sand alone is illustrated by a poem, 'L'Envoi', written by Rudyard Kipling.

Sandbanks are often named and well-known by the general public for a variety of reasons. For example, Kentish Knock, on the approach to the Thames Estuary is remembered for the battle named after it, as well as for being the first home of Radio Caroline.

The creation of nautical and maritime charts generally expressed and recorded the knowledge of the surveyed area but they also represented a tool for recording hazards and other dangers associated with the sea and keeping them updated.

Wrecks were fatal for many but also highly dramatic events for those who lived to tell the tale and add to the local heritage of stories about dangers on the high seas. They are now also perceived as a recreational opportunities, with the many wrecks of the region being dived upon by amateur dive groups and professional organisations.

Many wrecks are also valued for their addition to habitat diversity in their areas. For similar reasons wrecks are also valued by the fishing community as they attract certain prey species.

RESEARCH, AMENITY AND EDUCATION

Through the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage, Bournemouth University undertook the 'Mapping Navigational Hazards as Areas of Marine Archaeological Potential' project. The project developed a methodology for identifying and mapping areas of maritime archaeological potential by characterising areas exhibiting trends in ship losses due to environmental, structural and meteorological navigational hazards, which have been described in historical sources such as charts and pilotage documents (Merritt *et al* 2005, 2007).

Wrecks serve as important habitats for aquatic life since they act as artificial reefs which increase biodiversity in their areas. In this sense, wrecks are often seen as beneficial by marine ecologists. Therefore, further collaborative work between marine biologists and archaeologists would be beneficial to enable a deeper understanding of species living in wreck sites, how they contribute to the wreck preservation, and contextualising this information within broader sea dynamics.

Wrecks can also be used as useful tools for amenity and educational initiatives. Shipwrecks often attract divers. 'Respect Our Wrecks' is a campaign which educates divers about preserving our common underwater cultural heritage, whilst also demonstrating the environmental value of those sites. Wrecks provide opportunities for divers to explore and engage with the past and by respecting them, present and future generations can enjoy and learn from them

(http://www.projectaware.org/english/global_initiatives/respect_our_wrecks.aspx). Wrecks are therefore not only recreational tools but also educational ones, allowing a more comprehensive understanding of the different uses and dangers of the sea. In terms of formal education, wrecks can provide excellent cross-curricular case studies on which to base investigations covering a range of curriculum subjects.

There may also be a link between the occurrence of sea-floor obstacles and the presence of wrecked craft, lost gear or accumulated prehistoric or historic deposits. Environmental conditions will also indicate whether there is potential for preservation of prehistoric or historic materials.

CONDITION AND FORCES FOR CHANGE

This Character Type is and will increasingly be affected by projected direct and indirect changes due to global warming and sea level change. Variations on sediment distribution and oceanographic conditions (e.g. sea level, wave height and direction and storminess), which are difficult to predict with accuracy (BGS 2002), will certainly affect this Character Type. The response of the coastline to scenarios of climate change was considered by a consortium led by Halcrow Maritime working on a DEFRA-funded project called 'Futurecoast'. Futurecoast provides predictions of coastal evolutionary tendencies, which are to be considered in the updating of Shoreline Management Plans (SMPs) and other strategic plans targeted at determining broad-scale future coastal defence policy throughout the open coast shoreline of England and Wales (http://www.halcrow.com/html/our_projects/projects/futurecoast.htm)

The preservation of wrecks will depend, amongst other factors, on the construction materials and the natural environment where they wrecked. For example, exposed wooden components will generally decay quickly. In general, wooden parts of ships that survive are those that were buried in silt or sand soon after sinking. An example of this is the Mary Rose (Portsmouth Historic Dockyard). Steel and iron, depending on their thickness, may retain the ship's structure for decades. As corrosion takes place, sometimes helped by tides and weather, the structure collapses.

Climate change impacts on, for example, water temperature, are already changing the microclimate where wrecks are located and hence their preservation. At national and regional levels, there are also records of casualty losses which are generally known from documentary references. These casualty records show the potential of wrecks in an area but do not necessarily show their existence (e.g. casualty records at the National Monuments Records (NMR)). Today's prevalent marine conditions will also affect the degree of survival of wrecked vessels and casualty losses, especially regarding sediments movements or scouring by currents.

Physical hazards, such as banks, shoals and rocky outcrops amongst others, are subject to a broad range of influences including erosional and accretional processes. However, their rate of change and extent may be influenced by human-made activities or constructions that change the marine conditions. The changing nature of sandbanks and shoals means the character of the landscape/seascape is in continuous change. This changing character may reveal material remains that are regularly or sometimes only rarely exposed before being covered again (as for example in the Protected Wreck *Stirling Castle*, off Kent). Some features and remains may be more or less permanently embedded within such bedforms and will only be revealed after seismic survey (e.g. see Gaffney *et al* 2007).

Sea dredging and beam trawling may seriously affect seabed obstructions and wrecks, whether known or unknown. This would take the form of both direct damage to wreck structures, contents and setting, and the destabilisation of sites resulting in renewed corrosion and potential decay (Val Baker *et al* 2007). The Aggregates Levy Sustainability Fund (ALSF) distribution by English Heritage to a range of coastal and marine projects has demonstrated that collaboration between regulators, the heritage sector and the aggregates industry can be very positive in promoting environmentally friendly extraction, helping enable more effective conservation of the historic environment and the cultural legibility of its character for present and future generations (see Dellino-Musgrave 2007).

RARITY AND VULNERABILITY

Navigation hazards are an integral part of the cultural seascape character of many areas of our coasts and seas, expressed directly through their records on charts and by prompting of highly visible maritime safety installations. But they are also present culturally in the vast store of myths, legends, traditions and stories of the sea and its dangers that pertain to most coastal communities and are a strong element in local distinctiveness that holds an attachment for their inhabitants and an appeal to visitors. In the dynamic coastal and marine environment, navigational hazards will always be present and while their risks may be diminished by modern navigational aids, they will not disappear. Their positive and negative contributions to local distinctiveness will inevitably continue.

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1.1.4 Character Type: Maritime safety

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Maritime Safety includes the following Sub-types:

- Daymark,
- Lighthouse;
- Buoyage;
- Safety area (offshore)
- Safety Services (including coastguard stations, coastguard cottages, and lifeboat stations amongst others).

HSC mapping is not to be used for navigation. It's mapping selects and depicts maritime safety features solely as part of its own assessment of historic seascape character.

'Maritime safety' includes areas containing features usually erected at important or dangerous points on or near the coast for the warning and guidance of mariners, and areas occupied by structures serving the safety needs of coastal or marine users of the sea. Some safety features can be sited well inland, such as church towers and spires used as navigational aids and more generalised place-finders.

A 'Daymark' refers to an unlit, highly visible and distinctive feature on the coast that can be used by mariners for navigation during daylight only (NMR Monument Type Thesaurus). Numerous features have been deployed as daymarks for sighting, navigation and survey. Some were specifically built as daymarks, often brightly painted to enhance their visibility; others include features such as churches, beacons, windmills, factory chimneys, primarily built and used for other purposes but serving, from a maritime perspective, to identify a known coastal location to aid navigation to varying degrees of precision. Lighthouse towers commonly also serve as daymarks, hence their white colour, and may continue to serve as such even if the light itself has been decommissioned as, for instance, at St Agnes Lighthouse, Isles of Scilly. In a less precise position-finding role, prominent hills and distinctive coastal headlands were often brought into play for a similar purpose along coastlines otherwise lacking in distinctive features or with confusingly repetitive coves and inlets.

A 'Lighthouse' is a tower or structure, with a powerful light or lights at the top, usually erected at an important or dangerous point on or near the sea-coast for the warning and guidance of mariners (<http://thesaurus.english-heritage.org.uk/>).

Buoyage refers to floating, fixed markers used to indicate to a navigator a sea area to approach or avoid (<http://thesaurus.english-heritage.org.uk/>). Single, or arrangements of, buoys, beacons and lights are often used to demarcate safely navigable entrances to estuaries and rivers, submerged hazards and foul areas.

A 'Safety area' refers to areas of the sea with advised or designated restrictions on navigation, or exclusion from permitted navigation altogether, to promote maritime safety. These areas may respond to a variety of dangers, for example: to facilitate safe passage around marine, coastal or estuarine hazards or between shipping lanes or they may be exclusion zones for safety reasons around offshore oil and gas installations or military practice areas.

'Safety services' refer to coastguard and lifeboat stations and National Coastwatch Institution (NCI) lookouts located at strategic points to monitor the coastline and, in the case of lifeboat stations, to launch search and rescue missions.

For obvious reasons the majority of features associated with this Type are typically found on or adjacent to the coast although daymarks may be well inland. Navigable entrances to estuaries and rivers, areas of submerged hazards and foul areas are often demarcated by tracks of posts, buoys, lights, beacons, bells and topmarks. In more stable areas, the sites of some navigation aids have a long history, being repeatedly represented on Admiralty charts and maps since their inception. On land, daymarks were commonly used in sighting, survey and navigation, also providing the triangulation basis for surveying maritime charts and coastal profiles.

Some areas of the sea are themselves characterised as 'safety areas', with advised or designated restrictions on navigation, or exclusion from permitted navigation. These may be designed to facilitate safe passage around coastal or estuarine hazards or between shipping lanes, or exclusion zones for safety reasons around offshore oil and gas installations, or military practice areas. Also important in maritime safety are the coastguard and lifeboat stations and lookouts dotted strategically along the coast.

The scale of features mapped within this Type will, as always, depend of the purpose and intended presentation scale of the HSC but where some have a character effect well beyond their physical size, smaller features may have been buffered to ensure their depiction.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- marine navigation aids such as areas of buoys, beacons and lights;
- land-based navigation aids such as lighthouses, fog stations, daymarks (e.g. churches, beacons, windmills, chimneys, distinctive topography, distance marks and lights), topmarks, distance marks and lights.
- coastguard stations;
- lifeboat stations

Areas advised or designated as zones of restricted navigation or exclusion for safety reasons are also included.

The coast and sea have always brought opportunities to farm, harvest, trade, export and import, emigrate or immigrate. In conducting such activities, mariners have always faced the challenges presented by the sea, not only those inherent such as storm conditions, obstacles and sandbanks, but also those posed by other people's activities, including from wrecked vessels or at times of war.

From the prehistoric into the medieval period, non-instrumental methods were generally used for navigation during sea voyages. Stars were used for course-steering and orientation; distances were estimated in terms of a standard day's sail; prevailing directions of winds and currents were understood and used, and the influence of the moon's phases on tides were known (McGrail 1998, 2001).

There is evidence for the use of sounding leads to gauge sea-floor depths from around 2nd century BC in the Mediterranean (*ibid.*). The use of magnetic compasses is known from medieval times (around 12th century) and sandglasses were used from around 13th century. Navigational instruments improved in the 15th century with the development of astrolabes, quadrants and cross-staffs in southern Europe. These devices measured the altitude (angle in the sky) of the sun and stars, which made it possible to calculate latitude, a crucial step for transoceanic navigation. There was no accurate means of determining longitude until

Johns Harrison's perfection of the chronometer in c.1736 (Sobel and Andrews 1998). So prior to the 1600s, seamen used their experience and knowledge for sea voyages and safety at sea, known as Environmental Navigation (McGrail 1998, 2001; Parker 2001).

Determining and following a course relied in part on the recognition of coastal features, such as headland shapes, church spires, and other landmarks. It was preferred to approach a destination in daylight so hazards could be recognised in good time. At night, of course, such features could often not be seen, so in some places rudimentary lighthouses were erected. In England the earliest example, within Dover Castle, dates to the Roman period. By the medieval period, at least thirteen lighthouses are thought to have existed in medieval England, some lights maintained by religious bodies (one renowned example being on St Michael's Mount, Cornwall) while others were funded by local shipping tolls (Friel 2003: 85-6),. During this time, buoys and poles were also used to mark sea channels, so mariners could avoid shallow water, although very little is known about this. Evidence for seamarks becomes clearer in the 16th century with the appearance of buoyed channels laid and maintained by organizations such as Trinity House of Deptford. Founded in 1514, Trinity House survives today as the body responsible for lighthouses and other navigation features in England and Wales (<http://www.trinityhouse.co.uk/>) following an Act of Parliament in 1836 which gave the organisation compulsory powers to levy out private individuals who owned lighthouses.

Eddystone Lighthouse, built by Henry Winstanley, was first English lighthouse to be built on a rock at sea; located 28 miles off Plymouth, it was completed in 1698 but was washed away during the Great Storm of November 1703, along with Winstanley himself (Hart-Davis and Troscianko 2002). Lightvessels (ships which serve as lighthouses in areas lacking suitable sites for lighthouse construction) were historically employed in the 18th and 19th century particularly around the east coast and the treacherous approach to the Thames. Most are now obsolete but some survive, as over the Seven Stones reef near the Isles of Scilly.

Sea-charts were first developed in 13th century Italy, but were probably not used in northern Europe until the 16th century. The earliest known English sea-chart dates from the 1530s. Sea-charts are practical and visual tools to enable safe navigation. Historically, they were also used for colonial policy, serving as a guide for exploration and material conquest (Mrozowski 1999: 154). Maps and charts were manifestations of how the world was perceived and experienced, offering an analogue for the acquisition, management and reinforcement of knowledge and power (Bender 1999: 32; Colwell-Chanthaphonh and Hill 2004). Modern charts, whose compilation in the UK is the responsibility of the UK Hydrographic Office (UKHO), are regularly updated both in their representation of the landscape for maritime purposes and in their portrayal of maritime safety features around the coasts and seas.

Lifeboats were originally run independently by maritime communities who would rescue those who got into trouble at sea. In 1824, the National Institution for the Preservation of Life from Shipwreck was formed. The change of name to the RNLI took place in 1854, which is still being used today. The RNLI took over the running of the lifeboats across the country although a single independent lifeboat still exists at Caister in Norfolk.

Today, the Maritime and Coastguard Agency (MCA) provides a response and co-ordination service for maritime search and rescue (SAR), counter pollution and salvage. The SAR role is undertaken by HM Coastguard, which is responsible for the initiation and co-ordination of

civil maritime SAR. This includes the mobilisation, organisation and tasking of adequate resources to respond to people either in distress at sea, or in inland waters, or to people at risk of injury or death on the cliffs and shoreline of the UK. As part of its response, HM Coastguard provides Coastguard Rescue Teams for cliff and shoreline search and rescue purposes (MCA 2008).

VALUES AND PERCEPTIONS

Maritime safety features inevitably have a strong integration with our landscape and seascape perceptions. As a part of the coastline or shoreline, to fulfil their roles they generally have to be readily recognisable and distinctive, with strong contribution to the present landscape/seascape.

Lighthouses, beacons, and daymarks are iconic markers of place for many people viewing them both from land and sea. They bridge the perceptual boundaries between land and sea. The strength of emotional feeling many attach to them is clear in the many responses sometimes provoked by the proposed decommissioning of lighthouses, from those fearing the loss of a feature they see as a vital element in their perceptions of a particular part of the coast, an example being the reaction to suggestions in 2010 that Godrevy Lighthouse in Cornwall might cease operation.

Safety installations that employ sound, such as fog horns and bells, have an immediate effect alerting mariners about the dangers ahead but similarly have a landward dimension too, their often haunting sound sometimes carrying far inland.

Some maritime safety sites are less obvious to those not involved in maritime activity. These are the church spires and towers, factory chimneys, tall towers, communications masts and the like, which were not built or primarily used for maritime safety but which serve, from the maritime perspective captured by HSC, as daymarks or generalised place-finders. The same applies to the cultural adoption for the same purpose of distinctive headlands and cliffs which may be otherwise little-modified.

Lighthouses have also been a source of inspiration and subject matter for many artists and writers, for example James F Cobb's 1920 adventure novel 'The Watchers on the Longships: A Tale of Cornwall in the last Century' and Virginia Woolf's 'To the Lighthouse' (1927) inspired by Godrevy Lighthouse and summer holidays in Cornwall.

RESEARCH, AMENITY AND EDUCATION

Considerable documentary evidence exists regarding this Character Type, both in archaeological and historical studies and on historic and modern charts. Further research using landscape-based approaches may enhance our understanding of past perceptions of the sea and coastline and their dangers, as with current Dutch work using early map reference points to ascertain the locations of now-drained estuarine channels where numerous wrecks were recorded.

The use of landmarks and navigation aids facilitated the development of surveying techniques and the drafting of maritime charts and coast profiles. Further research can identify features still archaeologically extant but now lost to knowledge.

Plotting the location and understanding the development of coastguard stations along the coast would give valuable information about the development of hazards and preventative methods for coastal trades of all types (Val Baker *et al* 2007).

Lighthouses are often used as amenity resources, open to the public. Further educational initiatives could be developed to enable a better understanding of the development of maritime safety in England.

This Character Type lends itself well to local, regional and national case studies appropriate for the Secondary National Curriculum especially geography which looks at how places and landscapes are understood and how people, their perceptions and their environment interact.

CONDITION AND FORCES FOR CHANGE

Although navigation aids, particularly those at sea, are often replaced and renewed, their mooring sites may still hold evidence of successive use and re-use. This is exemplified in the use of fixings, piles and other materials to anchor these features to the seabed.

Terrestrial markers are increasingly becoming disused, since these traditional methods are being replaced with radio, satellite navigation, digital marine charts and seismic technologies. This is true also of lighthouses, with debates ongoing about their relevance since we are currently living in a society that is using Global Positioning Systems (GPS) for most navigation. Arguments that lighthouses no longer justify their costs of maintenance are countered by those that want to retain them as a fail-safe should GPS systems fail.

RARITY AND VULNERABILITY

Many navigational aids are sited in locations vulnerable to coastal erosion processes, not only from the sea but extreme weather conditions too. Such risks apply to substantial structures including lighthouses too, several of which are at risk from erosion, particularly in the East Anglian region where Happisburgh and Orford Ness lighthouses are under medium term threat.

Maritime safety structures are vulnerable too from technological advances: electronic and digital systems offering comprehensive position-finding and chart data readily available to most marine users and making redundant many well-spaced material fixtures which rely on visibility for their operation. Coupled with that obsolescence, pressures on public finances are forcing the increasing centralisation of safety services and closure of some smaller coastguard stations.

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1.2 BROAD CHARACTER: INDUSTRY

1.2.1 Character Type: Extractive industry (minerals)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Extractive Industries (minerals) includes the following Sub-types:

- Aggregate dredging
- Aggregate quarrying
- Quarrying
- Mining (coal)
- Mining (metals)
- Mining (other)
- Mining (unspecified)

Extractive industry (minerals) refers to imprints from industrial activity focused on primary extraction of minerals from the earth, including stone, specific minerals, and ores, along with initial processing at extraction sites. It includes coal but excludes hydrocarbons which come under the 'Energy Industry' Character Type. Coverage by HSC is limited to areas of extractive industrial character located along the coast and within the marine zone.

Aggregate dredging involves the extraction of sand and gravel by dredging from the sea-floor, for use principally in construction and civil engineering. It includes past and active dredge zones, wharves used by dredgers and associated onshore facilities for washing, screening, and preparation.

Aggregate quarrying refers to areas of past or present extraction of sand and gravel by quarrying on land, also for use principally in construction and civil engineering, and includes closely associated facilities for washing, screening, and preparation.

Quarrying refers to areas of past or present open-cast extraction of stone, used principally in construction and civil engineering, and excluding aggregates, coal, specific minerals and ores. It includes closely associated spoil heaps and facilities for initial processing and transportation from extraction site. Coastal sites are often favoured for quarrying due to outcrop exposures and ease of access and transport.

Mining (coal) refers to areas characterised by past or present extraction of coal, whether by open-cast, pit or by shaft. It includes closely associated spoil, processing and transport facilities and processing waste. Such closely associated spoil may include colliery waste spread onto nearby shores. Some coastal coal mines extend into strata located beneath the sea-floor. Almost all onshore coal resources in England occur in strata of the Carboniferous system approximately 356-299 million years old. In England, coals of Mesozoic and Tertiary age are insignificant onshore but occur over large areas offshore (BGS 2001). In general, extensive re-landscaping is undertaken after the end of mining at a site with the aim of returning to other productive uses of the land, often transforming the legibility of past Character Types expressed in today's landscape. For example, the impact of coal mining on the coastal dimension has been significant in some areas such as the North East (Co Durham) and Cumbria. It produced 'black beaches' formerly covered with sand, creating large scale topographic changes. However in another highly cultural intervention, subsequent management initiatives, with strong and necessary levels of public engagement, have now removed much of that coal waste from the shoreline (see <http://www.durhamheritagecoast.org/dhc/usp.nsf/pws/Durham+Heritage+Coast+-+Durham+Heritage+Coast+-+Videos+-+Turning+The+Tide>).

Mining (metals) refers to areas characterised by past or present extraction of metal ores, whether by open-cast, pit or by shaft. It includes closely associated spoil, processing and transport facilities and processing waste. Such extraction may be focused on single metal ores or, commonly, complex ore bodies from a diversity of economically-significant metals and minerals. Coastal metals mines often extend into strata located beneath the sea-floor.

Mining (other) refers to areas characterised by past or present extraction of known minerals other than metal ores, coal, salt, clays, stone for construction, and aggregates. It covers mining whether by open-cast, pit or by shaft. It includes closely associated spoil, processing and transport facilities and processing waste. Economically-significant minerals may include such items as gypsum, cobalt, arsenic, jet, wolfram, fluorspar and uranium.

Mining (unspecified) refers to areas characterised by past or present extraction by open-cast, pit or by shaft but whose stone/metal/mineral resource is not specified in sources available to the HSC assessor. It includes closely associated spoil, processing and transport facilities and processing waste.

This Type is usually an intrusion across other Types of contemporary and earlier date, as extractive industries and their components are generally determined by the underground location of their object. It includes quarrying, dredging and mining, by open-cast, pit and shaft. Most mines, quarries and dredging works develop over some time; while earlier

features may be partly effaced by later activity; there are commonly traces of earlier technologies, plant, dumps, scours, etc, among remains from later working.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Overall, typical components of this Character Type include:

- mines;
- quarries;
- wharves;
- dredging vessels;
- office, storage and factory buildings;
- mine workings, including open-cast and pit workings;
- waste tips, dumps, and spoil heaps;
- specifically associated transport systems (such as tunnels, railways and harbours).

Marine aggregate deposits (MADs) are sands and gravels of economic value that can be found on the seabed. Marine aggregates are used primarily for building and construction purposes and a substantial proportion of the United Kingdom's need for aggregates is obtained from the seabed. Currently the UK is reliant on marine-sourced aggregates to a far higher degree than virtually any other nation in the world (Flatman and Doeser 2010, 164). Dredging activity is closely related to market demand, therefore activity within licensed areas can be sporadic and difficult to predict (Rogers 1997).

Using marine resources reduces the pressure to work minerals on land where resources are constrained in areas of agricultural, environmental or development value (ODPM 2005). It is known that there are very extensive deposits of soft aggregates (i.e. sand and gravel) in English waters. Their distribution is uneven with variable thickness, illustrating the complex geological history of the seabed (ODPM 2005). Two main areas of maximum MADs potential have been identified: the southern North Sea and the English Channel (Wenban-Smith 2002). Processes such as climate change and fluctuation of sea levels over the last 2 million years contributed to the deposition of sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by river systems that are now submerged (BMAPA 2000; ODPM 2005). The seabed was periodically exposed as dry land, creating a space for human occupation and the potential for associated past human remains on those landscapes. Over the last twenty years the growth and development of the offshore extraction and construction industries have increasingly threatened the submerged archaeological resource. The past character of these submerged environments is now being recognised at national and international level by both heritage organisations and seabed developers (see www.jnapc.org.uk). As a result, initiatives promoting environmentally friendly extraction have been developed. For example, the Aggregates Levy Sustainability Fund (ALSF) demonstrates how this scheme has enabled English Heritage to support a range of timely initiatives, providing new insights into mitigation, assessment, evaluation and potential of the marine historic environment through remote survey and field investigation. Historic Seascape Characterisation (HSC) has considerable contributions to make to applying our understanding of the historic character of the marine zone to the key licensed aggregates extraction areas to the median line with UK neighbours.

Whilst coal fuelled the Industrial Revolution during the 18th and 19th centuries, oil and gas were the most important natural fuel resources to be discovered in England during the later 19th and the 20th century. They provide energy and essential chemicals for the home, industry, and the transport system as well as earning valuable export and tax revenues to support the UK economy.

Gypsum has been a basic ingredient of the plaster industry for building, rendering and decorative purposes since the 13th century. It has been used more recently for medical and surgical purposes, in the pottery, brewing and paper industries, and still on a large scale for building-plaster and plasterboard. Alabaster is a fine-grained, compact form of gypsum, and has been valued since the medieval period as a material for carving, domestic ornamental and decorative work. The gypsum industry includes the processes of mining, quarrying, transporting, preparing and producing gypsum. The mining technology used to exploit gypsum is similar to that used in other mining industries. Rock gypsum or alabaster scrap is crushed and ground to powder in plaster mills, prior to being heated in a kiln to remove most of its water content and produce 'Plaster of Paris', while higher temperatures produce a pure plaster. Typical components comprise similar elements to those found in other mining industries such as adits or levels, open-cast workings, gin circles, engine houses, inclines and a range of associated buildings, together with grinding mills and kilns, as well as specifically associated transport systems.

Alum was imported into England mainly from the Middle East before the 15th century, and, from the late 15th century onwards it was imported from the Papal States for hundreds of years. Alum was primarily used in the textile industry as a dye-fixer (mordant) for wool. England's most important medieval industry, the wool trade, relied upon a steady supply of alum since the value of the cloth depended on how well it was dyed. However, these sources were unreliable and there was a push to develop a source in England especially as imports from the Papal States were ceased following the excommunication of King Henry VIII. With state financing, attempts were made throughout the 16th century, but without success until early on in the 17th century (<http://en.wikipedia.org/wiki/Alum>). During this time, the attention was centred upon North East Yorkshire due to the discovery of a Jurassic Upper sequence of rock strata that outcropped in a thick band in the coastal cliffs to the north and south of Whitby (and in certain inland locations) and which contained aluminium sulphate (the vital ingredient of alum). The production of English alum was concentrated in this region for the next 250 years, stimulating the development of other industries and helping to lay the foundations for the Industrial Revolution from the 18th century. In general, alum quarries and their associated spoil tip represent the first stages of the manufacture process. The next stage in the process was to extract the aluminium sulphate from the calcined rock by soaking it in water. This was undertaken in large stone tanks called steeping pits requiring a constant supply of fresh water. The secondary processes were undertaken in a purpose-built factory called the alum house. These were often some distance from the quarry, so the raw liquid had to be transported. Once at the alum house, the raw liquid was boiled and concentrated to a point where the aluminium sulphate would crystallise with the addition of an alkali. The crystals were then purified through a sequence of washing and re-crystallising cycles. The details of this process were a closely guarded secret, and no contemporary accounts survive. Typical components of this industry include: quarries; steeping tanks; alum houses; storage and office buildings; reservoirs; waste tips, dumps, and spoil heaps; and specifically associated transport systems such as tunnels, railways, harbours and rock-cut tracks crossing rocky shores for loading beached cargo vessels.

Ironstone works have had a long history in England. Ironstone is used as a component in some ceramics, commonly known as 'ironstone china' (a hard white earthenware). Most early ironstone was made in Staffordshire because of the abundance of clay and the proximity of a seaport for shipping the finished wares to North America and Europe. During the 17th century, several Staffordshire potteries produced a ceramic ware that they called 'stone china'. Josiah Wedgwood manufactured a 'stoneware' china in the 19th century that

could be mass-produced. It was commonly used for heavy-duty dinner services in the 19th century. Charles Mason took out a patent for 'Mason's Ironstone China' in 1813 as a cheap alternative to porcelain. Ironstone china was also very popular during the 1970s (<http://en.wikipedia.org/wiki/Ironstone>). In some areas, ironstone deposits have been strip mined, resulting in deep linear quarries known as 'gulleys', surrounded by extensive areas of spoil. Some of these former workings have been returned to agriculture, but others (e.g. Twywell Gullet) support limestone grassland rich in plant species such as orchids (http://www.naturalengland.org.uk/ourwork/conservation/geodiversity/englands/counties/area_ID25.aspx). Usual components include mines; quarries; bloom furnaces and slags; office and factory buildings; waste tips, dumps, and spoil heaps; and specifically associated transport systems (such as railways and harbours).

The use of jet has a long history, reaching back to the early fourth millennium BC in England and flourishing again in the Roman period. Best known now for its use as a symbol of mourning in Victorian times after the death of Prince Albert in 1861, jet has been accorded a special status during many periods in the past. Its rarity and aesthetic appeal have led to its use as a prestige commodity. In England, the only commercially viable deposits of jet occur in North Yorkshire Moors. Although most jet was mined from inland strata on those Moors, some of the 'jet rock' outcrops along the coast near Whitby and Robin Hood's Bay, giving rise to a distinctive local jewellery industry in those coastal towns and villages which thrived in the 19th century and still survives to a much smaller extent today. These particular deposits have high levels of aluminium and this produces jet of extremely high quality. Usual components include: mines and adits, which are a type of entrance to an underground mine (in both cliffs and foreshore); waste tips, dumps, and spoil heaps.

Potash is used worldwide in almost every major agricultural industry. It is used as a fertilizer on grain crops such as corn, soybeans, oil palms, coffee, sugar cane, cotton, fruit and vegetables. The majority of potash production goes into fertilizer, but it is also used in commercial and industrial products (e.g. from soap to television tubes) (BGS 2006). Potash is worked by underground mining methods. Waste products include the discharging of clays and salt. Boulby Mine is the only potash mine in operation in England. Usual components include mines and exploration boreholes; office and factory buildings; and specifically associated transport systems (such as railways, roads, ships and docks).

England is a major source internationally of china clay. Extensive quarrying of the Hensbarrow Downs, mid-Cornwall (and to a lesser extent on Bodmin Moor and the south-western fringes of Dartmoor) has created a unique landscape of large open quarries and associated spoil heaps and infrastructure forming a distinctive skyline to this part of the south west peninsula when viewed from the sea. Facilities to export the clay to the potteries of the Midlands, and latterly to the paper mills of Northern Europe, were purpose-built at Par in the early 19th century but the harbour there was closed to clay traffic in the late 2000s and most clay is now exported from the deep-water port of Fowey.

Quarrying has played a major role in the economic and maritime history of England. The remains of many slate quarries can be seen along the North Cornish coast, along with the facilities to export the slates from these, and larger quarries inland. The early demand for granite was met by moorstone from West Penwith, Bodmin Moor, and Dartmoor, but as demand increased larger quarries were opened and facilities for transport of the material expanded. Much of the stone from the dimension quarries of the later 19th century such as

De Lank were carefully cut and dressed and used in major engineering works such as lighthouses (Herring and Rose 2001). The Isles of Purbeck and Portland are renowned for their limestone and are dotted with the remains of quarrying. Quarrying for Purbeck marble and Portland limestone dates back to Roman times for sarcophagi and inscribed stones and to the medieval period for building stone. Much of London was rebuilt using these stones following the Great Fire of London. Portland cement is also manufactured here from raw materials extracted locally (Cement and Concrete Basics website).

The mining of metals has a long and significant history in the country and the South West has nationally important centres for iron production in the Forest of Dean, for lead in the Mendips, and for tin and copper in Cornwall and west Devon. Evidence for iron ore extraction in the region goes back to the Roman period with furnaces excavated at Chesters Villa on the Severn (Mullin *et al* 2009, 24). Roman ironworking has been identified on Exmoor and more tentatively in Cornwall, adjacent to the fort at Restormel (Smith in Thorpe 2007, 27). It is likely that the smelted metal would have been transported by sea to centres of production. Lead production in the Mendips is centred on Charterhouse and, although it may have begun prior to the Roman conquest, is concentrated around the 1st to 3rd centuries. Evidence from the distribution of the highly characteristic ingots suggests that the lead was transported by road to the south coast for export to Gaul and beyond (Holbrook 2008, 155). Likewise, the North West was important for iron and coal mining, as well as iron and steel processing. These were the main drivers behind the development of settlement and industry along the west Cumbrian coast from the 17th century onwards. Cumbria had the first undersea coal mine, at Saltom near Whitehaven, which was a classically planned town built with its own harbour to take advantage of the overseas trade in coal from the 17th century.

Tin and copper mining has a rich and diverse history in the South West with tin likely to have been exploited since the beginning of the Bronze Age in Cornwall and west Devon. Trade with the Mediterranean world has been inferred from scraps of ancient writings thought to ultimately derive from the autobiographical account of the voyage of Pytheas of Massalia, sadly now lost, who describes tin streaming and the working of the tin into ingots, as well as the customs of the merchants and sailors who traded between Belerion (Cornwall) and Gaul (Cunliffe 2002, 76). Industrial mining from the 18th century brought great wealth to Cornwall, as well as cycles of boom and bust, and technological innovations associated with the industry spread around the world, along with a great Cornish diaspora. Many of the mines were coastal and the sight of engine houses lining the rugged Cornish cliffs is a powerful national symbol as well as providing landmarks for coastal craft. Many of the coastal lodes will have been identified by miners engaged in their summer occupation of fishing and shafts and galleries may extend out from the coastline for some distance.

England is essentially self-sufficient in mined rock salt (salt extraction by evaporation from brine is discussed under the HSC Character Type text for 'Processing Industry') Historically, rock salt mining has been carried out since at least the medieval period with exports having exceeded imports at times. Trade is currently roughly in balance (BGS 2004). England has huge resources of rock salt (BGS 2004). Office and factory buildings were usually set up adjacent to the extraction sites and brine reservoirs were built. Rock salt mining produces no waste but has been associated with subsidence of overlying surface land. Salt is now produced in only two areas in England: Cheshire and the North York Moors National Park (BGS 2004).

England has been a producer of building stone for hundreds of years. The country possesses a varied geology, with a wide range of building stone types available and the quarrying of such stone is of great importance. The use of these various types of stone has influenced architectural style throughout the nation (<http://www.bgs.ac.uk/mineralsuk/minequar/stones/home.html>). Sandstone has been in demand due to its hardened quality when weathered which makes it resistant to the effects of immersion, and therefore useful in harbour works. Usual components of quarrying include pits, waste tips, dumps, and spoil heaps; and specifically associated transport systems (such as railways, roads, ships and docks).

Smaller-scale extractive industries have included clay for agriculture and brickmaking, coppers for a number of chemical purposes, and coprolite for fertiliser.

VALUES AND PERCEPTIONS

There are many tangible and intangible reminders of England's rich and varied mining past along our coastline, both directly and in the infrastructure, the harbours, quays and wharves, which served them. The remains of these often extensive industrial processes on the present landscape/seascape can generate complex and mixed feelings in different regions and places, in part dependent on people's closeness in time and family ties to these industries. Some may link this Character Type, especially its coal industry expressions, to a hard labouring life, with many workers who suffered illnesses, but for many it also invokes a feeling of pride in their industrial past. In the present coastal landscape it is also often represented by the artificial landforms of reclaimed spoil heaps and post industrial communities with no obvious economic base after the mines closed.

The Durham Heritage Coast's 'Turning the Tide' project provides an exemplary initiative on the need to engage strongly with people's emotional attachments to recently closed extractive industries along the coast while addressing the ongoing environmental issues they generate and creating a forward-looking future for the coming generations (see <http://www.durhamheritagecoast.org/dhc/usp.nsf/pws/Durham+Heritage+Coast+-+Durham+Heritage+Coast+-+Videos+-+Turning+The+Tide>).

The level of cultural values attached to the deep mining of the South West were underlined by the recent inscription of the Cornwall and West Devon Mining Landscape as a World Heritage Site in 2006. The Cornwall and West Devon Mining Landscape World Heritage Site bid built on the large base of interest and enthusiasm for Cornwall's industrial past that already existed. There are many people in Cornwall who worked in the industry and the last mine only closed down in 1998. In addition many have family ties to the industry in the form of parents and grandparents. The success of the WHS bid has validated this interest and encouraged others to think of the remains of the industry in a positive light. The remains of the industry are a powerful reminder to many of prosperity and a time when Cornwall was at the heart of the Industrial Revolution.

Coastal quarrying is often viewed negatively whilst operations are ongoing but their industrial remains, trackways and the bases of cranes for loading stone onto coastal shipping have also lent distinctiveness to many stretches of our coastline and provided sources of considerable research interest to industrial archaeologists. Some coastal quarries are on such a scale that they form impromptu position-markers for passing mariners. Abandoned quarries may form important recreational areas, and are often valuable wildlife or geological sites. They may also be used as rubbish dumps, both official and unofficial.

Many of the indirect effects of extractive industry often go unrecognised, such as the development of nearby towns and the generation of wealth expressed in large 18th and 19th century landowners' estates.

RESEARCH, AMENITY AND EDUCATION

Through the Aggregates Levy Sustainability Fund (ALSF) Regional Environmental Characterisation (REC) surveys have taken place, collecting baseline information on large areas of the seabed to enable better informed environmental assessments (<http://www.alsf-mepf.org.uk/projects/rec-projects.aspx>).

Besides also funding the Historic Seascape Characterisation (HSC) projects, the ALSF has supported a number of research projects related to the historic environment including establishing guidance (Marine Aggregates Dredging and the Historic Environment (2003)) and a protocol for finds reporting at all stages of extraction (Marine Aggregate Industry Protocol for the Reporting of Finds of Archaeological Interest). This has seen wide-scale reporting of archaeological finds and a significant interest in the historic environment within the dredging community. This was accompanied by an awareness programme funded by the ALSF and implemented by Wessex Archaeology including visits from archaeologists to workplaces, a newsletter (Dredged up from the Past) and a training DVD. One of the most significant consequences of the Protocol is the recent find of 75 Palaeolithic tools from dredging Area 240, approximately 8 miles east of Great Yarmouth. These were discovered on a wharf in Holland during sorting and sourced back to Area 240, following which an ALSF project was initiated to fully explore the area with some interesting results.

A wealth of research has been produced on extractive industries addressing issues surrounding the environmental footprint of quarrying and the sustainable provision of aggregates (see <http://www.sustainableaggregates.com/index.htm>). Furthermore geophysical surveys are a requirement for offshore aggregate extraction to enable, amongst others, the assessment of the impact of these developments on the historic environment. These surveys also have potential to increase knowledge of the historic environment for an area. This information will feed into the local and national monuments records and inform future curatorial decisions, providing an opportunity for beneficial cumulative knowledge regarding marine archaeology.

Extensive research has also been undertaken regarding coal mining in England. It would be useful to explore further links of this industry with the marine environment to provide a deeper understanding of this industry as a whole nationally and internationally.

Further research on the industrial archaeology in England would be beneficial to enable public access to, and appreciation and enjoyment of, the historic environment for present and future generations.

The presence of quarries has provided an opportunity to display cross-sections through the underlying geology at a large number of locations and many of these are Regionally Important Geological/Geomorphological Sites (RIGS).

The inscription of the Cornwall and West Devon Mining Landscape as a World Heritage Site in 2006 has created a focus for visitors to the various components of the industrial heritage

of the area as well as encouraging cultural events with mining themes, lecture programmes covering all aspects of the site, and exhibitions displaying aspects of the landscape.

Today's impact of the extractive industries in England can be seen through the wide range of museums and abandoned quarries use for amenity and educational purposes, many of which are coastally situated (e.g. Geevor, West Penwith, for the Cornish deep mining industry). The ALSF has also provided a wide range of educational initiatives including two Derek the Dredger children's books, emphasising aspects of aggregate extraction, marine archaeology, marine biodiversity and how such industries work together and the Aggregates to Outreach Teaching Pack with curriculum linked lesson plans and handling collections (see www.hwtma.org.uk).

CONDITION AND FORCES FOR CHANGE

The condition of coastal extractive industrial remains varies considerably: from almost total destruction to excellent preservation. Coastal remains from these industries are prime targets for public-awareness initiatives in the context of the forthcoming coastal access requirements from the Marine and Coastal Access Act 2009. This access will need care in its routing to avoid increasing visitor erosion on surviving features.

Former extractive industrial sites are often classed as 'derelict land' which has been gradually 'tidied-up' by farmers or subject to expanding housing and industrial developments: in such cases, liaison with the relevant heritage planning advisers is needed to conserve and/or record earlier features where they still survive. In some areas the remains of early industry have been damaged or destroyed by cliff falls, for example the coastal remains of Saltom Coal Pit, Cumbria, now a scheduled monument, are considered to be at risk from both coastal erosion and potential cliff falls from the rock wall on its landward side.

RARITY AND VULNERABILITY

In terms of rarity, extractive industries (minerals) occur, of course, where their resource lies. Jet mines and alum works are nationally confined to north east, in particular to the North Yorkshire Moors. Ironstone mines, however, can be found in other parts of England.

In terms of vulnerability, raising awareness of industrial remains in England will make them more sustainable as a resource and part of the cultural legibility of the landscape and seascape accessible to present and future generations. The vulnerability of the landscapes and seascapes produced by these industries derives in large part from their susceptibility to neglect and collapse; to the development and 'restoration' of 'derelict land', and to needs to address inherited and unresolved problems of ongoing pollution from such industrial remains. However some of those 'polluting' aspects are more matters of perception – claims of 'visual pollution from unsightly industrial remains' – which may be short term and liable to change to more positive views if effectively addressed by public awareness campaigns while retaining the features in question to inform future generations of their cultural inheritance.

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1.2.2 Character Type: Energy industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Energy Industry includes the following Sub-Character types:

- Hydrocarbon field (gas)
- Hydrocarbon field (oil)
- Hydrocarbon installation
- Hydrocarbon pipeline
- Hydrocarbon refinery
- Power station (fossil fuel)
- Power station (nuclear)
- Renewable energy installation (wind)
- Renewable energy installation (tidal)
- Renewable energy installation (wave)
- Submarine power cable
- Overhead power cable

The Energy Industry Character Type covers areas whose dominant character is concerned with the extraction, processing and/or storage of hydrocarbons (oil, oil derivatives, and gas, but not coal); installations relating to all forms of renewable energy generation, by wind, wave or tide, and power stations of all fuels, together with their associated transmission facilities and directly associated transport facilities.

Hydrocarbon field (gas) refers to a production area for natural gas from naturally occurring reserves. Those reserves occur in organic-rich rocks such as oil shales or coal; hydrocarbons form when they are subjected to high pressure and temperature over extended periods. Mapping of these areas by HSC relates to the areas dominated by the production activity, not the full known area of the geological reserves.

Hydrocarbon field (oil) refers to a production area for oil from naturally occurring reserves. Those reserves occur in organic-rich rocks such as oil shales or coal; hydrocarbons form when they are subjected to high pressure and temperature over extended periods. Mapping of these areas by HSC also relates to the areas dominated by the production activity, not the full known area of the geological reserves.

England's offshore oil and gas originate from two sources: 1) from subsidence and burial of marine limestones under thick accumulations of basin sediments approximately 140 million years ago which have generated gas from coal source rocks; and 2) from deeply-buried mudstone source rocks from approximately 65 million years ago. Thus commercial petroleum reservoirs occur in almost every sedimentary succession ranging in age from approximately 410-36 million years (BGS 2001). Most of the UK-produced oil and gas for domestic consumption comes from the UK Continental Shelf. As that resource is in decline, it is expected that England will increasingly depend on imported oil and gas.

Hydrocarbon installation refers to an installation, for example a drilling platform, directly involved in the extraction of oil and natural gas. Closely associated structures include pipelines, platforms, tanker moorings, storage containers, warning signals and lights. Unauthorised navigation is prohibited within 500m of all such structures. Whether HSC depicts individual hydrocarbon installations or subsumes them under a 'hydrocarbon field' is guided by the dispersal of such installations within a production area, the purpose of the HSC and, especially, its intended viewing scale.

Hydrocarbon pipeline refers to a pipeline involved in the transmission of oil or natural gas between facilities involved in their extraction, processing, storage or distribution.

Hydrocarbon refinery is a building or structure that processes and refines oil and natural gas, such as an oil refinery or gas compressor station. This includes directly associated storage, transmission and transport facilities such wharves and docks.

Power station (fossil fuel) refers to a building or set of buildings and structures where power, especially electrical or mechanical, is generated, using fossil fuels: coal, oil or natural gas (<http://thesaurus.english-heritage.org.uk/>). This includes a power station's directly associated storage, transmission and transport facilities.

Power station (nuclear) refers to a complex of buildings producing power derived from nuclear energy (<http://thesaurus.english-heritage.org.uk/>). This also includes these power stations' directly associated transmission facilities.

Renewable energy installations are subdivided for HSC into their main power sources, wind, tidal and wave power, and refer to buildings, sites and structures associated with the harnessing of those sources for electrical power generation. This includes windfarms, tidal mills, tidal barrages and wave power-generation technology, their directly associated electrical transmission and distribution facilities and other related features such as tidal pools.

Submarine power cable refers to a cable used to transmit electricity from the mainland to islands or to offshore installations, or to link offshore electricity generators to the onshore national electricity grid.

Coverage by HSC is limited to areas of energy industry character where its imprints are situated along the coast and within the marine zone. Those imprints show some distinctive features within the overall energy industry, for example the coastal emphasis in the siting of nuclear power stations and the increasing focus on offshore locations for some of the UK largest wind-farms. UK hydrocarbons output is now in long term decline but in 2001 there were still almost 500 platforms and 10,000 kilometres of oil and gas pipelines running between offshore production wells and terminals on land, mostly in the North Sea.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical historical components of this Type include:

- oil and gas fields;
- slag heaps and offshore spoil dumping grounds;
- sub-sea wells and wellheads;
- fixed platforms and drilling rigs;
- large, sprawling industrial complexes;
- cooling towers, chimneys;
- distribution depots and customer service centres; and

- associated transport systems (such as railways, roads, ships, docks and tanker terminals). It is important to note that transport links are covered by the relevant 'Transport' Sub-types.

Oilfields are mostly found offshore in the UK, in the North Sea. A small onshore coastal oilfield is exploited on the Isle of Purbeck, Dorset. From the 1960s, while coalmines and railways were closing, oil and gas refineries were opening, both trends having impacts on the communities they were supporting and their coastal infrastructure. An example is the sharp decline in the 1980s in coal exports from Blyth Harbour, Northumberland, already under economic pressure from closure of its shipbuilding industry in the 1960s.

Natural gas from land-based reservoirs has been utilised to provide heating and lighting since the late 18th century. However, the situation changed in the 1960s and 1970s when a national conversion programme from 'town' gas to natural gas took place, with natural gas first discovered in English waters in 1965 and oil in the 1970s. By the mid 1980s there were over 100 oil and gas installations in the North Sea although the industry has been in decline since the beginning of the millennium.

When the first full scale nuclear power station was opened at Calder Hall, now Sellafield on the Cumbrian coast, by the Queen in 1956 the Lord Privy Seal, Richard Butler, described the event as "epoch-making" (www.news.bbc.co.uk). Subsequently 11 magnox power stations were built in the UK. Nuclear power stations have a markedly coastal distribution, facilitating their requirements for huge quantities of cooling water. Within that coastal spread their tendency towards more remote locations reflected, from the start of the industry, concerns over the safety of the technology but also a recognition of the industry's strong defence links and a desire ensure their operation was secure and, to an extent, hidden from the public gaze. By 1997, nuclear power contributed 26% of the UK electricity. Since then, UK nuclear power electricity generation has declined with the closure of several nuclear power stations with a number of others currently planned to close at the end of their planned functional lives by 2015. It is possible however that some at least will have their lives extended.

The UK has huge resources in wind, tidal and wave power. Wind power is the fastest growing form of global electricity generation and has become increasingly important in recent years, following the UN Framework Convention for Climate Change agreed in Rio in 1992 and the subsequent Kyoto protocol of 1997. This proposed a global cut of 5.2% greenhouse gas emissions by 2008-2012, specifically committing the UK government to reducing greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012. In 2000, the Crown Estate announced the first round of UK offshore wind farm development (Round 1). Round 1 was to cater for demonstration scale projects of up to 30 turbines with the selection of sites largely driven by developers. Later, the Round 2 tender process was for commercial scale projects within the Greater Wash, the Thames Estuary and Liverpool Bay areas, with the aim of meeting the offshore wind capacities identified by the Strategic Environmental Assessment (SEA). In 2008, and following an announcement made from the Department for Business, Enterprise and Regulatory Reform (BERR) on the launch of an SEA of UK waters to open up the seas to up to 33 GW of offshore wind energy, The Crown Estate announced proposals for Round 3 offshore wind farm leasing comprising nine zones: Moray Firth, Firth of Forth, Dogger Bank, Hornsea, Norfolk, Hastings, West Isle of Wight, Bristol Channel and Irish Sea. Wave power in the UK is at an early stage of development. For tidal power, between 2008 and 2009, five options were being considered for a tidal barrage

across the Severn Estuary. The UK Government ended that consideration in October 2010 by announcing it saw no strategic case for such a barrage for the foreseeable future. Advancing wave energy technologies, the South West Wave Hub, which was installed off Hayle on the north coast of Cornwall in 2010 is a grid-connected offshore facility for the large scale testing of technologies that generate electricity from the power of the waves.

Submarine power cables are represented in the England by the HVDC Cross-Channel which is a high voltage direct current (HVDC) connection that operates under the English Channel between continental Europe and the UK. The first HVDC Cross-Channel went into service in the 1960s. Because this first installation did not meet the increasing requirements, it was replaced in the 1980s by a new HVDC line with over 45 kilometres of submarine cables present in the sub-sea floor.

I

VALUES AND PERCEPTIONS

This Character Type is often stimulates varied and complex and strongly held views, differing according to the interests being considered, the energy source, and the region and place concerned. In the most generalised terms some think that energy generation by any available means is a 'necessary evil' to support our society; others that we should move to more renewable methods which generate energy in a 'clean, safe and reliable' way. Others feel that the energy production is inherently an 'eyesore', 'noisy', cannot be wholly environmentally friendly and is just one aspect of a more universally unsustainable relationship between human economies and the world we inhabit.

The controversy is exemplified by Sizewell power station in Suffolk. The industrial complex incorporating the characteristic dome of Sizewell B dominates the coastline, as do the power lines that emanate from it. The structure is located within an Area of Outstanding Natural Beauty (AONB) and has therefore been the subject of much debate, some seeing the visual effects as now an iconic aspect of the distinctive character of this stretch of the Suffolk coastline, while others see it as an iconic visual symbol of the unacceptable intrusion of unsustainable and dangerous modern technology into an 'unspoiled' area (albeit one considerably shaped by previous human activity including a strong military presence).

The use of nuclear power has always been controversial, not least because of the problems and uncertainties surrounding radioactive waste storage for indefinite periods. The potential for severe radioactive contamination by accident or sabotage, and the possibility that its use could indirectly lead to a proliferation of nuclear weapons are also viewed as unacceptable by some communities of thought.

Renewable energy generation also produces strong and sometimes polarised views. It is considered by many as a 'sustainable' means of energy generation, offering solutions to issues of global concern in all dimensions of sustainable development: economical, ecological, and social. From that standpoint, renewable sources of energy may be perceived as benign symbols of hope. However, renewable energy complexes are also seen by many as high-profile visually-intrusive features impinging on familiar and highly valued landscape and seascape, also add to levels of noise, smell and activity in 'tranquil' settings.

The UK Government agrees that renewable energy is central to securing a diverse and sustainable energy supply which will achieve the UK's carbon dioxide emission reduction targets. Questions about the capacity of renewables to meet that aim alone, coupled with a future 'energy gap' apparent in the UK's generation capacity against its energy demands,

have led to proposals to build a new generation of nuclear power stations coupled with a major expansion of offshore wind generation under the Round 3 leases being offered by the Crown Estate (http://www.thecrownestate.co.uk/offshore_wind_energy).

RESEARCH, AMENITY AND EDUCATION

Decommissioning of nuclear power plants offer opportunities to undertake research into the landscape/seascape character perceptions surrounding such highly visible complexes, building on recent Scottish work on the heritage aspects of the Dounreay Nuclear Power Station.

The development and maintenance of the offshore energy industry creates large amounts of data relating to the seabed, most notably geophysical data. This is an invaluable resource for the offshore historic environment, providing information on past landscape surfaces as well as shipwrecks and other intrusive features. In addition renewable energy developments are often accompanied by educational facilities in order to inform the general public about the benefits of this type of installation and any additional data produced.

The hydrocarbon industry is declining and a record of its history may be valuable. A recent project undertaken by the British Library National Life Story Collection and the University of Aberdeen entitled 'Lives in the Oil Industry' recorded first hand oral accounts of working in the oil and gas industry in order to preserve this history.

Considerable numbers of these industrial areas are founded on reclaimed land, often drained saltmarsh and mudflats, infilled from the late 19th century onwards. These buried deposits may have considerable potential for preserving palaeoenvironmental material and artefacts and features associated with estuarine environments.

Public amenity may be limited by health and safety considerations but other possibilities could be explored such as virtual and interactive displays. Even so, the former nuclear power station at Sellafield, Cumbria, has a visitor centre and is a key tourist attraction for the west Cumbrian coast, outside of the Lake District National Park.

General policy trends show an expansion of renewable energy with an encouragement of wind power, especially in offshore locations where more consistent strong wind speeds are available. Within this context, recognition of existing historic environment considerations in planning future wind farms is expressed, for example, by the Collaborative Offshore Wind Research Into The Environment (COWRIE), a company set up by The Crown Estate to raise awareness and understanding of the potential environmental impacts of the UK offshore wind farm programme. COWRIE published a guidance note for best practice in survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the UK (Oxford Archaeology and George Lambrick Archaeology and Heritage 2008; Wessex Archaeology 2007). Historic Seascape Characterisation (HSC) can inform that on the typical historic character of areas under consideration for renewable energy developments, adding area-based context of the commonplace processes that have shaped an area to the more traditional point-based records of the rare and the special in the historic environment.

CONDITION AND FORCES FOR CHANGE

Output from the largest oil producers – the UK and Norway – has now peaked and entered a period of long term decline. In 2001, around 500 platforms and 10,000 kilometres of rigid and flexible oil and gas pipelines were running between offshore production wells and terminals on land (CEFAS 2001).

Increasing concerns relating to the finite nature of hydrocarbons and the burning effect these resources have on global warming places is increasing pressure on the energy industry sector. Nuclear power has been the main form of alternative energy production with renewables increasing as a share of overall UK energy production. Renewable energy is viewed by the UK Government as an essential element to tackle climate change. Recent debates suggest that new nuclear power stations are unlikely to make a significant contribution to current needs. However, it has also been stated by government that even though *'the share of renewables will grow, it is likely that fossil fuel generation will meet some of these needs. Given the likely increase in fossil fuel generation..., it is important that much of this nuclear capacity is replaced with low carbon technologies. New nuclear power stations could make an important contribution to meeting our needs for low carbon electricity generation and energy security...'* (BERR 2008; for further details also see <http://www.decc.gov.uk>; <http://www.defra.gov.uk/environment/radioactivity/mrws/waste/new-nuclear-power-stations.htm>).

Expansion of offshore windfarms raises many concerns about seascape impacts, both visually and across the full depth of the marine levels, where the material imprints occur which inform our understanding of marine historic character, These considerations will be accommodated for particular windfarm proposals by the landscape considerations required to be included in their necessary Environmental Impact Assessments (EIA). HSC has a particular role in informing those EIAs on the historic cultural dimension of seascape.

RARITY AND VULNERABILITY

Oil and gas working installations are found in coastal expressions within the overall English mainland and territorial and continental waters. If any remains of installations are found, statutory designation for modern structures exists in the form of designated safety zones around them. The purpose is to protect the safety of people working on or in the immediate vicinity of the installation and the installation itself against damage. They also provide the additional benefit of protecting fishermen and other mariners by reducing the risk of collision with the installation and preventing loss of gear which can become snagged on underwater equipment (Val Baker *et al* 2007).

An environmentally responsible approach will continue to be encouraged within this sector. There is government legislation that ensures consistent standards throughout the offshore industry (e.g. DEFRA 2002; HM Government 2009). Relevant archaeological guidance notes regarding the energy industry sector are also publicly available (Oxford Archaeology and George Lambrick Archaeology and Heritage 2008; Wessex Archaeology 2007). Since their publication, Historic Seascape Characterisation (HSC) has emerged providing an area-based assessment of the historic character of the typical in the coastal and marine zones.

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1.2.3 Character Type: Processing industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Processing Industry includes the following Sub-types:

- Chemical works
- Iron and steel works
- Industrial production (unspecified)
- Sewage works
- Nuclear reprocessing
- Spoil and waste dumping
- Lime production
- Salt production

The Processing Industry Character Type covers a broad range of processing and production industries which have a particular relevance for HSC due to their distinctively coastal and/or maritime expression and occurrence.

Chemical works refer to an industrial complex involved in the production of chemicals (<http://thesaurus.english-heritage.org.uk>). Likewise, 'iron and steel works' refers to an

industrial complex for large-scale production of iron and/or steel in the 19th and 20th centuries. Both chemical works and iron and steel works are often located on the coast and in or near ports to take advantage of imported raw materials and for the distribution and export of finished products.

Industrial production (unspecified) refers to an area of facilities relating to industrial production but whose chief product is not specified in sources available to the HSC assessor. The areas included here will have aspects giving them a distinctively maritime character.

Sewage works refers to an area in which sewage is filtered and purified in large rectangular or circular tanks (<http://thesaurus.english-heritage.org.uk>). This includes associated outfalls, pipelines and diffusers.

Nuclear reprocessing refers to an industrial area for the decommissioning of structures associated with the nuclear industry, reprocessing of nuclear materials, nuclear waste management and/or nuclear fuel manufacturing activities take place.

‘Spoil and waste dumping’ refers to marine areas regularly used and licensed for the disposal of domestic and/or industrial waste. Material deposited may include dredging spoil, drilling waste, treated sewage, domestic refuse and other land waste.

‘Lime production’ covers areas associated primarily with the transport and production of burnt lime from limestone, largely for agricultural use but also for lime mortar. It includes lime kilns and contiguous associated infrastructure such as quays, jetties and loading ramps.

Salt production refers to coastal and areas concerned with the production of salt for use primarily in food preparation and the preservation of foodstuffs, notably fish and meat. Area dominated by rock salt mining are discussed separately under the Character Type text for ‘Extractive Industry’.

‘Processing Industry’ is directly related to the production and manufacture and, indirectly, to the consumption of goods. For example, iron is the most widely used of all the metals. Its low cost and high strength make it indispensable in engineering applications such as the construction of machinery and machine tools, automobiles, the hulls of large ships, and structural components for buildings. Since pure iron is quite soft, it is most commonly used in the form of steel (<http://en.wikipedia.org/wiki/Iron>). Timber has been mainly used for shipping and building industries, as well as fuel. Brick, tile and clay have been generally used in the building industry as well as the production of pottery. When different types of clay are used in combination with different minerals and firing conditions, earthenware, stoneware, and porcelain can be produced, which have been shipped and distributed commercially at a global scale for several hundred of years. Typical examples are tin-glazed earthenware, the first white pottery (often painted) manufactured in England during the 17th century. In the 18th century, industrial and technological developments enabled standardised productions and mould-made sets, amongst others (e.g. creamware and saltglaze types) (see Draper 1984; Gaimster 1997; Gesner 2000). Sugar refining was a significant production industry in the centre of Liverpool in the post medieval period, and a number of sugar houses are known. Large quantities were imported through the docks from the West Indies, on the final leg of the triangular slave trade.

Areas occupied by processing industries developed considerably through time, usually leaving traces of earlier technologies, either materially or as influences on later plant layouts. Sometimes in production areas, earlier industrial features could be partially impacted by later workings while traces of earlier non-processing features could also be identified, such as remains of settlements and fields pre-dating the industrial complexes.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of Processing Industry include:

- chemical works
- iron and steel works
- timber yards
- brick, tile and clay works
- potteries
- glassworks
- mills
- lime kilns
- cement works
- roperies
- warehouses
- engine and boiler works
- sewage treatment works
- water treatment works
- sewage pipelines
- diffusers
- outfalls
- pumping stations
- reservoirs
- saltworks

English society experienced a period of transformation during the 18th century, especially between 1750 and 1800, when industrial developments, inventions and new scientific discoveries were taking place within the context of a growing capitalist system. This period contained complex social dynamics that had profound impacts on local, regional, national and international scales. These changes were expressed in this first phase of Britain's industrialisation from about 1750, in which economic growth accelerated rapidly, creating a cycle of positive feedback where that growth was both a cause and a product of the economic and social transformations occurring at that time (Hobsbawm 1999: 12).

Patterns of production and consumption were transforming at the end of the 18th century, and English society demanded much greater quantities of certain goods while maintaining quality standards. Industrial and technological developments responded with more standardised productions and mould-made sets, amongst others changes. The industrialisation process also stimulated changes in cultural attitudes, ideas, world-views, work practices and life styles in different areas of England, impacting hugely on the character of past and present societies.

The iron and steel industries were particularly significant both during this early phase of industrialisation and in its later development and expansion during the 19th century. These industries were used in the production of machinery, tools, ships, weapons and buildings.

Iron and especially steel allowed the development of more precision machine requirements as needed in the manufacture of efficient steam engines and eventually enabling the construction of, for example, railways (Appleton 1929); steam-powered shipping; cranes for loading goods at wharves and quays; rifled military guns for longer range coastal defence, and a diversity of later 19th century coastal recreation facilities such as the large piers projecting into the sea on steel supports.

From a maritime perspective timber yards and roperies were particularly important suppliers for shipbuilding. The second half of the 17th century experienced a great demand for timber, especially within the growth of the shipping and house building industries.

Warehouses are intimately linked to the processing industries and are used by manufacturers, importers, exporters, wholesalers, transport, businesses, and customs amongst many others. Historically, warehouses load and unload goods, sometimes directly from railways or seaports. For example, the complex of dock buildings and warehouses at Albert Dock (Liverpool), opened in 1846, and were the first warehouse structures in England to be built from cast iron, brick and stone, with no structural wood. As a result, it was the first fully non-combustible warehouse system in the world, a major advance on the earlier fireproofing of timber structural supports in mills and warehouses. At the time of its construction, the Albert Dock was considered a revolutionary docking system because ships were loaded and unloaded directly from the warehouses.

Brick and tile works are generally poorly documented but there is evidence of the industry dating as far back as the Romano-British period, with indications that it was introduced to England by the Romans (Rowe 2000). In the later medieval and early post medieval periods, the brick industry was given a stimulus from bricks imported to coastal ports as ballast in shipping from continental ports where brick usage was already prevalent.

Regarding sewage, there was no controlled method for the disposal of liquid waste effluent until Victorian times. Before then, rivers, streams, tidal estuaries and the sea provided the means for carrying away waste. By the early 19th century, the rapid growth of towns and cities and the development of industry created major problems concerning waste disposal whose significance as a cause of mass disease outbreaks, notably the spread of cholera and typhoid fever, was only recognised in the 1850s. London responded by constructing enclosed interceptor sewers whose contents were pumped into the Thames downstream. Treatment at extensive sewage farms was also taking place in some towns. By the end of the 19th century, sewage farms became overloaded due to the continuing growth in population. As a result, more intensive handling methods were devised, the infrastructure of which still required large areas of land. These methods were gradually replaced by the more space-efficient activated sludge technique (developed in the 1910s). By World War II, much land previously occupied by sewage farms had become redundant and was subsequently used for housing, leisure facilities and industry (Department for the Environment Industry Profile 1995).

Lime production began in Britain in the Roman period to supply demands for lime mortar and plaster for the construction of stone buildings. Kilns from this period are found throughout much of England but with a concentration in the south. The advent of medieval castle and church building saw a revival in the use of lime as a building material. However from the 16th century, it was the recognition that burning lime produces material that lowers soil acidity and increases soil fertility that led to the construction of large numbers of lime kilns, often, in lime-deficient areas, with a particular bias towards coastal locations to where

the raw materials, limestone and coal, could be imported. Rising populations to feed and wars with France in the 18th century saw a rapid growth in the demand for lime: kilns were built alongside nearly every creek and landing point in some parts of the country, particularly in those areas lacking in shelly beach sand which could be used for the same purpose. Since the south-west of the country possessed little limestone of its own, and had predominately acidic soils, most lime and the fuel coal was imported, from South Wales but also nearer to hand from Plymouth and Dorset along the south coast (Isham 2000). The construction of lime kilns often necessitated purpose-built quays or rock-cut landing places.

Before the 18th century, almost all salt used in England was produced by various methods of boiling brine, most derived directly or indirectly from seawater but some was supplemented by inland brine wells in Cheshire and around Droitwich, Worcs. The resulting coastal bias in salt production was enhanced from the medieval period by extensive use of salt for preserving fish for inland markets or for export. Coastal evidence for early salt production, dating back in Somerset to the Middle Bronze Age, comprises finds of coarse pottery (briquetage) from boiling vessels, trays and pedestals, often accompanied by hearth debris. By the later Iron Age and Roman periods this leaves some extensive surviving landscape features, notably the debris mounds known as 'red hills' beside present and former coastlines of Essex and Suffolk, but extensive Roman salt production has left similar debris along the south and south west coasts. Documented medieval coastal salt-making was widespread; field evidence from Cumbria and Lincolnshire includes saltworks boiling concentrated brine extracted from salt-encrusted silts, a process called 'sleeching', associated with extant mounds of waste and filter pits. From the late medieval period, coal-fuelled direct boiling of seawater dominated: associated coastal features include rock-cut cisterns, embanked 'saltpans' to trap quantities of seawater, especially along the Cumbria, Northumberland and Durham coasts using adjacent coal deposits, and workers' cottages. Mined Cheshire rock salt and cheap sea-salt imports from Brittany rendered most English coastal sea-salt production uneconomic in the 18th century except along the Hampshire coast: Portsmouth's naval victualling needs supported extensive salt-making on Lymington marshes until 1865: large embanked evaporation ponds survive there with traces of the salthouses. At Teesside, salt was refined from brine pumped from underground deposits from 1863 to 2002.

The chemical industry is a significant coastal industry, particularly in the north of England where it developed in relation to other industries from the late 18th century. In Alkali production was centred on Tyneside in the north-east, and on Merseyside and Deeside in the north-west. When mixed with fat, alkali was used to make soap, and the industry grew and developed with the introduction of industrial-scale cloth production. When mixed with lime and sand, alkali was used to make glass, and industrial-scale glass production became important industries on Tyneside and Merseyside. Chemical products like soap, dyes and bleach were increasingly in demand and the need for glass also encouraged the industry. Such works also produced soda, alum and Epsom salts. One of the biggest problems associated with the alkali works was pollution, mainly from emissions of hydrochloric acid fumes which devastated the neighbouring countryside. One solution was to build tall chimneys to drive the fumes further away, creating a visual impact which changed the character of the landscape and seascape of the area.

VALUES AND PERCEPTIONS

The processing industries generate a range of often contrasting views and perceptions. For some, they represent places of work or future employment where people can earn a living

or more broadly putting money into the local economy which will support the breadth of shops and other service infrastructure. Many people working in the industries or living in the towns where they are located, are also proud of the goods and products which these industries create, many of which are eagerly consumed by wider society.

Some processing plants, such as sewage works, are clearly essential public amenities, though few want them in their immediate neighbourhood for aesthetic, environmental and local character reasons. However, others may perceive the material presence of processing industries as more generally unattractive and a cause or risk of various forms of pollution, whether sensory, physical or both.

Conservationists often oppose the construction of reservoirs for their potential impact on local flora and fauna, however among the wider public, reservoirs can be highly valued for the space they offer for recreation, tourism and leisure activities, often providing water sport facilities for wind surfers, canoeists, water skiers, anglers and yachtsmen.

RESEARCH, AMENITY AND EDUCATION

The past and ongoing reliance of many processing industries on the coast and sea for their materials supply and products distribution networks have often been overlooked, yet this dependence has led to many traces of these industries now forming highly distinctive parts of the coastal landscape and seascape for much of the country.

As they make such a contribution to their areas' distinctiveness, some features in this Character Type, such as mills, salterns and limekilns, may well be appropriate for wider public presentation in local visitor and tourist information resources as foci for raising awareness about local character and its development to the present.

The amenity potential of coastally-situated reservoirs is also extensive for fishing and water sports as well as areas of natural beauty and wildlife havens.

CONDITION AND FORCES FOR CHANGE

The condition of coastal processing industrial remains varies considerably from almost total destruction to excellent preservation. Where modern processing plants become redundant, they are generally quickly cleared and re-presented as areas ripe for new development. Historic coastal remains from these industries are prime targets for public-awareness initiatives in the context of the forthcoming coastal access requirements from the Marine and Coastal Access Act 2009. This access will need care in its routing to avoid increasing visitor erosion on surviving features.

Former processing industrial sites are often classed as 'derelict land' if remains are still present or, if recently cleared as noted above, as 'development land'. In either case, it is usually subject to expanding housing and industrial developments, though liaison with the relevant heritage planning advisers is needed to conserve and/or record earlier features where they still survive.

RARITY AND VULNERABILITY

In terms of rarity, processing industries exist, of course, where their necessary resource supplies exists: for many such industries, that supply is ship-borne and their distribution is

therefore coastal. In some cases that distribution may be further skewed by proximity to the land-based resources most costly to transport or to the chief market which the industries supply, hence for example the concentrations of large complexes of processing industries along the Thames and Mersey estuaries near their markets in greater London and in the Merseyside and Manchester conurbations.

In terms of vulnerability, raising awareness of the roles and unique values of our coastal industrial processing remains in England can make them better understood as an integral part of the cultural legibility of their land and seascapes, a legibility which can be handed on to future generations.

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1.2.4 Character Type: Shipping industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Shipping Industry includes the following Sub-types:

- Boatyard
- Shipyard
- Commercial shipping route

This Character Type refers to areas dominated by activity relating directly to the non-recreational use, maintenance, storage and administration of shipping.

A 'Boatyard' is a place where boats are built and stored (<http://thesaurus.english-heritage.org.uk>).

A 'Shipyard' is a place where boats or ships are built or repaired (<http://thesaurus.english-heritage.org.uk>).

A 'Commercial shipping route' refers to a route regularly used by ships engaged in commerce or trade. This may be defined by usage or in some areas, formally defined by regulation. It may be distinguished from broader 'navigation routes' by its specific or overwhelming association with commercial shipping as opposed to naval, recreational or ferry traffic.

The shipping industry has a substantial direct socio-economic impact for today's society. Its impact as a trade facilitator across all sectors of the economy is huge but viewing the industry in more specific terms, recent statistics have shown that the shipbuilding and repair industry employs about 25,000 people (2004 statistics, Annual Business Inquiry (ABI) 2005). Strong competition from Eastern Europe and the Far East has made commercial shipbuilding a highly challenging market for European shipyards, and there are few remaining large English shipyards operating in the commercial sector.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- docks
- basins
- wrecks
- wharfs, quays, jetties and slipways
- warehouses, offices, depots and travelling cranes
- dockworkers cottages
- specifically associated transport systems (such as railways, roads, tramways)

Docks are places to load and unload goods and supplies as well as areas to undertake ship repair and maintenance. Wooden ships required frequent attention to the caulking between the planks. In the days before wire rigging, the heavy hemp rope needed regular adjustment and replacement. Dry docks are particularly suitable for ship repair as ships can be floated in on high tide and propped in position. When the tide falls, the dock gates are closed and the ship is left fully accessible and dry for work to be carried out. Constant wear and tear on wooden hulls meant a steady demand for dry dock facilities (White 2004: 96).

Evidence for prehistoric and early medieval vessels in England is sparse. This is primarily due to the perishable nature of the materials from which these vessels were constructed. It is believed that log boats (canoes made from hollowed out tree trunks) and hide boats were probably very common, and used during early periods as ferries, fishing boats, trading or war vessels (Friel 2003: 22; McGrail 2001). The remains of large Iron Age log boats have been found in Poole Harbour and at Hasholme, East Yorkshire. They continued to be used well into the medieval period and one from a tarn in West Yorkshire has been dated to the late 14th century (McGrail 2006, 32-4). Hide boats have probably been in use from the at least the Bronze Age but due to their nature survival is rare. There is documentary evidence of their use in the seas of North West Europe from writers of the Classical period onwards and a gold model boat of the 1st century BC from Broughter Ireland is thought to represent one of these craft (McGrail 2006, 30-2). Their use continued, particularly in the western

parts of the British Isles, well into the medieval period and they are still being built and used in Wales and Ireland to the present day.

Although ships and boats made from wooden planks have a better survival rate than log or hide boats, few early medieval examples have been found in England. Important examples of early plank-built vessels include the Dover Bronze Age boat dated to c. 1300 BC. It was found in freshwater sediments with associated peat layers about 30m from the course of the modern River Dour. A long sequence of channel-narrowing puts the original context of the Bronze Age boat in a riverside location, with direct access to the sea. This indicates some use of the area as a refuge or landing place for that period (for further details see Clark 2004). Other plank-built Bronze Age boats include those found in the Humber such as Brigg and Ferriby.

One of the most famous examples of an early medieval boat is the Sutton Hoo ship, the ghost traces of which were discovered in an Anglo-Saxon burial mound near Woodbridge (Suffolk) (Friel 2003: 24). Other medieval ships include the Magor Pill and Newport ships from Wales but English examples are rare.

The location of shipbuilding sites seems to have been rather haphazard in England's medieval landscape. The sites themselves were rudimentary, although ships were being built in simple docks from at least the 1330s (Friel 2003). Accounts from between the late 13th and early 15th centuries state that shipbuilding was still based on clinker construction (Friel 2003; McGrail 1998; 2001).

Changes in European shipping during the 15th century were influenced by the skeleton-built Portuguese caravels. Skeleton construction involved nailing hull planks to a pre-erected skeleton of strong frames; the planks did not overlap, but were laid against each other, giving the hull a smooth exterior (Friel 2003; McGrail 1998, 2001). Other 15th century shipping changes included the introduction of two- and three-masted ships and a decline in the number of large ships. The latter may have been due to changes in the demand for goods being transported. Merchant ships of more than 100 tons were uncommon in England until the late 16th century, when they were constructed for long-distance bulk trade and war (Friel 2003; McGrail 1998, 2001).

The rapid development of the shipping industry and trade in the middle decades of the 18th century was linked to increased competition among the expanding European powers as well as processes such as capitalism and colonialism (see Davis 1962; Dellino-Musgrave 2006; Staniforth 2003). The English shipping industry underwent a particularly rapid development following the Seven Years War against France (1756-63), and the rate of English naval construction rapidly increased (see Parry 1971: 113-129). Before that war, French warships were considered to be better designed and faster than the English ships (see Lavery 1983; Parry 1971: 119). Subsequently, the English shipping industry promptly flourished since they based their ship designs on those of the French, the English becoming a maritime power from the end of the 18th century onwards. By contrast, after the declaration of the Seven Years War, the French shipping industry remained steady, and after some time, declined.

During the mid 19th century, technological and economic progress gained momentum with England as a world leader in the development of steam-powered ships and railways, and later the internal combustion engine and electrical power generation. , England became one of the leading industrial powers of the 19th century, due in no small part to the strength of

its shipping industry (Hedges 1989, 5). During this period, steamships gradually replaced sailing ships for commercial shipping. Many new demands on rapid freight transport were made which could be more easily met by steam-powered vessels, especially from the 1840s when iron hulls and the screw propeller were introduced (Hobsbawm 1999; Pearsall 1985).

In the 1900s, the internal combustion engine and gas turbine replaced the steam engine in most ship applications. Trans-oceanic travel, transatlantic and transpacific, was a particularly important application, with steam powered ocean liners replacing sailing ships, culminating in the 'Superliners' such as those of the White Star Line, including the unfortunate *RMS Titanic*.

The impact of U-boats (military submarines) operated by Germany during the two World Wars underlined the importance of shipping to England's economic sustainability. In practice, U-boats were most effectively used in an economic-warfare role, enforcing a naval blockade against enemy (in this case, British) shipping. Remains of several U-boats are present in English waters, in particular on the east coast.

Although the historic importance of sea travel for passengers considerably decreased during the 20th century due to the development of road transport and especially aviation, it is still very effective for short trips and pleasure cruises. Sea transport remains the largest carrier of freight in the world, most of it international rather than between domestic ports.

VALUES AND PERCEPTIONS

Historically, the development of new technologies in shipbuilding has been perceived as a means of increasing the speed, efficiency and volume of links with distant regions, places and people.

Shipbuilding has inspired many artists and writers but beyond that, the imprints that the shipbuilding industry has left on today's landscape are widely and often proudly accepted and valued as reflecting their areas' part in England's long maritime heritage.

Today, the shipping industry is commonly perceived as a means for leisure and recreation, with many overlooking its still-vital role in facilitating the country's trade. Shipping can also be perceived as an expanding global business, offering the opportunity for commercially competitive shipping industries to share in this growth providing significant inward investment opportunities and, principally, wider economic benefits in England.

RESEARCH, AMENITY AND EDUCATION

Shipbuilding traditions have recently been explored as a social product (Adams 2003, forthcoming), helping to contextualise shipbuilding within its much broader societal roles at national and regional levels.

This Character Type contains a strong amenity value linked to recreational and leisure activities such as cruises and sailing. Related amenity and educational values can be seen through the wide range of museums and historic shipyards (e.g. Portsmouth Historic Shipyard and the National Maritime Museums at Greenwich and Falmouth). In addition the study of shipbuilding, associated infrastructure and wreck sites offers a wealth of cross-curricular opportunities incorporating science, maths, English, history and environmental studies.

CONDITION AND FORCES FOR CHANGE

The shipbuilding industry in England is widely expressed through its components such as docks; basins; wrecks; wharfs, quays, jetties and slipways; warehouses, offices, depots and travelling cranes; dockworkers' cottages; and specifically associated transport systems (such as railways, roads, tramways). At some locations, these components have now been transformed into marinas or commercial centres, Albert Dock (Liverpool) being an example (<http://www.albertdock.com/>).

The impact of this Character Type has been mainly economic, providing employment, income resources and providing transport for the necessary import/export needs of manufacturing industry in England.

RARITY AND VULNERABILITY

This Character Type is strongly linked to the economic vitality major ports such as London, Liverpool, Southampton and Felixstowe. Its impact is seen on the links to international trade and the British Empire with many British ships having sunk overseas.

Once redundant, former shipbuilding areas form prime development land open transformation to marinas, commercial centres or even mixed use retail and residential areas.

Today, the shipping industry could be seen as an expanding global business and the opportunity for commercially competitive shipping industries. This potential growth offers significant inward investment opportunities as well as wider economic benefits in England. Commercial shipping routes may be subject to change as many of England's east coast harbours are being extensively developed. The largest of these is the London Gateway project but there is also development underway or planned at Felixstowe, Harwich and Great Yarmouth.

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1.3 BROAD CHARACTER: FISHING

1.3.1 Character Type: Fishing

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Fishing includes the following Sub-types:

- Bait digging
- Bottom trawling
- Shellfish collection
- Fixed netting
- Hand netting
- Longlining
- Seine netting
- Drift netting
- Pelagic trawling
- Demersal trawling
- Fishing ground
- Potting
- Shellfish dredging
- Fish market
- Fish warehousing
- Fish trapping

The 'Fishing' Character Type refers to areas of the sea, estuaries and rivers whose character is dominated by activities concerned with the capture or gathering of wild fish and unfarmed shellfish stocks by various methods such as trawling, netting, trapping, potting, dredging and collection by hand. This includes directly associated landing, marketing, processing and distribution facilities.

Bait digging refers to areas whose character is dominated by regular digging to acquire bait for fishing by various methods. Generally found in estuaries, sandy and rocky foreshores.

Bottom trawling refers to commercial fishing involving trawling the lowest levels of the water column and/or the surface of the sea floor, the demersal and benthic zones

respectively. These methods often result in disturbance to the sea floor itself. The most widely used methods are otter trawling and beam trawling.

Otter Trawling uses funnel-shaped trawl nets, with sides extended forward to form wings to guide fish into the funnel. The net is held open horizontally as it moves through the sea by wooden or steel 'otter boards' while floats raise open the upper edge of the net mouth. Weights distributed along the lower edge (ground rope) ensure good contact with the sea-floor and disturb the fish into position for catching in the net.

Beam-trawling uses a rigid beam of wood or metal across the net mouth. At each end of the beam are steel plates called beam-heads fitted with stirrup-shaped shoes that keep the beam slightly raised from the sea-floor and hold open the net mouth. The net funnels out behind the beam, with chains arranged in front of its lower edge to disturb the sea floor. When the trawl is in motion, the disturbed fish are caught in the net as it passes. This fishing method is widely used by fishermen for catching 'flat fish' species, however the method has also been accused of causing major ecological damage from sea-floor habitat disturbance and its indiscriminate by-catch.

Shellfish collection refers to an area of regular commercial collection by hand or hand-held tools, of naturally-occurring shellfish stocks for food, bait (if dug for bait, the 'Bait digging' Sub-character Type will be more appropriate) or other products. This does not include the collection of farmed shellfish from artificial structures, for which 'Shellfish farming' under 'Aquaculture' is more appropriate.

Fixed netting refers to areas of commercial fishing by fixed net methods, sometimes also termed set netting, which cover several detailed netting methods using gill nets, tangle nets or trammel nets. It refers to netting held stationary rather than being towed by a vessel or allowed to drift in the current. The nets hang vertically in the water column, generally in the range 50-200m long and are used singly or as a series joined end to end. Floats are attached to a headline and they are usually anchored by lead weights along a footrope but in shallow water they may be fixed to posts or other suitable objects driven into the seabed. The footrope is designed to rest on or just above the seabed. Fish are caught either by gilling or entanglement. Fixed netting is largely confined to inshore areas.

Hand netting refers to areas of fishing using hand-held nets worked by an individual fisherman. Regional variations include haaf netting on the Solway and Lune estuaries, lave netting on the Severn, and dip netting on the Parrett. All consist of a rectangular frame from which a net is suspended. A haaf net has a middle leg which extends for carrying the frame (beam) and to tip it to trap fish; a lave net consists of a hand-staff which is held in one hand and a headboard with the other, whilst the fingers are entwined in the bottom of the mesh feeling for the fish. The haaf net is positioned in front of the fisherman, to face the run of the water. The most common method is to stand in shallow estuary waters during the ebb tide. The fisherman faces the outgoing tide holding the net to catch salmon. Haaf-netters sometimes fish in a line, in small numbers or alone depending on the ground. Includes local variants such as 'Flood Beam' or 'Marsh Haaf'. The lave net is used at low spring tides in flat and calm conditions. Dip nets, larger versions of the child's rock-pool net, are used around the Severn Estuary and on the River Parrett, to catch elvers (young eels).

Longlining refers to commercial fishing using long-line methods. Longlining involves setting out in the water column a fishing line, often several kilometres long, from which shorter lines called snoods are spaced at intervals and carry baited hooks. The lines may be set

vertically or horizontally, with an anchor and marker buoy at each end, at various levels in the water column depending on whether the target species are demersal or pelagic. The size and types of fish caught are also determined by the hook size and the type of bait used. Longline fishing in the UK is typically engaged in by small inshore vessels, 10m or less, generally operating on grounds near their home port.

Seine netting refers to commercial fishing using seine nets. A seine net is a long net that hangs in the water column with floats along the upper edge and weights along the bottom. The ends of the net can be drawn together to encircle and herd a school of fish, and then hauled in, usually by a fishing vessel in modern commercial fisheries but, historically in shallow inshore waters, by hand too. Two main types of seine nets are in use: purse seines and Danish seines. Purse seines have a drawstring running through rings along the lower edge, which closes the floor of the net to prevent the fish from escaping as it is hauled in. Danish seines use a conical net anchored to the sea floor at one end; wires attached to wings at the other end are towed around a shoal by a vessel, herding the fish into the net for hauling in.

Drift netting refers to areas of commercial fishing using large nets that drift in the water, moved by currents and lacking any fixtures to keep them in place. These are generally used for pelagic or migratory species. Drift nets are rigged in a straight line to form a curtain in the water. Fish swim into the net and are trapped there by their gills.

Pelagic trawling refers to commercial fishing involving trawling midwater levels of the water column, targeting the pelagic fish species, most commonly mackerel, herring or sprats in the UK. Large funnel shaped nets, held open at the mouth by floats and weights, are towed by one or two (pair-trawling) vessels. Net size varies considerably, up to 240m wide, as does the size of vessel operating such fisheries, which may be inshore or offshore.

Demersal trawling is a generalised term referring to the act of catching flat fish species that mainly live on or near the seabed through fishing methods that involve trawling the bottom of the sea and often results in the disturbance of the sea floor itself.

Fishing ground refers to an area regularly exploited for commercial fish and/or shellfish extraction, but within which the locations of actual fishing activity at any given time may vary, seasonally and over other temporal cycles according to the behaviour of the target species concerned and regulations governing their exploitation. Consequently the definition of fishing grounds will depend on several factors: the distribution and behaviour of the commercial fish species, fishery regulation at regional, national and international levels, and custom and tradition within the fishery concerned.

Potting refers to areas characterised by commercial fishing using pots and creels. Pots and creels are small portable traps set on the sea floor in coastal waters to catch a variety of crustacea and molluscs such as lobsters, crabs, cuttlefish, crayfish and shrimps. When baited, they are set on the sea floor singly or in lines with marker buoys at each end. There are many designs reflecting both target species and local tradition. Traditionally made from basketry but now usually of cord mesh over a metal and wooden frame, they generally have one or more funnel-shaped entrances allowing the prey species to enter but not leave. Potting grounds are rarely more than a mile offshore and in most parts of the country occur in areas of rocky sea-floor.

Shellfish dredging refers to areas characterised by the regular commercial collection of naturally-occurring shellfish stocks for food, bait or other products using a dredge towed behind a fishing vessel. In UK waters the target is usually scallops. Scallop dredges consist of a ruggedly constructed triangular steel frame and tooth-bearing bar, behind which a mat of linked steel rings is secured. A heavy netting cover joins the sides and back of this mat to form the bag in which the catch is retained. Scallops, which usually lie in sand or fine gravel, are raked out by the teeth and swept into the bag.

A fish market is a market where fish is sold (<http://thesaurus.english-heritage.org.uk>). This includes closely and functionally associated open areas, built structures, wharves, quays and distribution facilities.

Fish warehousing refers to an area characterised by buildings used specifically for the storage of fish or fish products. Such storage may relate to several aspects of the fishing industry, for example the storage of fish after landing and before auction or sale, or the cold storage of fish after sale. It includes closely and functionally associated transport and distribution facilities.

Fish trapping refers to areas characterised by the use of fish traps for the capture of naturally occurring fish stocks. Fish traps are permanent or semi-permanent structures, built or placed in rivers (freshwater or estuarine) or tidal areas and designed to catch fish as they move along in river currents or down the shore on the ebbing tide. Fish traps include stone, timber, basketry or framed-net structures, sometimes covering extensive areas with their funnel-shaped plans, concentrating trapped fish towards a collection point; in other cases, smaller structures are sited in strategic position along rivers or tidal channels, again designed to ensnare fish travelling along them. This Sub-type does not include temporary portable pots and creels which are repeatedly lifted and re-set at sea: the 'Potting' Sub-character Type covers areas dominated by that method.

The character of fishing in the open sea is similar to that of hunting and gathering in that it exploits its prey resources over extensive territories across which the areas of actual fishing activity will move, seasonally and over other temporal cycles according to the behaviour of the prey species concerned. Those territories: the fishing grounds, and the fishing methods which dominate within them, are defined and can be mapped according to several factors: the distribution and behaviour of commercial prey species, fishery regulation at regional, national and international levels, and by custom and tradition.

Fishing methods also vary considerably in their impact on marine and estuarine biodiversity and on the physical environment of the areas in which they operate producing, for example, clear differences between the ecological and physical imprints of pelagic trawling and those of bottom trawling.

Following implementation of the Marine and Coastal Access Act 2009, the Marine Management Organisation (MMO) controls sea fishing in seas around England. Its responsibilities include enforcement of sea fisheries legislation, licensing of UK commercial fishing vessels, sampling of fish catches, management of UK fisheries quotas, an advisory role and general liaison with the fishing industry.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Fishing is an ancient practice and has been an integral part of human activity since at least the Palaeolithic (c. 40,000 years ago). Historic features such as shell middens, discarded

fish bones and cave paintings show that sea foods were important for survival and consumed in significant quantities. During this period, people lived a hunter-gatherer lifestyle and were, of necessity, nomadic (i.e. constantly on the move), though this would not preclude a regular cycle of repeated visits to favourable locations across an extensive territory. The coastal zone is an especially rich resource for the hunter-gatherer lifestyle and, due to post-glacial sea level rise, several early sites are now submerged (see Fischer 2004).

Since the end of the last glacial period c13,000 BP, many cultures around the world made the transition from nomadic hunter-gatherers to more sedentary farmers. With the new technologies of farming and pottery came basic forms of all the main fishing methods that are still used today (http://en.wikipedia.org/wiki/History_of_fishing).

One of the world's longest trading histories is the trade of dry cod, which commenced at least during the Viking period and probably earlier, and has therefore been practised for well over than 1000 years.

Fishing became a major industry in the medieval period in areas such as East Anglia, where the herring fishery was key and already established by the time of Domesday. This industry continued into the 20th century, despite several periods of decline. The industry was based on small, localised fleets often launching off the beach. The medieval period also saw the further development by the English of the Icelandic cod industry following the Anglo-Danish Treaty of 1490 which eased restrictions on fishing in Icelandic waters.

Many of the English fisheries were in decline by the early 17th century as a result of competition from foreign vessels, especially the Dutch herring fleets. Foreigners were prohibited from fishing in all the fisheries off the coasts of England, unless they bought licences: the seas were no longer 'free' (Starkey *et al* 2003).

In the mid 18th century, trawling in English waters was mainly confined to stretches off the south west and south east coasts. Devon sailing trawlers worked out of Brixham and Plymouth, while Barking was the centre for craft trawling in the Thames approaches (Starkey *et al* 2003). The widespread introduction of bottom and beam trawling had a revolutionary impact on the fishing industry in England as a whole and Brixham's refined and improved trawlers became famous, influencing timber-built trawler design for fishing fleets across the world at that time. By the last quarter of the 19th century the most dynamic sector of the English fisheries was trawling in the North Sea.

At the beginning of the 1900s, gas powered boats were beginning to make an appearance, and by the 1930s, the row-sail boat had virtually disappeared. In the 1930s, the drum was created, allowing nets to be drawn in faster. Along with the faster gas powered boats, fishermen were able to fish in areas they had previously been unable to go into, thereby revolutionising the fishing industry.

During World War Two, navigation and communication devices, as well as many other forms of maritime equipment (e.g. depth-sounding and radar) were improved and made more compact. These devices became more accessible to the average fisherman, thus increasing their range.

During the 1960s, the introduction of fine synthetic fibres (e.g. nylon) in the construction of fishing gear marked an expansion in the commercial use of gillnets. The new materials were cheaper and easier to handle, lasted longer and required less maintenance than natural fibres. Nylon is highly resistant to abrasion; hence the netting has the potential to last for many years. This 'ghost fishing' is of environmental concern, however it is difficult to generalise about the longevity of ghost-fishing gillnets due to the varying environments in which they are used.

Historically, a huge diversity of fish species has populated the northern seas but fishing activity has tended to focus only on a limited part of that range, with two species in particular, cod and herring, being heavily exploited in North West Europe. Today, the North Sea is one of the world's most important fishing grounds. Major UK and international fishing fleets operate in the southern, central and northern North Sea, holding over 150 species of fish, 15-20 of which are of commercial value.. One of the most characteristic fisheries in the North Sea is the mixed demersal fishery that targets cod, haddock and whiting in the central and northern parts of the region (see CEFAS 2001).

VALUES AND PERCEPTIONS

Modern fisheries are increasingly coming to the attention of the wider general public with a growing concerns over falling fish stocks and unsustainable fishing practices. Modern perceptions of fishing are often related to the destruction of fish stocks and damage to the seabed and marine biodiversity in general. However, fishing still has a deeply engrained and traditional economic role for many coastal communities in England, even if its actual practice in now much diminished. It is greatly valued for the distinctiveness it affords such areas by both local communities and visitors alike, and for some it remains an important element in the local economy.

RESEARCH, AMENITY AND EDUCATION

There is considerable potential for further research into the history of fishing, in particular its early development and the various catching, storing and processing techniques employed. Such research has much potential to inform strategies for sustainable fisheries and the marketing of their products, utilising the historic character and the distinctiveness of place attaching to such fisheries to complement the identification of patterns, trends and materials used. Much potential for socio-economic research on the fishing industry past and present also exists: for the present and future, the ability to conduct such research effectively will rest on the collection and availability of more detailed data than hitherto on methods used, days at sea, crew numbers, catch and by-catch species and quantities. Archaeological finds associated with wrecks, inshore fishing and coastal potting areas will further inform a fuller understanding of the character and history of this industry.

CONDITION AND FORCES FOR CHANGE

One of the main forces for change regarding this Character Type relates to sustainability issues. In general, there is more knowledge about the fishing practice rather than the location of specific areas of activity. Some fishing practices will impact on the historic character of an area more than others. For example, trawling methods have a more intrusive impact on the seascape than pelagic netting and long-lining methods. The material evidence left by trawling activities includes trawl scars on the seabed itself.

The condition and drivers for change affecting historical aspects of the character of an area include, for example, pressures from the tourist industry on historic fishing settlements including developments such as hotels, marinas, caravan parks, and their associated roads and services. Economic and environmental pressures on the present fishing industry addressing issues of sustainability also need to be taken into account.

To date the impact of fishing activity on historic features has received relatively little study and has not been fully quantified. However, fishing has had large-scale character impacts on coastal settlement patterns and forms across the country, strongly influencing their embedded historic character in ways that their local communities and visitors value highly.

RARITY AND VULNERABILITY

Traditional fishing practices such as long-lining have been declining since the advent of more intensive trawling. Generally, fisheries are in a period of retrenchment and quotas. Restrictions on fishing grounds are impacting on the scale, range and economic sustainability of the present industry.

Continued control over exploitation of fish stocks is necessary to enable their sustainable management, with European Union (EU) and UK reforms and measures progressing towards that end. This has considerable implications for the people whose livelihoods depend on marine food resources and on the character of places that accommodate those livelihoods. Regulation aimed at the sustainable harvesting and greater conservation of wild fish stocks may well alter the future balance between fishing and aquaculture in providing fish and shellfish protein, and the methods and species used in aquaculture.

Understanding historic fishing practices and their effects on the fishing resource may contribute to the long-term sustainability of sea fisheries. Consumer pressure might also encourage more sustainable fishing practices and give greater market value to fish caught using what are perceived as locally distinctive and 'traditional' methods, especially if their sustainability can be added to the marketing equation.

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1.3.2 Character Type: Aquaculture

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Aquaculture includes the following Sub-Character Types:

- Fish farming
- Shellfish farming

The 'Aquaculture' Character Type relates to the commercial cultivation of fish and shellfish populations under controlled conditions which are often, but not always or wholly, enclosed from wild stocks. It includes the raising of saltwater and/or freshwater species and may occur in locations inland, in rivers (freshwater or estuarine), tidal areas or in fully marine situations. Under 'Aquaculture', the main Sub-types, 'Fish farming' and 'Shellfish farming' generally involve different methods, locations and material features.

Fish farming refers to areas characterised by the commercial cultivation of fish populations under controlled conditions. Fish farms may be sited inland or coastally located artificial ponds, or in rivers, estuaries or the open sea, and they may be enclosed to varying degrees from wild fish stocks in tanks, cages or nets. The Sub-type includes closely and functionally associated management, storage and distribution facilities.

Shellfish farming refers to areas characterised by the commercial cultivation of shellfish populations under controlled conditions which are sometimes, but not always, enclosed from wild stocks. Shellfish farming includes oyster beds, mussel beds and cockle beds, which are 'seeded' and managed over several seasons until they are big enough to harvest. Structures used at such farms to provide additional surface area for shellfish attachment include arrays of trestles, racks and poles. The Sub-type includes closely and functionally associated management, storage and distribution facilities.

The commercial cultivation of fish and shellfish populations under controlled conditions (cockles in particular) is popular to supply a broad range of cooking traditions now popular in England. Cockles still collected, as they have been since time immemorial, by raking them from the sands at low tide. Many of the cockles sold in England are from the Thames estuary. In some parts of England, cockles are sold freshly-cooked as a snack (e.g. Essex).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Shellfish farms
- Fish farms
- Oyster beds
- Fish quays and wharfs

The exploitation of oysters has a long history in England. Prehistoric shell middens containing oysters are known around the country, the oysters collected with other shellfish by groups of hunter gatherers exploiting the rich coastal resources. Gathering oysters was probably quite common in coastal areas at this early period but prehistoric evidence of oyster 'farming' is lacking and the evidence for oyster consumption is limited to shell midden contents, such as those dating to the Mesolithic period at West Voe, Shetland (Melton and Nicholson 2004). They were probably a subsistence food. Coastal areas would have been the most productive in Mesolithic England due to their relative abundance of food, which would almost certainly have included oysters (Hunter and Ralston 1999). Historical reference to the exploitation of existing natural oyster beds in England occurs during the Roman occupation (Eyton 1858). Oyster shells have been found in many of the English Roman villas, including Fishbourne and Barton Court Farm (Potter and Johns 1992). Oyster beds on the Kentish Flats that have been used since Roman times and the town of Whitstable (Kent) is still particularly noted for its oyster farming. By the 18th century, oyster fishery was certainly flourishing in England (Whitfield 2005).

Physical remains of oyster beds are notoriously difficult to date, although it is likely that most archaeologically recorded English examples are medieval or post medieval (Hegarty and Newsome 2005, 86). A peak in oyster consumption was observed in the mid 19th century when oysters were a common food for the poor.

Fish farming as a distinctly maritime-related activity relevant to HSC is relatively limited in extent nationally. For example there are currently an estimated 55 aquaculture businesses in south west England, but most of these are freshwater fish farms. Parts of Langstone and Chichester Harbours which are designated as a sea bass nursery area and important spawning ground for demersal fish (Hampshire County Council, 2010).

VALUES AND PERCEPTIONS

Modern aquaculture is increasingly coming to the attention of the wider general public in various ways. For some, fish farming is seen as a potential answer to unsustainable fishing of the wild resource, while for others there are significant outweighing concerns over man's ability to control chemical and nutrient pollution from fish farms and the potential for genetic mixing of farmed fish with wild stocks.

However the shellfish-farming side of aquaculture is recognised as having a very long tradition in some areas and that form of aquaculture is still deeply engrained in the perceptions and economy of many communities, as in the case of Whitstable oysters noted above. As such, it is valued for the distinctiveness it affords these areas and as an important element in the local economy.

RESEARCH, AMENITY AND EDUCATION

Overall, the lack of systematic investigation into the archaeology of coastal shellfish fisheries has been identified in the past as a serious omission and a weakness in archaeology (Fulford *et al* 1997). This is being addressed to some extent by the Rapid Coastal Zone Assessment Surveys (RCZAS) and the National Mapping Programme (NMP) which have begun to identify such features. There is considerable potential for further research into the history of aquaculture, in particular its early development and the various techniques employed from catching to processing.

Further research, being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

From an educational perspective, issues of over-exploitation of fish stocks are helping raise public awareness of sustainability issues surrounding this Character Type.

How we meet society's demands for protein and in particular from fish and shellfish resources, couple with the practicalities, logistics and issues associated with the different types of aquaculture and its conflicts and compromises with estuarine and marine conservation and development, provides an interesting cross-curricular educational case study.

Paintings and historic photographs relating to this Character Type also have a valuable role to play both in research and in producing attractive educational resources to raise public awareness about the history and development of aquaculture.

CONDITION AND FORCES FOR CHANGE

Shellfish remains a popular foodstuff And much shellfish collection is still undertaken utilising traditional methods (i.e. by hand) and/or by being sucked up by a machine similar to a large vacuum cleaner, the latter having a more intrusive impact on the seascape. However pressures on the naturally occurring resource may produce an increase in more controlled shellfish farming to meet demand. Recent research has shown that global warming is likely to uncouple and alter the phase relationship between temperature and photoperiod (the period of time per day that an organism is exposed to daylight) and this is likely to have significant consequences for the reproduction of shellfish. Although this is unlikely to lead to extinction, it may cause species to disappear completely from particular areas. However, this will depend on speed of adaptation in relation to climate change and the degree of mixing between populations across the range of species (Lawrence and Soame 2004).

Other economic and environmental pressures on the present fishing and aquaculture industry addressing issues of sustainability also need to be taken into account. Although it concerned naturally occurring shellfish resources, health and safety aspects of the shellfish industry came to the fore after over 20 Chinese cockle-pickers were drowned in Morecambe Bay on 2004. Shellfish farming is also vulnerable to economic pressures on its export trade from increasing continental shellfish stocks and poor export prices. Fish farming also raises environmental concerns over abilities to control pollution from nutrients and disease-control chemicals from fish farms and the potential for genetic mixing between farmed fish and wild stocks.

Aquaculture has had large-scale character impacts on coastal and estuarine settlement patterns and forms as well as presenting visible material remains on the foreshores and estuaries of some areas. It provides a strong and thriving aspect of the locally distinctive historic character of such places.

The industry is also set to undergo regulatory change as, under the Marine and Coastal Access Act 2009, the Sea Fisheries Committees are replaced by Inshore Fishery Conservation Authorities (IFCAs), with a differing membership and differing objectives.

RARITY AND VULNERABILITY

Traditional and long-established shellfish farming methods (i.e. by hand) and/or by the use of a suction machine are still being used today.

Continued control over exploitation of fish stocks is necessary to enable their sustainability, with European Union (EU) reforms and measures progressing towards that end. This has implications for the people whose livelihoods depend on marine food resources and on the character of places that accommodate those livelihoods. Regulation aimed at the sustainable harvesting and greater conservation of wild fish stocks may well alter the future balance between fishing and aquaculture in providing fish and shellfish protein, and the methods and species used in aquaculture. Understanding historic aquaculture practices and their long-term sustainability may offer a valuable inputs to these future trends.

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1.4 BROAD CHARACTER: PORTS AND DOCKS

1.4.1 Character Type: Ports and docks

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Port, Docks and Harbours includes the following Sub-types:

- Dockyard (Civil)
- Wet dock
- Harbour
- Landing point
- Working pier
- Port
- Quay
- Breakwater
- Terminal building
- Warehousing

This Character Type relates to areas dominated by the functioning of ports and docks, together with their harbours and directly port-related industry, features and imprints.

A 'Civil dockyard' is an area, often enclosed, in which ships used primarily for non-military activities are built and repaired, and where ships' stores are brought together (<http://thesaurus.english-heritage.org.uk>).

A 'Wet dock' is a built structure or group of structures enclosing an area of water which was impounded by lock gates to maintain water levels artificially, facilitating the loading, unloading, building or repair of ships.

Harbour is an area on the coast where ships can find shelter or safe anchorage. Harbours require features that provide shelter and a pool area large and deep enough to accommodate vessels at anchor. The necessary shelter and pool may be provided by unmodified topographic features or by artificial walls and breakwaters, while pools may have floors and access channels deepened by dredging. Where the dominant character of a harbour area's activity is governed by dedicated harbour-navigation administrative controls, the harbour may have been assessed as a 'Harbour pool' discussed in the 'Navigation' Character Type text.

A 'Landing point' is a place where vessels can land passengers and goods (<http://thesaurus.english-heritage.org.uk>).

A 'Working pier' is a raised platform, generally of iron or wood, supported on spaced pillars or props and projecting out into the sea and designed to facilitate the transfer of cargo and/or passengers on and off shipping. They vary considerably in size and complexity, providing raised access over the sea from the shore to an adjacent position near or below MLW. Working piers incorporate landing points for shipping at their end and/or along their sides. They are distinguished from 'pleasure piers', whose function is primarily recreational and which are discussed in the 'Recreation' Broad Type and Character Type.

A 'port' is a settlement area that combines a harbour and terminal facilities at the interface between land and water transportation systems (<http://thesaurus.english-heritage.org.uk>).

A 'quay' is an artificial bank or landing place, largely of solid construction, built parallel to, or projecting out from, the shoreline to facilitate the loading and unloading of vessels (<http://thesaurus.english-heritage.org.uk>).

A 'breakwater' is a structure which protects a beach or harbour by breaking the force of the waves (<http://thesaurus.english-heritage.org.uk>). Breakwaters may be constructed entirely offshore at a strategic location or with one end attached to land. Commonly associated with ports and navigable river mouths, breakwaters often have subsidiary roles in helping keep harbours and river mouths free from silts and in carrying maritime safety structures, not least to warn of the presence of the breakwater itself.

A 'terminal building' is a building within a transport terminal, often associated with the registration and clearing of incoming and outgoing passengers or freight (<http://thesaurus.english-heritage.org.uk>).

'Warehousing' refers to an area, forming an integral part of a port, dock or harbour, which is characterised by buildings used for the storage of goods or merchandise (<http://thesaurus.english-heritage.org.uk>). Warehousing areas known to have been specifically associated with the fishing industry are discussed under 'Fish warehousing' in the 'Fishing' Character Type text. Warehousing located outside recognised port, harbour and dock areas and lacking any clear distinctive maritime character is not covered by HSC: it forms an aspect of relevance to HLC instead.

Port areas involve artificial coastal or riverine facilities where boats and ships can load and unload. Ports often have cargo-handling equipment such as cranes and forklifts for loading and unloading of ships. Often, ports may have warehouses for storage of goods and a transport system for transporting goods inland (e.g. railway, road transport or pipeline transport facilities). Harbour pilots, barges and tugboats are frequently used to manoeuvre

large ships in tight quarters as they approach and leave ports (<http://en.wikipedia.org/wiki/Port>). The presence of deep water in channels or berths, the provision of protection from the wind, waves and storm surges and access to intermodal transportation such as trains or trucks are critical to the functioning of ports.

Ports form the interface between land and marine transport and distribution systems. In that role they perform a range of functions: to receive ships; to transfer and accommodate cargo and people moving to and from ships; to provide a coastal distribution hub for various scales of hinterland; to provide dockyard maintenance and repair facilities, again at various scales, and to offer shelter from storms. Associated features include the necessary structures to ensure safe approach, entry to and landing at the port, such as breakwaters, harbours, quays, wharves. Harbour pilots, barges and tugboats are commonly used to manoeuvre large ships in tight quarters as they approach and leave ports. Many ports have maintained deep water channels and berths: many of the aspects covered by the 'Navigation' Character Type are closely associated with ports. Ship maintenance, supply and repair facilities may be small in scale or enlarged to form enclosed dockyards. Transfer and reception of goods and passengers includes terminal facilities and closely associated car parks; in some cases also customs and immigration facilities. Ports usually include areas of hotel accommodation for passengers in transit and housing for workers servicing the port. Loading and unloading of goods requires storage and transfer areas: now often involving container storage and 'big sheds', but historically too, warehousing grouped around or behind the quays. Processing and manufacturing facilities from various industries are often located very close by, while some ports have specialist areas for landing and distributing fish, with characteristics relating to the 'Fishing' Broad Character Type. From their role as coastal distribution hubs, many ports also have extensive areas devoted to road and rail transport linking with their landward catchment and hinterland: sometimes a national one for the bigger ports.

Ports do not have an assured lifespan and may become redundant for many reasons. Rye (East Sussex) was an important English port in the medieval period, but sediment accretion and land reclamation have considerably altered the coastline and it is now 2 miles (3.2 km) from the sea. London, on the River Thames, and Manchester, at the head of the Manchester Ship Canal, were once important international ports, but changes in shipping and cargo-handling methods, notably the use of containers and larger ships, put them at a disadvantage (<http://en.wikipedia.org/wiki/Port>) to expanded and new container ports at Felixstowe, Suffolk and, under construction from 2010, the London Gateway complex on the Essex coast of the Thames Estuary.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- landing stages, wharfs, jetties, pontoons, slipways, terminals;
- port administration and regulation areas;
- slipways with cranes or ramps.
- cargo-handling equipment, storage facilities;
- custom areas, quarantine areas;
- pilot stations, small craft facilities;
- wrecks;
- lighthouses, batteries;
- specifically associated transport systems (such as railways, roads, tramways).

Whilst seaborne traffic has been a strong element in British prehistory since the Neolithic period, it is only in the Iron Age that there is clear archaeological evidence for a port. Prior to this ships and boats are likely to have been dragged up onto sheltered beaches and mudflats, with any evidence from that likely to be in the form of coastal settlements and intertidal artefact concentrations. Mount Batten, a sheltered promontory in Plymouth Sound shows a sudden growth in metalworking and evidence for trade with west Cornwall, Dorset, and Brittany from the 8th century BC (Cunliffe 1988). Evidence for more permanent port facilities appear at Poole Harbour in the late 3rd century BC and at Hengistbury Head in the early 1st century BC in the form of jetties and a gravel hard adjacent to an inlet respectively (Parfitt 2004, 100).

During the Roman occupation, Poole Harbour continued to be a major civilian port and others were established or continued at Colchester, London, Rochester, Chichester, Bitterne (Southampton), Exeter and Gloucester (Mason 2003, 116). Military ports may also have been used by civilian traffic. These would all have had quays and jetties, warehouses, and administrative buildings.

Smaller native settlements with less infrastructure will have existed around the coast. An example of one of these may be represented by Lellizzick, near Padstow on Cornwall's Camel Estuary, where up to 70 circular structures representing a multi-phase settlement spanning the Roman and Post-Roman periods shows evidence of trade with continental Europe throughout its lifetime. Boats would have been drawn up onto the sheltered beach immediately below the settlement. Similar arrangements may well have occurred at nearby Tintagel during the Post Roman period, where there is evidence of substantial trade with Latin Europe: 19th century photographs show beached vessels loading slate cargo at Tintagel Haven at that late date.

The first post-Roman English towns appear in the 7th and 8th centuries as settlement and centralized political control became more established. A significant number of these English towns were sea and river ports (Friel 2003: 25). The growth of ports was occurring at an international level, since ports trade with other ports. This period is marked by the development of settlements on both sides of the North Sea and the English Channel, with the Germanic word-element *wic*, meaning 'trading place', incorporated into their names (e.g. Runswick, Saltwick, Gippeswic (Ipswich), Hamwic (Southampton), *Lundenwic* (London), and *Eorforwic* (York)). These towns were mostly located on navigable rivers or in good coastal harbours (Friel 2003: 25-26).

Small hards, quays and landing places all around England were used as means for transferring goods since marine transport was faster and more efficient than via road. Some examples have been identified in the Hamble area (Hampshire) (see Hampshire & Wight Trust for Maritime Archaeology 2008, downloadable from <http://www.hwtma.org.uk/index.php?page=project-3>).

During the 8th century sea trade, and its prosperity, operated as a major fuel of economic growth in England. The growth of ports was generally stimulated deliberately by local rulers and, from early times, it seems that the government was involved in trade. The link between trade and wealth underpinned its regulation and protection.

Customs: the duties, tolls, or imposts imposed by the sovereign law of a country on imports or exports, are widely enforced at ports and landing places by customs agencies, establishments, or procedures. In England, customs duties were traditionally part of the

customary revenue of the king, and therefore did not need parliamentary consent to be levied, unlike excise duty, land tax, or other forms of taxes.

Quays or wharfs (structures built along or projecting from the shore of navigable waters) are necessary components of ports, allowing ships and other vessels to load and discharge cargo and passengers. Wharves may occur far upstream along rivers where they may be served by small craft which could get through any bridge arches, carrying coastal shipments or cargos off-loaded from bigger ships. 'Creeping waterfronts' are another characteristic commonly found at quays and wharfage. At their simplest, they are responses to silt built up against the waterfront, making it difficult for larger vessels to tie up: a new quay would be built further out to provide sufficient depth of water for these larger vessels. But the process of repeated waterfront expansion into the sea or a river estuary has often been by deliberate land reclamation to increase the area available for land-based port facilities and to enhance the vessel mooring capabilities. This process, infilling behind the new waterfront at each stage with rubble and often archaeologically-rich occupation deposits, has occurred since the Roman period, at London and York for example.

The East Anglian ports such as Great Yarmouth and Dunwich enjoyed a degree of eminence during the Middle Ages due to their proximity to the continent and the export needs of their hinterland's extensive textile industry. However economic, political and coastal processes combined between 1300 and 1600 to bring about the collapse and decay of virtually all their international trade. In the 16th and 17th centuries, heightened threats of piracy also placed pressure on long distance trade from many smaller ports.

Perhaps the most dramatic downfall of a port is exemplified by Dunwich in Suffolk, East Anglia's premier port in the 11th century with a population of 3000. Between 1286 and 1326 the port and town was effectively destroyed following two major storms and a gradual silting of the harbour.

Piers (often used as landing places, promenades or to protect or create a harbour) are also essential components of ports. Piers range in size, form and complexity from a simple lightweight wooden structures to massive solid structures extending over a mile out to sea. Lightweight piers are supported by widely spread piles or pillars allowing tides and currents to flow almost unhindered. In England, the term pier is principally associated with the image of a Victorian cast iron pleasure pier but many also function as port landing places and as harbour breakwaters.

The arrival of the railways established a number of ports including Felixstowe, Suffolk, which was founded in 1875 by Colonel George Tomline, creating the Felixstowe Dock and Railway Company. Felixstowe is now the largest container port in the UK and pioneered the construction of container ships and the development of roll-on/roll-off (Ro ro) ferries. Other established ports flourished in the railway age as freight and passengers were more easily transported to the coast. Major 20th century improvements in land freight transport also led to a massive decline in smaller ports' competitiveness.

Shipping and maritime trade through our ports are important elements of the UK economy and, in 2002, it was estimated that around 95% of the UK's international trade by volume was transported by sea (DTI 2002). In general, major ports and 'sea ports' handle ocean-going vessels, and 'river' ports are mainly related to river traffic, such as barges and other shallow draft vessels. Some ports on a lake, river, or canal have access to a sea or ocean, and are sometimes referred to as 'inland ports'.

VALUES AND PERCEPTIONS

Ports and docks are perceived by visitors and locals in different, often conflicting, ways. They may be perceived as highly competitive commercial entities, commercial centres, or recreational places of iconic historic importance, as at Liverpool's Albert Dock. Ports and docks might be perceived as areas that allowed the connection of distant regions, places and people, with many and varied cultural influences. Liverpool's transatlantic port connections have been identified as one factor contributing to the city's early rise to prominence in the postwar popular music industry. Ports and docks have also inspired many artists and writers. However, major ports can also bring to mind historical aspects seen as less welcome, such as the slave trade and smuggling.

The historic roles of civil ports and docks in the building of England as major maritime trading force in the 19th and early 20th centuries is probably well recognised but the major modern container ports are generally not closely integrated with most people's common experience. Many people are probably now unaware of the enormous proportion of the goods they use that are brought into the country through our ports.

RESEARCH, AMENITY AND EDUCATION

In general, historical narratives about ports and docks as well as work on their associated coastal wrecks are well documented but relatively little work has yet been done to use this documentation to better understand the present form, character and distinctiveness of our current and historic ports and dockyard areas. That will provide the connections needed for these places' heritage to play its full role in informing planning and regeneration to future coastal settlements, in many cases still as ports, where their cultural legibility and distinctiveness remains.

In respect of the rapid changes in England's late 20th and early 21st century economy, while imports have maintained high levels, the rise of the financial services and service sectors have been accompanied by a rapid decline in manufacturing and hence exports, which has altered some ports. It is likely that much of the industrial imprint associated with ports may be prone to redevelopment, leaving some urgency in recording their present features and assessing their roles and viability for the future.

Ports and docks also have a strong amenity value linked to recreational and leisure activities such as sailing. There is also potential for educational and outreach activities such as visits to harbours, local history courses in schools and in further education as well as a source of inspiration to historians and writers.

CONDITION AND FORCES FOR CHANGE

Ports and docks in England experienced many changes that created their long, complex and dynamic histories. Many of these ports and docks still remain active (e.g. London, Liverpool, Southampton, Portsmouth), others have been reused for other activities such as commercial and recreational centres or marinas (e.g. Liverpool's earlier waterfront docks declared a UNESCO World Heritage Site in 2004) and others that have been abandoned.

The late 20th and early 21st century economic changes noted above have had serious effects on the form and viability of many older or smaller ports, as has technological change,

especially the general move to containerised shipping transport. These factors, and the rise of highly centralised land-freight distribution systems, have greatly favoured the building of modern container ports as wholly new sites with massive investment in new infrastructure to link them to their markets, as at the London Gateway container port being built from 2010 (<http://www.londongateway.com/>).

RARITY AND VULNERABILITY

Past and present ports of varying size and date are quite densely distributed around England's coastline. Many are well recorded historically but the greatest vulnerability probably lies in the redevelopment, and in some cases the withdrawal of port functions, from several of our current larger ports due to the changing factors discussed in the previous two sections. Their vulnerability can be seen in those port areas that have been transformed into commercial and recreational centres or marinas. Many of the specific issues relevant for consideration here are discussed in an English Heritage policy guidance note 'Ports: The impact of development on the maritime historic environment' (<http://www.helm.org.uk/upload/pdf/Ports-policy.pdf?1296822223>).

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1.5 BROAD CHARACTER: COASTAL INFRASTRUCTURE

1.5.1 Character Type: Flood and erosion defence

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Sea Defences includes the following Sub-types:

- Sea Defence
- Flood Defence

This Character Type relates to provision of structures designed to remove, reduce or mitigate the risk of coastal and estuarine flooding from the sea, rivers or un-channelled rainfall run-off, or to counter losses to coastal land from marine erosive forces. In practice, along the coast the concepts of both flood and erosion defence are commonly incorporated in one and the same structure, though their character in terms of siting, design and build may be more heavily influenced by the one or the other at different locations.

Sea defence relates to an artificial structure designed to counter losses to coastal land from the erosive forces of the sea. Such structures may work directly to withstand those forces along a defined line, as for example with sea walls, or they may seek to dissipate them in the intertidal zone, as with lines of spaced revetments. This Sub-character Type is here termed 'Sea defence' in preference to 'Coastal Defence' to avoid potential confusion with pre-1956 British military 'Coastal Defence' policy.

Flood defence relates to man-made constructions used to prevent water flooding the surrounding area. Often taking the form of a bank or wall but sometimes much more sophisticated e.g. the Thames Barrier, and may include run-off drains and reservoirs (<http://thesaurus.english-heritage.org.uk>). Areas of flood and erosion defence are often slender and linear in form, and associated with other Character Types, for example 'Reclaimed Land' or 'Settlement'.

In England, this Character Type is administered under the Coast Protection Act 1949. The Department for the Environment, Food and Rural Affairs (DEFRA) generally gives maritime District Councils grant aid for undertaking works on the coastline provided it can be shown that the works are technically sound and are environmentally, socially and economically justified. The Environment Agency (EA) is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales. The EA is the authority responsible for implementing and managing flood defence schemes in England and Wales. The EA also plays an important role in warning people about the risks of flooding, and establishing and maintaining flood-warning systems. Today, the Agency provides and maintains more than 34,000km of river and coastal defences in England and Wales (<http://www.environment-agency.gov.uk/aboutus/default.aspx>).

In England, Shoreline Management Plans (SMP) exist to promote the management of the coastline in a sustainable manner (see <http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm>). An SMP is a large-scale assessment of the risks associated with coastal processes, projecting those risks' effects forward to periodic future scenarios, informing planning to reduce these risks to people and the environment, and providing context for future flood and erosion defence needs in a given area (<http://www.environment-agency.gov.uk/research/planning/104939.aspx>; <http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm>).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Type can include:

- breakwaters
- groynes
- sea walls
- dykes
- embankments

Coastal management is used throughout the world for many different purposes, but it is predominantly used to reduce coastal erosion and flooding. There are many techniques of coastal management including 'hard' and 'soft' construction and planning approaches. Hard construction is the more traditional response to erosion and involves the construction of structures which absorb and reflect or stop wave energy reaching the shore. These have often caused problems themselves, such as increasing erosion elsewhere. Soft construction techniques have become more popular because of this. Soft construction techniques involve promoting natural systems such as beaches and salt marshes which protect the coast, and are usually cheaper to construct and maintain than hard construction techniques.

Sea walls are one of the more traditional methods used in coastal management. Sea walls were constantly repaired and maintained throughout their active lifetimes, giving them historical depth. Often the position of sea defences has shifted due to coastal processes or changes in land management, including land reclamation, leaving them far inland. Programmes such as English Heritage's ongoing National Mapping Programme (NMP) are currently recording the position of some of these relict structures.

This Character Type has had an essential role in creating and maintaining vast areas of land reclamation around the English coasts from the Roman period onwards, especially, but not exclusively, in the Fens during the post medieval period. However in some cases, sea walls have been held responsible for losses of beach material *in situ*, exposing and undermining the base of the wall, or enhancing erosion elsewhere along the coast.

England, like other countries, has a long history of defending coastal flood plains and extensive areas of reclaimed land with hard construction techniques like dykes and embankments. Since the 1990s this has been brought into question. 'Softer' approaches to coastal defence, which work with nature rather than against it, have been introduced. The EA and SMP initiatives are examples, with the EA working hard to ensure that current coastal management objectives are widely accepted and embedded in local planning policy.

The first generation of SMPs resulted in the production of individual strategic plans monitoring programs and studies only at a local or regional level (Murphy 2006) whilst the second generation will provide a 'route map' for local authorities and other decision makers to move towards meeting our future needs (see Conditions and Forces for Change, below).

VALUES AND PERCEPTIONS

Sea and flood defences are generally perceived as essential for the preservation of many English coastal settlements as well as for the safety of the people who live in them. However, some people view the more visually intrusive recent sea defences as having a detrimental effect on the picturesque character of some of the smaller villages of England. There is also increasing recognition among local communities and heritage managers that

patterns of historic sea defences and the areas of reclaimed land they maintained contribute strongly to local distinctiveness.

There are also conflicts between SMP coastal protection policy/resources and the perceived interests of some coastal communities: the high profile debates at Happisburgh (Norfolk) provide some examples. Elsewhere, the need for improved sea defences has been incorporated into regeneration schemes, such as the rebuilding of the Victorian promenade at Blackpool and the early twentieth century promenade at Cleveleys on the Fylde coast of North-West England.

Breakwaters are often highly visible features lending distinctiveness to coastal ports, large and small. They often feature in depictions of these places and become cultural reference points (e.g. 'The Cobb' at Lyme Regis, the breakwater at Bude).

RESEARCH, AMENITY AND EDUCATION

Sea and flood defences have been used in England for many centuries and as such some of the early coastal defence systems are now the focus of historical and archaeological interest in their own right (Fulford *et al* 1997: 190).

Sea and flood defences provide a stimulating and relevant focus for cross-curricular educational topics, including case studies looking at the environment, landscape, coastal change and sustainability. Case study resources related to flood defence schemes are freely available online, for example from Met Office Education and the Geographical Association.

CONDITION AND FORCES FOR CHANGE

Shorelines constantly change due to waves and tides. The extent of physical change depends on many factors, with changes over timescales ranging from seconds to centuries and millennia. Coastal processes have been hugely influenced by human activity over time, seeking to reduce erosion or flooding while maintaining and extending people's desired coastal management. In some cases this has taken place without a wider or coordinated appreciation of the effect these actions may have on other places along the coast (see <http://www.environment-agency.gov.uk/research/planning/104939.aspx>).

Coastal erosion has increasingly affected English coastal communities physically and perceptually and, more widely, aspects of both the natural and cultural dimensions of our environment. This in turn has affected future commercial development opportunities along the coast. In response, DEFRA have made significant progress in understanding and mapping coastal processes to inform the development of SMPs. In the first generation of SMPs, many operating authorities adopted SMP recommendations as a basis for production of individual strategic plans, monitoring programs and studies for all or part of their coastline (Murphy 2006). The second generation of SMPs (SMP2s), in covering the entire coastline in England and Wales, provide a 'route map' for local authorities and other decision makers to move towards identifying the most sustainable approaches to managing the risks to the coast in the short term (0-20 years), medium term (20-50 years) and long term (50-100 years) (<http://www.environment-agency.gov.uk/research/planning/104939.aspx>).

In addition, the current Environment Agency (EA) policy on sea defences involves strategic planning to make decisions about maintaining and building new flood defences, as well as raising public awareness of people living in vulnerable areas. They also advise local, regional

and central government on the building of sea defences and their environmental impacts (<http://www.environment-agency.gov.uk/research/planning/104939.aspx>).

The threat of flooding along the English coast and rivers is also an issue of rapidly increasing importance. The population at risk is likely to increase as residential, service and commercial development continues to take place on floodplains and low lying coastal regions while the effects associated with global warming, such as sea level rise and storm events, continue to intensify. Planning policies in place in England to manage flood risks are guided by PPS25, a key part of a holistic approach to managing risk as set out in the cross-Government programme developing strategy for flood and coastal erosion risk management in England, *Making Space for Water* (<http://www.defra.gov.uk/enviro/fcd/policy/strategy.htm>) (Department for Communities and Local Government 2006, 2008). For specific lengths of the coastline, SMPs present a long term policy framework to reduce these risks in a sustainable manner. Their effectiveness requires adequate and properly interpreted information to be integrated into all stages of the SMP, ensuring proper consideration of the historic and cultural environment within the SMP process (see English Heritage 2003; Murphy 2006). HSC contributes to this, characterising the cultural context which has shaped the typical and commonplace of the present everywhere (see Dellino-Musgrave and Oxley 2007; Hooley 2004 and in press; Fairclough 2003, 2006).

RARITY AND VULNERABILITY

In general, coastal defences are fairly common and their associated structures are usually not designated. The vulnerability of this Character Type could be intensified if erosion rates increase. Their frequent occurrence along and, in historic terms, behind the coast, makes them a major feature in land- and sea-scape distinctiveness along some parts of England's coastline.

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1.6 BROAD CHARACTER: COMMUNICATIONS

1.6.1 Character Type: Transport

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Transport includes the main physical communication methods:

- Canal
- Railway
- Tramway
- Road
- Tunnel
- Bridge
- Civilian airfield

The Character Type Transport relates to areas of coastally-specific, maritime-related infrastructure related to the physical movement of people and/or goods.

Canals are artificial navigable waterways used for the transportation of goods. Nowadays they are also used for recreational purposes (<http://thesaurus.english-heritage.org.uk>).

Railways involve a line or track consisting of iron or steel rails, on which passenger carriages or goods wagons are moved, usually by a locomotive engine (<http://thesaurus.english-heritage.org.uk>).

Tramways refer to a light railway on which raw materials, goods and/or passengers are conveyed. Early usage was predominantly industrial with carriages hauled by animal power or by a centralised power source. In later usage tracks were inlaid into a road surface, on which tram cars run, powered by a centralised source, usually for the conveyance of passengers.

Roads are 'a way between different places, used by horses, travellers on foot and vehicles' (<http://thesaurus.english-heritage.org.uk>). Within a HSC context roads will be those related to coastal areas, coverage of ports, shipping routes, ferry crossings and ferry routes, for example.

Tunnel refers to an elongated, enclosed routeway for the transportation of goods and people under roads, railways, rivers, or through topographic features such as hills (<http://thesaurus.english-heritage.org.uk>).

Bridge is a structure with one or more openings beneath it to span a river or other physical obstacle, for the purpose of providing passage over that obstacle. Bridges commonly have substantial dedicated approach areas and their abutments and support pier/pillar footings may go deep into the beds of rivers and estuaries.

Civilian airfield refers to areas used for the landing and take-off of primarily civilian aircraft, often including associated buildings, equipment and other installations (<http://thesaurus.english-heritage.org.uk>).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Canals were important elements in early industrial development since they met the need for cheap transport of raw materials and manufactured items. In Europe, particularly England, inland canals preceded the development of railroads during the earliest phase of the Industrial Revolution. In the 1760s, the opening of the Bridgewater Canal (North West England) halved the price of coal in Manchester. This triggered a period of "canal mania" in England and between 1760 and 1820 over one hundred canals were built. The culmination of canal building came at the end of the nineteenth century, with the opening of the Manchester Ship Canal from Eastham on the Wirral to new, purpose-built dock facilities in Salford and Manchester. It allowed deep draft ships to access Manchester directly, avoiding port charges at Liverpool, and led to the development of Manchester as the country's largest inland port (Wood 2005)

In the 19th century, England was the leading country in the development of the railways which transformed lifestyles not only at a national but also an international level. In the early 19th century, various fundamental technical advances were made by engineers such as Richard Trevithick, George Stephenson and his son Robert Stephenson, leading to the development of the steam locomotive. During this time, the first passenger horse-drawn railway was opened between Swansea and Mumbles in Wales. In 1811, John Blenkinsop designed the first successful and practical railway locomotive - a rack railway worked by a steam locomotive between Middleton Colliery and Leeds on the Middleton Railway. The locomotive, *The Salamanca*, was built a year later. In 1830, the first commercial passenger steam railway, the Liverpool and Manchester Railway, opened.

Many coastal settlements were established or developed as a result of the advent of the railway network. This is particularly true in East Anglia where coastal resorts were often farmland and small hamlets prior to the construction of the railways. In many cases wealthy individuals bought land specifically to create resorts as a result of this development. It has been argued that some resorts such as Clacton owe their existence entirely to the railways (Williamson 2006, 125) which also brought tourism to the Broads. Similarly, ports were able to expand as new industry, parcels and passengers were brought to the docks

Steam locomotives required large investments in labour to clean, load, maintain and run. After World War Two (WW2), labour costs increased dramatically in developed countries, making steam an increasingly costly form of transport. At the same time, the war had forced improvements in internal combustion engine technology that made diesel locomotives cheaper and more powerful. This caused many railway companies to initiate programs to convert from steam to diesel locomotion.

From the 1950s, the period of large-scale motorway construction began. This marked a deliberate policy shift from railways to roads, as England's primary means of transporting goods and people. Rail transport also faced competition from roads for commuting, and air transport took passengers from long-haul trains. Where roads in towns had contained trams, most were replaced by buses, while high trans-shipment costs caused short-haul freight trains to become uncompetitive. The 1990s saw an increased focus on accessibility and low-floor trains. Many cities that closed their old tramways have reopened them as new light railway systems, as for example in Manchester.

The Channel Tunnel is the longest undersea tunnel in the world, linking Folkestone in Kent (England) to Coquelles in Pas-de-Calais (France). Eurotunnel shuttles, Eurostar and national freight trains run in the two single track and single direction tunnels at a maximum speed of 160km/h.

Road transport has developed over the centuries from foot transport to motorways and their related service points. The earliest routeways are often still in use and have been developed over the centuries, others have become disused and superseded by later constructions. Several early trackways have been found in England in intertidal contexts. For example, the Neolithic trackways on the Isle of Wight at Wootton Quarr (Waller 2006) and the Formby prehistoric footprints (Merseyside) (Huddart *et al* 1999). Some of these included built wooden tracks used to traverse wetlands and boggy areas around the coast and estuaries. Examples are found dating as far back as the Mesolithic in Ireland and the Neolithic in England. These include the Hightown Neolithic trackway near the mouth of the Mersey River with radiocarbon dating of 3960-3690BC (Gonzalez and Cowell 2007), and the Post Track and Sweet Track in Somerset, dated, dendrochronologically, to 3838 BC and 3807/3806 BC respectively (Pollard and Healy (eds) 2008, 75). Additional work such as the Rapid Coastal Zone Assessment Surveys (RCZAS) have also found previously unrecorded trackways including one on the Deben foreshore just below Sutton Hoo in Suffolk.

Packhorses were the chief form of transport for goods in England until the late 18th century. Away from main routes, their use continued into the 19th century. In remote areas, this usage has left a legacy of old paths still called *packhorse roads*, along with narrow and low stone arched packhorse bridges in various areas (e.g. Hacketty Way Bridge, Somerset). Many such former packhorse routes are now popular walking trails: walking remains a dominant means of commuting and recreation, valued for helping to maintain a healthy lifestyle.

England contains the vast majority of the UK's motorways, dating from 1958 (part of the M6) to the most recent (M6 Toll). Today, the Department for Transport is the government department responsible for the English transport network.

VALUES AND PERCEPTIONS

Some of the prehistoric trackways discovered in coastal and wetland areas have associated features showing they were endowed with religious values relating to the remote and liminal areas they accessed. This is particularly striking in the Bronze Age when water appears to have been afforded a particular spiritual value as demonstrated at the complex at Flag Fen, Cambridgeshire, and by the many artefact hoards deposited in watery contexts.

Canals have a lasting imprint on the present-day landscape from the 18th-19th century period of prosperity and success, affecting not only their own route but a wider swathe of associated settlement and land use. At the same time, they remain an integral part of the present social and cultural landscape, with a range of current uses, including leisure. In general, the early narrow industrial canals have ceased to carry significant amounts of trade. Many have been abandoned to navigation. In other cases, railways have been built along the canal route (e.g. Croydon Canal). In some cases, the Kennet and Avon Canal being an example, abandoned canals have been restored and are currently used for pleasure boaters. The towpaths may be used as footpaths, alongside which have sprung up leisure facilities such as cafes. Recently, in England, canal-side housing has become relatively popular. Another use of canals in the 21st century is as wayleaves (right of way in return for payment) along the towing paths for fibre optic telecommunications networks.

The imprint of rail and roads on the present landscape and seascape is vast, providing the major part of the landward transport infrastructure by which our ports function as hubs connecting the land and sea transport systems serving our society's needs. Coastal road and rail networks are also expressed in the ribbon development spreading residential, commercial and recreational areas along many of our coastlines. Conversely, in remote areas such as the Suffolk Coast and Heaths AONB transport is limited both in terms of rail and road. Whilst this can deter visitors it is also one of the main attractions of the area which retains its air of 'tranquillity'.

RESEARCH, AMENITY AND EDUCATION

Generally, in England, research has focused on canals from an 'industrial' and 'historical' point of view. Further research integrating maritime perspectives will contribute to a greater understanding of canals regionally, nationally and internationally. Today, canals are largely used for leisure purposes. As such, education and outreach initiatives which bring together leisure activities whilst also exploring the 'industrial heritage' of canals would be highly beneficial in terms of educating and raising public awareness. This could also be the starting point of promoting and seeking further economic benefits.

Further research on early long distance routeways would be highly beneficial at national, regional and local levels, by looking at the developing relationships through time between coastal populations, trade, transport and topography.

Communication routes are the means by which many perceive and appreciate other the historic cultural landscape and seascape, while also themselves possessing a range of features which are express people's past activity. Bridges, viaducts, stations, roadside

services and other infrastructure are also interesting elements contributing to their landscape/seascape.

CONDITION AND FORCES FOR CHANGE

In contrast with the large-scale European barge canals which continue to operate for freight transport, the narrow English early industrial canals have ceased to carry significant amounts of goods. Several have been abandoned to navigation, becoming derelict and overgrown, whilst in some cases railways have been built along the canal route (e.g. Croydon Canal). Elsewhere, abandoned canals have been restored and are currently used for pleasure boating.

Railways are still a major functional aspect of the nation's heritage, building on England's leading role in introducing the commercial railway. Many railway routes were later abandoned for road transport and several are now used as footpaths or cycle-ways; many others are derelict. Today, rail transport is an energy-efficient and capital-intensive means of mechanised transport which has emerged from post-war under-investment in favour of promotion of road for transport of goods and people (e.g. Eurotunnel).

Construction of communication routes at or near the coast frequently involves major engineering projects as coastal areas frequently present unstable environments (e.g. the main rail line from London to Cornwall between Dawlish and Teignmouth in Devon). Demands for new communication routes arise from a variety of factors including increased traffic to the coast, changing configuration of the coastline, rising sea-levels, and coastal defence initiatives, amongst many others. The environmental, including landscape, effects of such projects are assessed through the EC requirement that their proposals are subject to Environmental Impact Assessment (EIA).

RARITY AND VULNERABILITY

Today, the scale of change has affected the size and frequency of key nodal transport points. It has also affected the expression of past and present transport infrastructure along the coast as well as the low, easily overlooked (and therefore vulnerable) character of many early transport-related features.

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1.6.2 Character Type: Telecommunications

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Telecommunications includes the following Sub-type:

- Submarine telecommunications cable

This Character Type covers telecommunications infrastructure across coastal land, inter-tidal and marine zones. This includes historic telegraph stations and their associated cabling, and civic listening devices. Modern cables also transfer mass media such as the Internet and telephone systems.

‘Submarine telecommunications cable’ refers to cables or pipes laid beneath the sea to carry telecommunications. This is the most frequent function of submarine cabling, especially those covering long distances.

In general, modern telecommunications systems still require the use of submarine cables in addition to satellites. British Telecommunications plc is the principal body laying and operating submarine communications cables around England.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

In 1850, John Watkins Brett's Anglo-French Telegraph Company laid the first telecommunications line across the English Channel. It was a copper wire coated with gutta-percha, without any other protection. In 1851, a protected core, or true cable, was laid from a government hulk, the *Blazer*, which was towed across the Channel. In 1852, a cable laid by the Submarine Telegraph Company linked London to Paris for the first time. In 1853, England was linked to the Netherlands by a cable across the North Sea, from Orford Ness to The Hague (http://en.wikipedia.org/wiki/Submarine_communication_cable). The first transatlantic cable was laid in 1865-6 by the *SS Great Eastern*. The remote beach at Porthcurno in Cornwall became a major international [submarine telegraph](http://en.wikipedia.org/wiki/Submarine_telegraph) cable station in the late 19th century: the first cable was landed there in 1870, part of an early international link stretching from the UK to India.

The first submarine communications cables carried telegraphy (written communication) traffic. Later generations of cables carried first telephony (voice communication) traffic, and then data communications traffic. All modern cables use optical fibre technology to carry telephone traffic as well as Internet and private data traffic (http://en.wikipedia.org/wiki/Submarine_communication_cable).

The unprecedented popularity of the Internet and the development of e-commerce have brought about a considerable increase in global electronic data transmission over the last

few years. As a consequence, the number of cables linking England with mainland Europe has grown considerably.

Generally speaking, cables are trenched to a depth of 40-90cm with rock-dumping used as a last resort to anchor cables. However, older redundant cables are more likely not to have been trenched (Department of Trade and Industry 2002a, b).

VALUES AND PERCEPTIONS

The presence of submarine telecommunications cables across the coastal and marine environment is very unlikely to be perceived by most who use them. Despite that, they play a vital role in enabling the volumes of rapid communication that transformed the world's social, economic and political lives initially during the latter half of the 19th century and again, at a revolutionary scale, at the end of the second millennium.

RESEARCH, AMENITY AND EDUCATION

The early telegraph station at Porthcurno, including the hut above the beach that received many of the cables, is now presented as a well-visited museum and visitor attraction. It is also widely perceived as a major part of Cornwall's current character: its contributions to global communications technology, in conjunction with the nearby satellite telecommunications station at Goonhilly Downs on the Lizard.

The need for submarine telecommunication cables and the logistics, practicalities and issues associated with their installation and maintenance would provide an interesting cross-curricular educational case-study, balancing those technical issues with their application in enabling Internet, telephone and other media access, opening up a varied range of educational and amenity tools accessible to the public.

Some surviving early cables in English waters offer insights into the early development of telecommunications in the 19th-20th centuries, an aspect that has received scant attention from maritime archaeologists.

Coastal and sea-floor works undertaken during cable-laying and or maintenance also offer opportunities to investigate material remains of the historic environment in those areas, adding to our knowledge and further refining future landscape/seascape characterisation. Palaeoenvironmental evidence has been unearthed during such works, uncovering deposits rich in pollen taxa and microfossils that can further inform our knowledge of the evolution of marine transgressions and the previous character of the present sea-floor.

CONDITION AND FORCES FOR CHANGE

Cables are replaced fairly regularly as they reach the end of their functional lifespans or sometimes are damaged in their vulnerable sea-floor positions: although relatively uncommon, trawling and anchoring can cause breaks in cables (Fulford et al 1997). They also become obsolete as technology develops rapidly.

As with all offshore development, preliminary survey work, laying and maintenance of cables and the removal of disused cables will affect the character of the landscape/seascape. Preparatory investigation may involve intrusive survey of the sea-floor, exposing archaeological deposits, but also providing detailed knowledge of seabed

conditions. Laying the cables involves burying them where they cross the foreshore and in shallow waters, intruding into earlier aspects of the historic environment there. In deeper waters, submersible ploughs running on tracks or skis and towed by surface vessels are used for trenching, laying cable, and subsequent inspections (see Fulford *et al* 1997).

RARITY AND VULNERABILITY

The laying of telecommunications cables is likely to increase as a result of the rapid growth in the global use of the Internet and the development of higher capacity fibre optic cables. However, the development of wireless technology may eventually lead to the redundancy of many of these cable routes.

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1.7 BROAD CHARACTER: MILITARY

1.7.1 Character Type: Military defence and fortification

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The 'Military defence and fortification' Character Type includes the following Sub-types:

- Coastal fortification (unspecified)
- Roman fortification
- Medieval fortification
- Post-medieval fortification
- Early modern fortification
- Modern fortification
- WW1 fortification
- WW2 fortification
- WW2 defence area
- Naval battlefield

This Character Type relates to defensive areas in coastal locations are designed to deter or prevent attack from seaward (i.e. by sea or air) although they may be locally oriented to defend against enemy troops attacking our coastal defences from landward too. Individual defensive sites, such as anti-landing defences, concrete pillboxes and decoy sites are often components within more complex arrangements of built and fieldwork fortifications tailored

to the landscape form and designed to protect strategic areas. During WW1 the Defence of the Realm Act 1914 enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. At the outbreak of the Second World War in 1939 a similar Act was passed, the Emergency Powers (Defence) Act 1939, and coastal defences were greatly extended.

Coastal fortification (unspecified) refers to military fortified areas and sites of unspecified or uncertain date in coastal locations.

The specified broad period subdivisions of this Character Type relate to the following date brackets:

- Roman fortification: AD 43-410
- Medieval fortification: AD 410-1540
- Post-medieval fortification: AD 1540-1750
- Early Modern fortification: AD 1750-1900
- Modern fortification: AD 1900 – present day

World War One fortification refers to coastal military fortified areas and sites whose present character is dominated by construction and use during the First World War (1914-1918).

World War Two fortification refers to coastal military fortified areas and sites whose present character is dominated by construction and use during the Second World War (AD 1939-1945).

World War Two defence area refers to coastal parts of the planned, strategically inter-related and largely static anti-invasion defences established in 1940-1941 during the Second World War.

Naval battlefield refers to areas of former naval battlefields, where they form the dominant character of those areas. Although usually fought on or above the sea surface, they may be associated with enhanced material imprints still extant in the form of wrecks and other debris.

Military fortifications are found along most of the English coast. The word 'fortification' can refer to the defences around a specific defensive 'site' or to the practice of improving a large area's defence with defensive works, as for example by town or city walls.

This Character Type is commonly located in strategically-positioned areas providing good sea views both to see and focus attack upon an approaching enemy. Mid 16th-18th century defences were usually guided by national defensive considerations but as with earlier defences they were frequently concentrated near ports since these were generally the areas where foreign attack could give an enemy the most effective foothold. Greater military mobility from the 19th century required a broader territorial approach to the nation's defence, with seriously threatening attacks possible anywhere along the nation's coastline.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type can include:

- Anti-tank defences
- Artillery
- Fortifications
- Anti-landing features

- Batteries and gun emplacements
- Castles and forts
- Moats and dikes
- Town walls and gates
- Minefields
- Pillboxes
- Battlefields and sites of battles
- Naval warships, submarines (including wrecks) and military aircraft crash sites

Since at least the stages at which human populations became more sedentary, there has been need to protect one's resources from others. It is in the Neolithic in Britain that fortified settlements appear, surrounded by substantial ditches and banks or rubble walling, suggesting that there was some kind of 'planning' in their construction. An increase in population, pressure on resources and changes in society may have created the need to demarcate and defend property. Defended settlements become much more widespread during the later Bronze Age and Iron Age, from around 1000BC, and there are many impressively sited defended prehistoric sites on coastal hills and cliffs, especially of southern England, built over 2,500 years ago. These forts, with their large enclosing banks and ditches, are thought to have been constructed to emphasise wealth and status as well as being used for defence. Although the British population at this time had extensive social and trading contacts with people from Europe, it is unlikely that continental coastal attacks were of any significance. It is more likely that the defences, if that was their intended function, were constructed as protection from neighbouring groups (see Hegarty and Newsome 2007). In south west England, many headlands were cut off by banks and ditches forming 'promontory forts' or 'cliff castles', although their exact function has been much debated (Sharpe 1992; Herring 1994).

In the early years of Roman influence in England, the construction and location of coastal installations was not related to territorial defence alone, rather they were related to securing supply routes, the transportation of goods and the harbouring and maintenance of the Roman naval fleet (see de la Bedoyere 2006; Laycock 2008). A series of 'Saxon Shore' forts were built in the 3rd century AD to defend against the increasing threat of Germanic invasion and piracy. These stretched from Brancaster in Norfolk to Porchester in Hampshire; a number still survive, several modified by later fortification, although others were lost to the sea, plundered for stone or allowed to erode away.

The Norman Conquest in 1066 saw the beginning of a new phase of war and conquest in England (Friel 2003: 49). The Norman Conquest was a pivotal event in English history, largely removing the native ruling class and replacing it with a foreign, Norman-French-speaking monarchy, aristocracy, and clerical hierarchy. This in turn brought about a transformation of the English language and the culture of England. By subjecting the country to a ruling class with substantial interests and landholdings also in France, it re-orientated England toward continental Europe and away from the Scandinavian world. It also had a significant impact on the landscape with the erection of impressive castles not only for defence but also as a symbol of their power and overlordship: those which survive still have the power to impress today. Most of these messages were at first directed internally to the conquered English population but some, as at the Tower of London and the twin mottes of Baile Hill and Clifford's Tower, York, were also sited to impress those using our estuaries to reach England's major trading centres. From the 12th century their rebuilding in stone by the Norman aristocracy was supplemented by a series of new

coastally-sited fortifications, good examples being those designed to defend against Scottish attacks at Scarborough Castle, North Yorkshire, and Warkworth and Bambrough Castles, Northumberland.

In the late 13th century the naval defence of England was divided between the Northern and Western Fleets. The Northern fleet generally covered the coast from Thames to Scotland and the Western fleet covered the seaboard from the Thames to Bristol. The naval expedition, the sea patrol and the coastal raid were the commonest types of naval operations that English ships undertook in the medieval period (Friel 2003: 57).

Large-scale naval battles were very rare during the medieval period. However, much activity during the Hundred Years War took place near the coast (http://en.wikipedia.org/wiki/Hundred_Years_war). Attacking a fleet in an anchorage or a restricted waterway, or intercepting a fleet passing close to the coast were favoured tactics. It was not until the addition of shipboard guns that sea battles became more common as a form of naval warfare. Shipboard guns were used in small numbers by the English and others from the 1330s, but they were essentially small anti-personnel weapons (Friel 2003: 58).

Defensive castles appeared on ships by the late 12th century, at first as rather makeshift-looking structures. Medieval sea battles were normally resolved by boarding actions. Through time, defensive 'castles' became a normal part of the structure of some vessels, particularly warships (Friel 2003: 80). The number of guns on ships significantly increased in the second half of the 15th century. By the end of the 15th century, large warships had multi-stage castles, a change possibly dictated by the massive increase in the number of guns carried by large combatants. However most warships did not carry large guns until the 16th century (Friel 2003), the *Mary Rose* being an example. During the 16th century, the Reformation and England's growing economic power left the country more vulnerable to invasion. That and the creation of an efficient, highly centralised administration under the Tudors led to the development of a nationally-focused strategy for England's coastal defences. Specific programmes of coastal defence were seen under Henry VIII and in the 1580s due to the threat of the Spanish Armada. These involved the protection of key anchorages such as the Humber and the Thames, which if captured could be used as footholds from which to launch a full scale invasion. Fortifications originating in this phase include Landguard Fort at Felixstowe, Suffolk; Tilbury beside the Thames in Essex, and Pendennis and St Mawes Castles flanking the entrance to the Carrick Roads, Cornwall.

In the 17th century, the commercial success of the Dutch fuelled English rivalry and led to the Anglo-Dutch wars for control over the seas and trade routes. The first Anglo-Dutch War (1652-54) took place in the English Channel and North Sea and included the Battles of Kentish Knock (1652) and the Gabbard (1653), both taking place off the East Anglian coast. During the second Anglo-Dutch War (1665-67) most of the fighting took place in the southern North Sea, including the Battle of Lowestoft (1665). A flotilla of Dutch ships broke through the defensive chains guarding the Medway and burned part of the English fleet docked at Chatham. An invasion force of 1500 Dutchmen was repelled at Landguard fort in 1667, having landed on the beach at Felixstowe. The third Anglo-Dutch War (1672-74) took place along the coast of East Anglia and included the Battle of Sole Bay (1672) off Southwold, Suffolk. The 'Glorious Revolution' of 1688 ended the 17th century conflict by placing William III of Orange on the English throne as co-ruler with his wife Mary. The Dutch merchant elite began to use London as a new operational base but the Dutch economic

growth slowed. The later 18th century saw the growth and establishment of the English maritime power. Some of the Dutch impact still survives in today's coastal landscape on the 'Dutch-style' buildings found in some areas of London and East Anglia.

England remained at war throughout the period of the Napoleonic Wars (1803-1814). Having built and lost most of its colonial empire in the preceding decade of the Revolutionary Wars, French efforts were focused mainly in Europe. Consequently, Napoleon Bonaparte saw an invasion of England as the key to supreme control over Europe. England responded with a new coastal defence strategy which included a chain of forts to be built along the coast, which in turn prompted a survey to assess potential locations and vulnerable points. The resulting forts were squat, circular towers, known as Martello Towers after a similar structure at Mortella, Sicily. In England, 105 were built along the south and east coasts between Aldeburgh in Suffolk and Seaford in Sussex and there are still many surviving in today's landscape, some re-used for a variety of purposes.

By the 20th century, the imprints from responses to the threat of war in England were considerable. For fifty years prior to WW1, England's defences concentrated on the protection of naval bases, since the main defence of the country was considered to rest with the Royal Navy. Military structures were confined largely within the ports and the garrison towns, although some fortification of vulnerable expanses of coastline was performed (English Heritage 2003).

At the beginning of WW2, England was ill-prepared to defend against an expected invasion by Germany and fortification only began in earnest after the German invasion of France in 1940. England's defence policy was based on maintaining a 'coastal crust' of beach defences and the deployment of the few available mobile columns, combined with static defended lines, 'stop-lines', extending inland across over a wide areas of the country. Their purpose was to obstruct and contain the advance of an enemy from the coast or an inland airborne landing, both by the use of obstacles and by fire from troops on the ground, thus allowing time for relief by a mobile reserve (e.g. fortification of the east coast) (English Heritage 2003). Beaches were to be made impenetrable by erecting scaffolding. Thousands of mines were placed behind the scaffolding. Behind the mines was barbed wire and behind the wire were more land mines. Finally, across the top of the beach, anti-tank blocks were sited. Behind the beach area, pillboxes were built to house machine guns (Green 2006; Whaley et al 2008). Special attention was given to areas of strategic importance such as Harwich Haven. A series of structures were also erected in the marine zone around the Thames and Mersey estuaries, known as Maunsell forts after the designer. These were intended to act as an early warning system, break up aircraft formations and prevent minelaying.

World War Two defences were later extensively dismantled and cleared. In 1956, the formal end of the military coastal defence policy in England was announced. Upon abandonment a number of the Maunsell forts were utilised by pirate radio stations and the Rough Sands fort in the Thames Estuary is still so occupied as the 'Principality of Sealand'.

VALUES AND PERCEPTIONS

Fortifications of different periods tend to generate differing perceptions. The 'heritage' of older structures such as late Roman Saxon Shore forts and medieval castles are often valued, protected and visited recreationally. The 19th century and later defences have been often viewed with less sympathy for their role in the nation's ongoing defence, possibly due

to the temporal closeness of the threat they represented and a wider dislike of concrete structures among the general public, especially where those structures are located in rural coastal areas.

But there are clear signs that attitudes are changing as the World Wars gradually pass from living memory. Programmes of clearance of 'unsightly concrete structures' are being replaced by research programmes turning their attentions to recording and understanding the surviving traces from these later periods. There is increasing recognition too that as for most periods, the more visible built structures from these late periods are closely related to the lie of the land and coast, and are usually complemented by a much wider complex of less visible earthwork defensive features including systems of connecting trenches. They are becoming perceived as part of the overall historic legacy of the coastal landscape.

RESEARCH, AMENITY AND EDUCATION

Castles and other historic fortifications along the English coast act as clear foci for tourism and educational initiatives and many have had specific educational resources developed, for example for Tintagel Castle (Cornwall) (see <http://www.english-heritage.org.uk/server/show/nav.15393>).

There is now widespread and ongoing research interest in 20th century military defences, with WW1 and WW2 military remains forming one of the most active areas of research for special interest groups in recent years. The larger coastal defence batteries from WW1 are relatively well known, but not so the contemporary practice trenches and smaller fortifications. In general, the material remains of WW2 have attracted the greatest interest, reflecting the greater number of surviving features and illustrating the active living memory of this event in some members of the population (Petts & Gerrard 2006: 190).

A result of an increased public interest in surviving military remains was the Defence of Britain Project (DoB) (1995-2002), which ran under the auspices of the Council for British Archaeology. The purpose of the project was to record the 20th century militarised landscape of the UK, and to inform the responsible heritage agencies at both local and national level with a view to the future preservation of surviving structures (<http://www.britarch.ac.uk/cba/projects/dob>). Nearly 20,000 20th century military sites were recorded in the UK as a whole.

World War One and World War 2 remains are also found underwater but are generally understudied, a contributing factor being that some of them could be considered as dangerous due to the potential presence of munitions. These submerged remains often have amenity value due to their popularity with sports divers. Educational value could be further explored through interactive web-interfaces.

In England, there are a number of military vessels (and all military aircraft crash sites) which are protected as war graves under the Protection of Military Remains Act 1986. The primary reason for designation as a 'war grave' is for it to be conserved the last resting place of UK servicemen (or other nationals). The Act does not require the loss of the vessel to have occurred during war.

A number of Martello towers in particular have been re-used as public amenities including museums and galleries. The tower at Jaywick in Essex is a good example, displaying exhibitions relating to Community, Heritage and Environment.

CONDITION AND FORCES FOR CHANGE

The physical evidence of this Character Type in the landscape/seascape, especially for WW1 and WW2, is a diminishing resource due to the effects of time, erosion and vandalism. Saltmarsh reclamation in later periods may also have affected the survival of pre-existing historical features of large defended coastal areas.

Many of the Early Modern and older coastal fortifications are recognised as 'heritage assets' and designated as such, with statutory protection in place and often conservation management plans of various forms too. Loss from coastal erosion inevitably remains an issue though, sometimes on a larger scale: the 'Sole Bay' of the 1672 Battle of Sole Bay no longer exists: that topographic feature on the Suffolk coast has long been lost to erosion.

Coastal erosion is a particularly serious issue for fortifications along most of the rapidly eroding lengths of England's east coast, especially those more recent ones, with the result that many WW2 pillboxes (and the less recognised WW1 examples) toppled from the low cliffs onto the beaches below.

Formally sanctioned programmes aimed at clearing 'unsightly concrete structures' from the two World Wars have largely ceased but occasional acts of clearance, sometimes under the guise of health and safety measures, do still occur as with the deliberate destruction of two pillboxes at Talland Bay, Cornwall, in the early 2000s.

Projects such as the 'DoB' Project and Rapid Coastal Zone Assessment Surveys (RCZAS) have begun to record and encourage interest in some of the more forgotten structures. Increasingly World War defences are becoming tourist attractions in their own right.

RARITY AND VULNERABILITY

This Character Type is quite widely represented along most of England's coastline, its many and varied expressions and dates reflecting those areas considered strategically defensible under various regimes and technologies, but they also reflect the ingresses of coastal erosion, again with date implications for the range of surviving coastal features in any given area.

In terms of vulnerability, raising understanding and awareness of the significance and unique values of coastal military remains in England will make them more sustainable as a resource and accessible to present and future generations. The vulnerability of this Character Type in the landscape is mainly due to erosion processes and neglect but it is also to some extent at risk of change from onshore and offshore commercial and industrial developments. Such risks should, however, be identified through the necessary Environmental Impact Assessments (EIA), enabling an assessment of the potential impacts (positive or negative) that a proposed project may have on the environment, specifically including landscape factors (of which 'seascape' is a subset).

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1.7.2 Character Type: Military facility

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Military Facilities includes the following Sub-types:

- Barracks
- Firing range (land)
- Military airfield

- Military base
- Ordnance dumping
- Military practice area
- Naval dockyard
- Naval firing range

This Character Type covers a broad range of areas and sites intimately connected with military activity but ancillary to the locations of defensive or offensive activity themselves. So for example it includes training areas and establishments, barracks, and repair and maintenance areas.

Barracks are areas of buildings designed to house members of the armed forces (<http://thesaurus.english-heritage.org.uk>). Such areas may also include closely related buildings such as refectories, mess rooms, hospitals, schools and gymnasia.

A 'Firing range (land)' involves a piece of ground on which small arms or large artillery may be fired at targets (<http://thesaurus.english-heritage.org.uk>) as part of military training.

Military airfields are landing or taking-off areas for military aircraft. They often include ancillary structures and buildings for the maintenance and storage of aircraft, etc. (<http://thesaurus.english-heritage.org.uk>).

A 'Military base' is a building or groups of buildings, often surrounded by a system of fortifications, used as residential and training sites by members of an armed force (<http://thesaurus.english-heritage.org.uk>).

Ordnance dumping is an area regularly used for disposal of spent or redundant military weaponry. Material known to have been dumped at sea includes both conventional and chemical weapons, and the mode of disposal may include carriage on ships scuttled over the disposal site.

A 'Military practice area' is an area used by armed forces on land or at sea for training and military exercises.

A 'Naval dockyard' is a naval base that builds, repairs, docks or converts warships, and is manned by civilian engineers and workers and administered by engineer duty officers (<http://thesaurus.english-heritage.org.uk>).

A 'Naval firing range' refers to an area of sea across which naval ships fire artillery at target sites or areas. In some cases accompanied by land-based observation facilities housing equipment to record accuracy and damage (<http://thesaurus.english-heritage.org.uk>).

Most military bases have restricted access to the general public and usually only authorised personnel may enter them (be it military personnel or their relatives and authorized civilian personnel). Military bases usually provide housing for military personnel, a post office and refectory facilities. They may also provide support facilities such as snack bars, a petrol station, chapels, schools, a hospital or clinic (dental and/or health clinics), shopping and convenience retail stores. Sometimes facilities such as fitness centres, libraries, athletic fields, and nurseries, amongst others can be found. Military bases provide accommodation for one or more units, but they may also be used as a command centre, training ground or providing ground.

Naval dockyards are often characterised by dry docks, basins, and tidal berths. Other facilities may include naval training establishments and bases for the Royal Marines (e.g. Plymouth). Often, some dockyards open to the public on certain days to enable visits by local residents and tourists (as for example on the Plymouth 'Navy Days'). Those that have museums are generally open most of the year (e.g. Portsmouth and Chatham).

Around English Territorial Waters there are several designated military practice areas, formally entitled 'Practice and Exercise Areas' (PEXAs), which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises. These include Royal Air Force (RAF) practice areas, submarine exercise areas and firing danger areas. Many of the practice areas in the marine zone in East Anglia are used for mine laying and mine counter measure exercises. Another off the south-east Cornwall coast is used for live firing exercises. Public access across these areas is only restricted during active exercises.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Army bases and barracks
- Radar bases and listening posts
- Firing/rifle ranges
- Naval docks and bases
- Submarine bases and exercise areas
- RAF bases

Before the mass mobilisation responding to the French Revolutionary (1792-1802) and Napoleonic Wars (1803-1814), soldiers and marines were usually housed within the structures that they garrisoned or close to naval bases. The massive increase in the number of military personnel after this point necessitated a widespread programme of barrack building, largely to a standard construction. Many of these were subsequently abandoned after the conclusion of the Napoleonic Wars. The invasion scares of the 1850s led to further military construction, this time with more of an emphasis on the provision of facilities for military families (Bone and Dawson 2008, 248).

Towards the end of the 19th century the advent of the railways and reforms aimed at stationing troops within population centres with the aim of fostering connections and boosting recruitment meant that barracks were no longer required to be located in areas vulnerable to enemy attack, for example the south coast (Bone and Dawson 2008, 248).

Formal naval facilities were established at Harwich in the 1650s and Devonport in the 1690s with the construction of the dockyard. The Devonport yard and its associated facilities expanded throughout the 18th and 19th centuries, becoming, with Portsmouth, one of the two largest naval bases in the country. In addition to the dockyard, facilities included a watering point, victualling stations (most notably the Royal William Yard), hospitals, gunpowder mills, and powder magazines. These were dispersed along the coastline fronting Plymouth Sound (Bone and Dawson 2008, 246).

During WW1, the Defence of the Realm Act enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. This included re-establishing Harwich as a naval base, sheltering the destroyers of the Harwich Force. Half a million people were stationed in England as a home defence force, and coastal defences were greatly extended. Much of the training of the army took place across the English Channel, or

on battle fronts. Some troops practised the construction of fieldworks for trench warfare, which left distinctive features on the landscape which can still be found today.

At the outbreak of WW2, under the Defence Regulations, the power to requisition and make use of land was given to service and civil departments. In 1944, at the peak period of the militarisation of the landscape in England, around 11½ million acres (4.6 million hectares) was under some form of military control.

As a result of these processes, the character of certain areas of the country became dominated by military facilities, for example the numerous airfields and bases of East Anglia. In recent years as the international political context has changed many of these facilities have been abandoned and in some cases re-used. A good example is the Orfordness base, which was used by the military from 1915 as a result of its isolated nature. The area was initially used as an airfield, an experimental station and a prisoner of war camp. After WW1 'the Ness' continued to be used for experimental flying and then as a general experimental facility and featured in the development of radar. The facility was used in WW2 as a training ground. However it became most significant during the Cold War when it was an atomic research establishment, developing the firing mechanisms for nuclear devices. Following the end of the Cold War Orfordness was bought by the National Trust and is now run as a nature reserve.

VALUES AND PERCEPTIONS

Recent military installations are usually perceived as State interventions in the landscape for national strategic reasons. This Character Type controls specific areas across the country dominating the landscape physically (through warning signs and security devices, sometimes highly intrusive in the landscape such as fences) as well as psychologically. Within some otherwise popular areas of the English coast, access is restricted due to firing, the Lulworth Range in Dorset being a good example.

Some of the more specialised military facilities have gained an air of mystery, most notably Orfordness in Suffolk. Its series of unusual structures and the isolated nature of the area, in addition to its long period of closure, has created an enigmatic feel for this disused facility.

Orfordness also exemplifies the maritime value of such facilities as its structures, including its highly visible radio masts, are important navigational aids in an otherwise featureless area of coast.

Elsewhere, extensive former military facilities situated in or near urban areas may offer redevelopment opportunities which use the former military fabric as a prestigious design feature, almost a pre-defined brand asset for the future development, a good example being the mixed-use redevelopment of the Royal William Victualling Yard in Plymouth.

RESEARCH, AMENITY AND EDUCATION

As defence installations, while in active use they are generally kept secret with restricted public access if any at all. However, recently decommissioned military sites and such features from earlier periods have received considerable prompt attention from military historians. Military installations and their history are understood as part of the nation's local, regional, national and international past and present. The inherently competitive nature of

warfare means that technology and its material expressions change rapidly in this particular sphere of human activity. Therefore, there is scope for further detailed and comprehensive archaeological research complementing both land and maritime perspectives. While operational, there will be little or no potential for amenity use but once decommissioned, military sites have considerable potential, being dramatic and 'exotic' at the same time. Those uses for public amenity may well compete with government needs to maximise financial returns from the land by disposing of it for development.

Programmes such as the Defence of Britain project (DOB), the National Mapping Project (NMP) and the Rapid Coastal Zone Assessment Surveys (RCZAS) have begun to record these facilities in locations where they may have otherwise been overlooked or forgotten.

Disused facilities have sometimes been put to educational and functional use, as seen at Orfordness which houses displays relating to its military use as well as providing a valuable amenity for eco-tourism and wildlife watching.

In terms of formal education, this character type is particularly relevant to the Secondary National Curriculum for history and geography, providing local, regional and national foci for studies of British, European and World History.

CONDITION AND FORCES FOR CHANGE

The Ministry of Defence and the armed forces themselves acknowledge the need, and take active responsibility for, maintaining historic features on their estate. The modern components are usually well-maintained while in use, although earlier features are vulnerable to alteration or removal by changes in current installations.

In the post Cold War period, the international political context has changed dramatically, as has the availability of training areas beyond the UK, and funding for the nation's defence. As a result of policy changes and defence reviews, many military needs served by these facilities are no longer supported, leading to their widespread decommissioning. With the government needing to maximise financial returns from this land, there are strong economic motivations to clear the remains of former military facilities and dispose of the land for redevelopment. This is especially true where the facilities are deemed to have little aesthetic value but which may nevertheless hold substantial historic evidential value which will need expert advice to elucidate.

A particular issue identified by the Ministry of Defence is the disposal of litter, rubble, spoil, and military equipment. The excavation of pits to dispose rubbish an intrusive activity which may impinge upon otherwise intact earlier deposits, especially as many coastal military training areas occur in areas also containing extensive surviving prehistoric and historic landscape features (Fulford 1999).

RARITY AND VULNERABILITY

This Character Type's occurrences for HSC are mostly scattered along the coasts of southern England and East Anglia, contributing strongly to landscape character as they tends to extend across discrete, often large, areas with a frequently high-profile sensory presence. Whatever one's perceptions of these areas, their decommissioning may inevitably lead to rapid character change which will vary according the form, age and design of the facility and its potential for re-development. Examples where redevelopment has recognised the development asset value of the facility itself, as at the Royal William Yard in Plymouth,

may be rare but could be more widely adopted if more imagination, understanding and sensitivity was exercised, recognising the various conservation values embodied by such facilities as they become redundant.

A particular issue has been the availability of a sufficient window of accessibility for historic environment specialists' recording and recommendation needs between a facility's announcement of decommissioning and proposals for actual closure and clearance for redevelopment. Improved understanding and communications between heritage professionals and the MoD would help resolve that.

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1.8 BROAD CHARACTER: SETTLEMENT

1.8.1 Character Type: Settlement

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Settlement includes the following Sub-types:

- Town
- Village

This Character Type relates to contiguous areas dominated by built structures serving various human activities including habitation. The range of activities beyond habitation, and extent of associated infrastructure, varies considerably.

The application of settlement terminology also varies enormously across England. A good example is provided by the differing applications of the term 'village' in areas of nucleated and dispersed settlement patterns and, partly related to that, the considerable sub-regional differences in the scale of settlement to which the term 'village' is considered appropriate. Relativism in application nationally is probably inevitable across HSC around different parts

of the coastline and is not necessarily to be deprecated: it reflects regional and smaller scale differences in settlement perception.

So accepting there will be such differing perceptions of the terms around the coasts, fairly bland and relativist definitions are seen as entirely appropriate here:

A 'town' is an assemblage of public and private buildings, larger than a village and having more complete and independent local government (<http://thesaurus.english-heritage.org.uk/>).

A 'village' is a collection of dwelling-houses and other buildings, usually smaller than a town with a simpler organisation and administration (<http://thesaurus.english-heritage.org.uk/>).

The term 'settlement' is generally used in disciplines such as archaeology, landscape history and other subjects to define a permanent or temporary community in which people live but along with that function is the potential for an enormous range of other socio-economic activities too, all of which may leave material imprints, whether or not structural. A settlement can therefore range in size from a small number of dwellings grouped together, to larger cities with surrounding urbanized areas. Settlement development can be based on analysis of archaeological or historical sources including, for the latest periods, historic Ordnance Survey maps; aerial photographs and local history.

In the context of HSC settlements are included where they are considered to be of maritime character. Coastal towns and villages often at least partially make their living from the sea and are inexorably linked to it as a consequence of their location.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- roads and trackways;
- enclosures;
- field systems;
- boundary banks and ditches;
- ponds, parks and woods;
- mills;
- manor houses, moats and churches, amongst others.

Settlement is a complex Character Type with different and numerous historical trajectories contributing to its present form. Therefore it is characterised by change and complexity but also strong elements of continuity. The variability of this Character Type is extensive, from region to region and from major metropolitan areas such as London, to tiny villages providing shelter for boats during stormy weather.

During the Neolithic period, the introduction of domesticated crops and animals had a profound effect on the development of settlement, land use and the landscape, intensifying changes already apparent in the preceding Mesolithic period. Pollen analysis has indicated phases of clearance, regeneration and further clearance. In some places, clearance was followed by soil deterioration initiating a process of degradation that was never reversed in some areas whose topography produced conditions of high rainfall and exposure. The present open higher moorlands of Cornwall, Devon, Somerset and Yorkshire are a product of this combined effect of human management and topographic form, an effect particularly apparent from the Bronze Age onwards (Aston 2000: 23).

During the Roman conquest, many new features were introduced to the landscape and new types of settlement appeared. Formal roads were built with military precision. Military forts were an innovation to the English landscape. Many, but not all, larger Roman towns seem to have developed from earlier forts, reflecting Roman strategic and tactical decisions. The introduction of the monetary system and the existence of markets in towns contributed to develop a more commercial economy in some areas. In late and post-Roman periods, the infrastructure enabling this commercial economy was disrupted and abandoned, returning to its former subsistence level (see Aston 2000). Large areas of former Roman towns appear to have fallen into neglect, developing black earth deposits over debris from previous floors and buildings.

Medieval English coastal towns and villages generally comprised fishing communities using small harbours, often little, if at all, protected by artificial harbour walling. Others sited on tidal rivers (often now silted) were trading centres. Most currently extant buildings in such settlements (except churches) are post medieval or modern. Some settlements were also built on shipbuilding industries and naval centres. Medieval coastal towns were often prosperous as a result of their proximity to the sea and their ability to therefore control trade and exchange.

During the post-medieval period settlements grew slowly at first. During the late 18th century, many coastal settlements started to rapidly expand with increased industrial activity and the growth of commercial activities. As a result, several new towns and industrial villages also grew up along the coast. The housing in these small communities was normally provided by the owners of the industrial enterprises who also built schools, hospitals, and chapels. The houses were often built in terraces with an allotment to the rear of the house. Rows of terraced houses can still be seen in many English coastal villages today.

The arrival of railways in the 19th century also encouraged the development of many coastal towns and villages, both by allowing their accessibility to tourist visitors and by enabling marine and coastal resources, notably fish for food, to reach large inland markets. By the 20th century, some towns and villages were created purely to house visitors such as Thorpeness in Suffolk. This mock-Tudor and *faux*-Bavarian village was the creation of a local landowner (Glencairn Stuart Oglivie) in the early 20th century who created a central mere by damming part of a tidal delta.

In the later 20th century, most coastal settlements also expanded through the provision of housing estates for local families and new residences for a growing population of retired people and people wanting second or holiday homes (e.g. in Cornwall and East Anglia). Many of England's coastal settlements are now largely residential or serve the tourist industry after their former industrial, harbour and port functions have died away.

Before the end of World War Two, many coastal settlements lacked basic, modern, sanitary amenities. Many of them were tenement buildings erected in the second half of the 18th century to accommodate the influx of labour to work in the shipyards, graving docks and ironstone mines (Frank 2002).

Today, England's coastal settlements vary greatly in form and function but all of them have a variety of building types from a range of periods, different sectors for residence, commerce, industry, storage, recreation, burial and ceremonial uses. Some settlements also

have military remains (from medieval castles to 20th century pillboxes) and most settlements have at least some areas of rich subsurface remains with the footings of past buildings and features of medieval or earlier periods.

VALUES AND PERCEPTIONS

There is an abundance of documentary sources stretching back at least three hundred years for most English coastal settlements but material remains, whether visible or buried archaeologically, may well date back far further to the early historic or prehistoric origins of the settlement. Influences from these settlements' past development may also be reflected in the street plans, market places, and surviving medieval buildings (e.g. castles and churches). Street names may also reveal now lost features or activities (e.g. Far Jetticks, Friarage Field, Iron Scar and Whale Hill amongst others). The discovery of artefacts and features encountered during developments and roadworks in towns represent a reminder to the observant dwellers of the richness of their town's past.

Coastal towns and villages also have important roles for mariners, not only as destinations and economic opportunities but also as distinct places signifying their position along the coastline or relative to inshore hazards. They are also watering and supply places, providing a breadth of necessary facilities and social life.

RESEARCH, AMENITY AND EDUCATION

Settlement patterns have been researched from many perspectives and these studies vary immensely. Of particular relevance is the work by Stuart Roberts and Brian Wrathmell (2000) characterising England's rural settlement patterns, of which patterns of coastal settlement form a distinct subset. Sociologists and historical geographers have also extensively researched patterns of urbanisation and urban regeneration. Smaller settlements have also seen dramatic changes throughout the 20th century whose drivers and present landscape/seascape effects and economic contexts are ripe for research using methods such as postcode address file analyses.

In rural settlements, extant buildings and the layout of surviving features are open to further study. In many cases, there will be a wealth of subsurface settlement remains, perhaps dating back to later prehistory. The study of documentary resources will complement archaeological studies, both shedding light on the history of the development of settlements in England.

Towns and villages are generally highly influential aspects of coastal landscape and seascape character. Their wealth and great variety of historical and archaeological components demonstrate considerable time-depth and contribute strongly to their area's appearance and character. This has potential for further archaeological and historical research as well as the development of education and outreach initiatives. Education and outreach initiatives for this Character Type can be particularly popular when based within local communities, focusing on their own town or village. Towns and villages are also attractive amenity elements, being often used by the tourist industry.

CONDITION AND FORCES FOR CHANGE

Although settlements, as hubs of human activities, go through continuous change, the layouts and historic fabrics of most of them in general are relatively well preserved, shedding light about the history and development of these settlements.

As places where people live and undertake their business, settlements will always have a dynamic nature. The creation of new means of transport such as roads, railways and sea transport such as ferries is a key area for large scale developments, often changing the character of towns and their immediate surroundings.

Many coastal settlements have declined since the late 20th century due to the popularity and more assured weather conditions of foreign holidays. In addition the expansion of ports and increased development can affect the character of nearby coastal towns, turning some into 'dormitory' suburbs of larger urban areas.

Today, the decline of the commercial centres of many towns in England, as out-of-town superstores take their toll, is perceived by most people as a negative force for change, removing traditional businesses and gradually taking away the meaning from these places.

A number of towns and villages are affected severely by coastal erosion. Policy towards addressing this is the responsibility of the Environment Agency but to ensure heritage considerations are fully informed and presentable, assessment work such as fine grained HSCs can complement surveys and recording by the English Heritage Rapid Coastal Zone Assessment Surveys.

RARITY AND VULNERABILITY

Towns and villages are frequent around most of our coastline and make strong and varied contributions to the seascape and landscape. They are vulnerable to change as are all of our settlements, with particular aspects applicable to them from the economic decline of the tourist industry and the effects of coastal erosion.

Subtle aspects such as street layouts and unusual features of, for example, buildings relating to commercial, social and religious concerns, may be easily overlooked and are thereby vulnerable but important for maintaining links with settlement origins and development as well as for enhancing local distinctiveness.

In many coastal settlements, historically and architecturally important structures are often designated as Listed Buildings. Similarly nationally important archaeological features may be designated as Scheduled Monuments. Conservation Areas also exist in most towns, generally in the historic cores. Local Plans reinforce these planning controls. The Historic Environment Record (HER)/Sites and Monuments Record (SMR) for towns are gradually improving but most HERs/SMRs still need to undertake a systematic reassessment of urban archaeological remains. Some settlements will also fall within areas covered by broader designations such as Heritage Coasts, National Parks or Areas of Outstanding Natural Beauty (AONBs) .

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1.9 BROAD CHARACTER: RECREATION

1.9.1 Character Type: Recreation

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Recreation includes the following Sub-types:

- Aquarium
- Bathing/swimming
- Recreational dive area
- Golf course
- Holiday park
- Leisure fishing
- Leisure sailing
- Marina
- Parks and gardens
- Seaside entertainment
- Sports facility
- Wildlife watching
- Promenade
- Pleasure pier
- Leisure beach
- Recreational open ground

'Recreation' refers here to areas whose dominant character arises from activities whose primary purpose relates to leisure, pleasure, or inspiration. This broad definition includes areas devoted to a considerable diversity of coastal and marine specific tourist and leisure activities whose commercial income forms a very important sector of the coastal economy. But it also includes areas dominated by less directly commercial aspects, such as those frequented by wildlife watchers, and areas given over to extensive public art installations such as Antony Gormley's '*Another Place*' art installation on Crosby Beach.

An 'Aquarium' is an area of buildings, artificial ponds and/or tanks in which aquatic plants and animals are kept for observation and study (<http://thesaurus.englishheritage.org.uk/>).

A 'Bathing/swimming area' is as it states; used by people predominantly for bathing and/or swimming.

A 'Recreational dive area' is used by recreational divers, sometimes focusing on wreck sites and other aspects of the cultural topography and historic environment interest.

A 'Golf course' is a prepared area of ground used to play the game of golf on (<http://thesaurus.english-heritage.org.uk/>).

'Holiday park' refers to areas dominated by commercial complex(es) encompassing lightly-built holidaymaker's accommodation and associated facilities, sometimes including entertainment areas. These areas include self-contained complexes often styled 'holiday parks' but also caravan parks and aggregations of chalet accommodation.

A 'Leisure fishing area' is used for recreational fishing and angling.

'Leisure sailing area' refers to areas used for recreational sailing, yachting, and other small craft pursuits.

A 'Marina' is a dock or basin, often inland, used for mooring yachts and other small pleasure craft (<http://thesaurus.english-heritage.org.uk/>).

'Parks and gardens' refer to parks and garden areas used for entertainment and relaxation, but only those assessed as having a distinctly maritime character are included in HSC, otherwise they are of relevance to HLC alone.

'Seaside entertainment' refers to areas dominated by commercial facilities, such as amusement arcades and fun fairs, used for entertainment by coastal visitors.

'Sports facility' refers to areas whose dominant character comprises provisions for sporting activity, whether or not commercially provided, and whether or not in areas of purpose-built structures. Only those assessed as having a distinctly maritime character are included in HSC, otherwise they are of relevance to HLC alone. So in HSC these may include, for example, land-based sporting facilities aimed specifically at coastal holidaymakers or areas regularly used for water-sports and often designated as such.

'Wildlife watching' refers to areas whose character is dominated by the recreational observation of wildlife, for example, areas regularly frequented by bird-watchers, boat trips to observe seals or cetaceans, or underwater nature trails.

'Promenade' refers to a designed open space within or extending from a settlement area, usually linear and specifically intended for strolling and public walks. Such promenades are often associated with good coastal views and commonly form part of the planned complex of facilities of a coastal resort.

A 'pleasure pier' is a raised platform, generally of iron and/or wood, supported on spaced pillars or props and projecting out into the sea and designed to provide primarily recreational access over the sea from the shore to an adjacent position near or below the mean low water level. Pleasure piers varied in size and complexity, but are commonly

support buildings providing light entertainment facilities and some incorporate embarkation points at their end and/or along their sides for ferries and pleasure shipping.

'Leisure beach' refers to inter-tidal areas, predominantly of sand, used mostly for leisure and relaxation by coastal visitors. A leisure beach may have a range of directly associated built facilities and may be managed actively by, for example, periodic scraping or beach replenishment, or passively by groynes, to retain the sand cover.

'Recreational open ground' covers open areas characterised by a principal use for public access and recreation. Any agricultural management of these areas is secondary and used as a tool to maintain the land's suitability for public recreation. Recreational uses of this land may include long distance footpaths, areas for the display and presentation of historic features, rural designed landscapes open to the public (but only where the design has a specifically maritime character), and areas of coastal land set aside for public appreciation of the maritime and coastal landscape.

Recreational appreciation of the coast has a relatively long history in England with origins in the earliest expressions of the Romantic movement. As such, areas dominated by recreational character today are likely to have had a number of previous recreational expressions in some areas. Later and current themes affecting the expression of 'Recreation' include the post-1950s decline of the English seaside resort and various current initiatives aimed at regeneration. Those recreational activities that have a maritime flavour could be exemplified by the gardens of many coastally-situated large houses open to the public, which are designed specifically to make use of the coastal topography and which display or shelter coastally-specific plant species. Similarly, golf-courses utilising coastal sand dunes rely for their physical existence on coastally-specific dune formations and for their economic existence by drawing on the coastal tourist trade.

Tourism is an important source of income and employment for many coastal regions and towns in England, Blackpool, Brighton, Scarborough, Clacton, Southend and Torquay being some well-known examples. The coastline attracts many people in pursuit of open-air leisure activities and many of these places have been visited historically for such purposes. Those visits have often prompted further commercial and visual attractions: Blackpool, for example, has been visited for well over a century because of the famous Blackpool Tower, its piers and seaside entertainment fun parks. Coastal recreational areas encompass a huge diversity, from small villages and high cliffs, to clear water and sandy areas offering a wide range of open-air leisure activities.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type involve, amongst others, walking, bird watching, sunbathing, golfing, climbing, camping, wildfowling, sea bathing, sailing, surfing, diving, leisure fishing, angling, water and jet-skiing.

Outdoor swimming pools, whether roughly created among inter-tidal rock formations or more formally built as 'lidos', were a recreational feature in some English coastal resorts. These pools were seen, especially in the 1930s, as a modern day 'improvement' on the 'health-giving' dips in the sea which first became popular with the aristocracy, but later used by the wider population.

Other coastal amenities in England include beach donkey rides, aquariums, pleasure gardens and parks. The cliff gardens and parks, with their walkways, boating lakes, fountains, flowerbeds and bowling greens, were appreciated for their peace and tranquillity.

Although golf has a long history extending back to the medieval period in Scotland, it appears to have been the installation of James VI of Scotland as King of England in 1603 that provided the impetus for the spread of the game south of the border. The first club outside Scotland, the Royal Blackheath, was not formed until 1766 but it is believed that the game had been played here since 1608. The first 18-hole golf course was constructed in 1764 and since then many have been built, often in coastal locations, particularly following the growth of the railways in the 19th century (<http://www.golfeurope.com/almanac/history/>).

Coastal resorts providing recreational activities developed in the 18th century as wealthier members of society began to appreciate the healthy air and relaxation of the seaside and many bought summer homes on the coast. This was boosted by the arrival of the railways and higher levels of income among the middle classes in the 19th century (Williamson 2005, 141).

The development of landscape heritage conservation measures in the later 20th century was applied to specifically coastal landscape too. A 'Heritage Coast' designation was initiated in 1972 to highlight the special scenic and environmental value of some stretches of coastline when development proposals are under consideration.

The 20th century saw the rapid development of the 'heritage industry' too. Coastal heritage sites and facilities in England, such as abbeys, castles, cathedrals and churches, the countryside, historic houses, Roman remains and museums are increasingly being used to promote tourism as well as increasing awareness about our common heritage.

VALUES AND PERCEPTIONS

Coastal recreation and water related activities have a number of positive outcomes, including health benefits, greater social inclusion, cohesion and quality of life, environmental protection and economic benefits (Church 2008). Many recreational activities such as swimming, rowing, canoeing, dinghy sailing and other activities that require sustained physical exertion are considered highly beneficial to achieve a healthy lifestyle.

Greater social inclusion and cohesion may be fostered through travel and recreation as a means of developing new social networks, acquiring knowledge and skills and gaining a sense of achievement whilst having fun.

In some regions of England, local authorities, including National Park authorities and other organisations, successfully manage a high level of water related recreation activity in very sensitive environmental sites using a wide range of tools such as permits, short closures and codes of conduct (e.g. the counties of Norfolk, Suffolk, and Essex, amongst others). This has shown that well-managed water-related recreation can happen alongside, and sometimes contribute to, sensitive environmental areas. As an example, angling organisations, landowners and private sector operators have all worked in partnership with the regulator, the Environment Agency to contribute to a significant increase in the availability and quality of riverine game-fish habitats (Church 2008: 7).

The economic benefits of recreational activity are closely related to those of the tourist industry, which is beneficial as a source of income as well as employment. This Character Type also stimulates consumer spending of sport related goods.

Recreation is perceived as an economic resource: a source of income and employment, but also as a means of providing a better lifestyle, hence it is highly valued for its contributions to the society as a whole.

RESEARCH, AMENITY AND EDUCATION

Recreation and tourism have had a profound impact on economy, infrastructure and social structure of England since the late 18th century. Further research of this Character Type could focus on a better understanding of the contributions of the tourist industry, past and present, to local coastal distinctiveness. Also to creating more effective tools to enable the prediction of tourism impacts from proposed developments.

Much recreation itself is essentially about various forms of human enjoyment of landscape and seascape as an amenity, whether simply perceived or artificially packaged and presented by public or private providers.

CONDITION AND FORCES FOR CHANGE

Coastal recreation plays increasingly significant and varied roles in the coastal and seascape perceptions both of tourists and coastal communities. Today, tourism is one of England's most important industries but cheaper and more attractive climatic conditions offered by easily available package holidays to the Mediterranean and beyond have put economic pressure on many seaside towns, although many of them are finding ways to regenerate, reinvent and re-launch themselves.

The UK Government has previously treated it as a national priority to promote sport and recreation in general as a means of improving people's health and quality of life. This has combined with the economic drivers for promoting the tourist industry in recent years in raising the profile of England's coastal recreation, sports in particular. Part of that has been a demand for better access to the coast itself, to which the 'England's Coastal Access' provisions are a response in the Marine and Coastal Access Act 2009.

Coastal recreation and the tourist industry in general require an infrastructure to be in place to enable their access and success, such as roads, footpaths, car parks and hotels. The development of these infrastructures and the activities of tourists, for example, can have major effects on the very historic cultural landscape/seascape that people live in or travel to enjoy. These effects can be summarised as: 1) offering positive opportunities to put provisions in place to increase public awareness, respect and enjoyment; 2) creating pressures for change and impositions on the present land/seascape, for example through new developments, signage, or increased visitor numbers, which some may welcome for the economic benefits but which others may perceive negatively..

RARITY AND VULNERABILITY

In character terms, recreational use has long been a major formative aspect along much of England's present coastline. Refurbishment and updating inevitably put pressure on earlier features but this is part of the ongoing change present and necessary everywhere. It needs

to be managed and accommodated in the same ways too, with knowledge and sensitivity regarding those aspects from the past that lend distinctiveness to places or which are judged by society (at many levels) to be rare or otherwise special. The latter may or may not be formally designated, but planning constraints on development initiatives in coastal areas also exert some control on the locations and forms of proposed recreation complexes.

Diving clubs that dive on previously unknown wrecks could potentially provide local archaeologists and historians with a wealth of new and valuable information on these sites. Encouraging collaboration between local divers, archaeologists and historians would provide opportunities to continue developing general public awareness. Recent initiatives from the Nautical Archaeology Society (see <http://www.nasportsmouth.org.uk/index.php>) and the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org.uk) provide some examples.

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1.10 BROAD CHARACTER: CULTURAL TOPOGRAPHY

1.10.1 Character Type: Palaeolandscape component

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Palaeolandscape includes the following Sub-types:

- Palaeolandscape component
- Palaeochannel
- Submerged forest
- Peat deposits

This Character Type includes surviving areas of ancient topographic features of former exposed land with evidence of strong potential for associated palaeoenvironmental deposits and/or old land surfaces. Many are areas that were once dry land at times of low sea level during the glacial periods and within several millennia to either side of them, when much water was locked up in the ice sheets. The relevance of these to HSC is as areas of former human habitat whose past topographic and ecological regimes shaped early human cultural activity and the perceptions it reflected, as well as our present understandings of those past landscapes. In intertidal or marine contexts, these will now mostly be submerged beneath the sea, buried beneath post-transgression sediments or buried deep in the muds and silts of estuaries and rivers. Part of this Character Type includes submerged forest remains recorded in some intertidal and inshore areas.

'Palaeochannel' refers to the course or channel of a river or stream preserved as a geological feature (<http://thesaurus.english-heritage.org.uk/>).

Submerged forest refers to tracts of submerged land retaining macrofossil evidence, often in situ, for former woodland and other woody vegetation cover. Submerged forests are strong indicators of submerged early land surfaces and contain important information relating to past human activity and habitats.

Peat deposits comprise unconsolidated semi-carbonised plant remains formed in freshwater-saturated environments. As a Sub-character Type, peat deposits refer to those formed in earlier periods and may be exposed by erosion on the land, intertidal or sea-floor surface, or they may be buried beneath later deposits. Their excellent preservation of organic remains gives peat deposits a particular importance in understanding past environmental conditions but they also have a vital role in terms of cultural landscape perception. They reflect areas of former bog which was often at the margins of the regularly visited and territorially familiar, a position ripe for endowment with spiritual significance and enhanced by a special reverence for water evident in early religions. Many ritually deposited items and hoards, and human bodies, have been found in peat deposits. Other, possibly more functional, artefacts include prehistoric trackways, such as those found on the Somerset Levels. Later cultural activity includes cutting and drying of peat for fuel, often the subject of the specific right of 'turbary' on common land, and in more recent times, industrial-scale peat extraction for garden soil enhancement. Many areas with rich peat deposits are now areas enjoyed recreationally by walkers and others.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The earliest dated evidence for human activity across north west Europe was recently pushed back to 950,000 BP by discoveries of exposed sedimentary sequences at Happisburgh and Pakefield on the coast of Norfolk and Suffolk (www.ahobproject.org/Happisburgh). For all glacial periods there is potential for archaeological material deposited in sediments on the continental shelf. For example, Pleistocene fluvial, glacial and periglacial and beach gravels form much of the Palaeolithic archaeological record. Furthermore, Late Devensian and Holocene gravels provide much of the buried archaeology of valley landscapes (Brown 2004). Processes such as climate change and the fluctuation of sea levels, particularly those resulting from glaciations, over the last 2 million years have contributed to the deposition of sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by river systems that are now submerged (BMAPA 2000; ODPM 2005). These processes periodically exposed the seabed as dry land, creating a space for human occupation and the potential for associated archaeological evidence. Hence, the potential of survival of palaeolandscapes in

marine deposits in and off English waters is immense. Fulford *et al* (1997) mention that 'recent interest in the potential of underwater landscapes around England was stimulated in part by an audit of the English coastline in 1997 which recorded coastal prehistoric peat deposits that were seen to follow ancient river systems extending offshore'; this makes reference to the rich source of Mesolithic material from the Solent area (e.g. Bouldnor Cliff) and the large number of finds found in Essex (Flemming 2004; Fulford *et al* 1997: 108; Momber 2004). More areas have been discovered since then, off the Humber being an example. Furthermore, there are confirmed examples of prehistoric sites in the intertidal zones from Neolithic and Bronze Age in England (e.g. Wootton Quarr and Langstone Harbour) stressing the historic character of these submerged landscapes. Fleming (2002) also identified a series of hotspots for palaeolandscape including fossilised river valleys, cliff coasts, estuaries, wetlands, mudflats and peat deposits.

In addition numerous archaeological remains have been recovered offshore through processes such as fishing and aggregates dredging, indicating the presence of further landscapes. For example worked bones dating to the Mesolithic have been trawled up by fishermen around the Dogger Bank and Brown Bank areas off the east coast and a number of Palaeolithic handaxes were recovered from aggregate dredging area 240 off Great Yarmouth.

Given the current limited understanding and early stages of research regarding this Character Type, various considerations were emphasised by Dix *et al* (2004) when seeking to understand its components, features and variability:

- There is a spatial and temporal diversity of archaeological material that potentially exists in the submerged areas of the UK continental shelf
- Large scale patterns of land use are evident in the terrestrial record which are likely to be applicable to the submerged regions
- The present seabed is not an exact analogue of the 'lowstand' land surface
- The submerged prehistoric material is likely to exist in one of the following states of preservation: primary, secondary or tertiary context
- The research potential of secondary contexts for the Upper Palaeolithic and Mesolithic and tertiary contexts for all periods needs to be further examined
- The prehistoric potential of the submerged material goes beyond interpretations referring to 'landbridges' or migration corridors
- Areas identified for further research include the antiquity and importance of coastal exploitation, and human response to sea level change
- Effective interrogation and exploitation of the submerged archaeological resource will require secure and accurate landscape reconstructions
- A significant quantity of archaeological material will be reworked by marine processes. Understanding the processes behind this is crucial to our understanding of submerged landscapes and future work should address these processes in detail.

A more secure understanding of marine taphonomic processes may aid our understanding of the potential and location of marine secondary and tertiary contexts.

VALUES AND PERCEPTIONS

Despite a long-standing tradition of research into coastal and marine landscapes and landscape perceptions in some areas, such as the Isles of Scilly (Thomas 1985), this has been limited. The maritime archaeological community has now started to recognise that maritime archaeology is not only concerned with shipwrecks but also prehistoric submerged landscapes. The archaeological potential that exists on the continental shelves has been

recognised in the UK, especially through the Aggregates Levy Sustainability Fund (ALSF) projects (see <http://ads.ahds.ac.uk/project/alsf/>), due to raised awareness from the recent expansion of industrial concerns onto the shelf.

However, for the wider community, the wider archaeological potential of these submerged landscapes is still mainly unknown. The latent public interest in undersea archaeology is already evident from the popularity of television series focusing on shipwrecks. The need to extend this to submerged landscapes is now being addressed by work such as Natural England's 'Undersea Landscapes Campaign' in 2008-9, and by considerable public interest which followed the screening of a Time Team special entitled 'Britain's Drowned World' in 2007. Historic Seascape Characterisation itself can build on this interest by providing a resource relevant to everyone's familiar area of the coast and sea, and which can inform and be responsive to public understanding.

There is also a developing interest in palaeolandscapes within those sectors of society which regularly come into contact with the resource. In particular fishermen and aggregate dredgers who often recover artefacts such as stone tools and bone. The Marine Aggregate Industry Protocol for the Reporting of Finds of Archaeological Interest funded by the ALSF is a clear expression of interest and support from the marine aggregates industry.

RESEARCH, AMENITY AND EDUCATION

Processes which periodically exposed the seabed as dry land created a space for human occupation and the potential for associated archaeological and palaeoenvironmental evidence. The potential of these marine deposits is therefore immense, and there is a need to enhance our understanding of these drowned landscapes and palaeoenvironments which are still relatively poorly understood. The significance of this potential is emphasised by the discovery of the stratified Mesolithic occupation site at Bouldnor Cliff (Momber 2004). To date, this is the only stratified prehistoric occupation site identified in UK waters. Additionally, there are submerged prehistoric landscapes and associated palaeoenvironmental material dating to the Neolithic and Bronze Age both off the Isle of Wight coast and off the New Forest, running for kilometres along the coast (HWTMA 2006, 2008). Remains of a submerged forest of St Mary's. Isles of Scilly, discovered in 2005, have recently been radiocarbon dated to the Late Mesolithic, a charcoal peak in the vegetation record could indicate slash and burn (Camidge et al 2010). Today, these provide baseline information about the time-depth of those now submerged landscapes.

Since the end of the last glaciation, rising sea levels resulted in the inundation of many coastal areas that were once terrestrial habitats. These submerged landscapes are now a major focus of underwater archaeological investigation because they potentially contain a high proportion of the prehistoric record of human settlement on coasts (Flemming 2004; Quinn et al 2000; Sonnenburg and Boyce 2008). On an international scale, the palaeolandscapes of the North Sea are crucial to our understanding of human development and periods of prehistory for which we have little evidence, as illustrated by the deposits uncovered at Pakefield and Happisburgh. The UK Continental Shelf is under intensive developmental pressure from a range of threats including mineral extraction and the direct impact of construction (Dix *et al* 2004). Because of these threats, further research will enable a deeper understanding of this Character Type before it is lost to future human

activity or to erosion processes. Public awareness should also be raised through dissemination programmes which focus on these unique submerged landscapes.

Some academic research has begun to address this Character Type, including Southampton University's 'Reassessment of the Archaeological Potential of Continental Shelves' (Dix et al 2004) and Birmingham University's 'North Sea Palaeolandscape Project,' now being extended to other areas. The form and scale of palaeogeographic and palaeoenvironmental change of the UK continental margins is of particular relevance to the processes of reconstruction, as it can radically alter prehistoric and historic timescales. Therefore, there is a need to understand the character of the UK continental margins and the short- and long-term processes that affect them. In an ideal world research into submerged prehistoric landscapes would proceed on very small "local" spatial scales (studies in the order of tens of metres through to a few kilometres), thus allowing very fine details to be observed. These smaller scale studies could then be fed into larger "regional" overviews (10s to 100s kms). In practice, the realities of underwater work render such a bottom-up approach sometimes difficult to undertake mainly due to lack of funding invested in this type of research. It is also clear, as on land, that the pace of change and areas being subjected to current and future development pressure far outstrip any possible progress at such fine-grained scales. Historic landscape and historic seascape characterisation provide one response to this problem. Dix et al (2004) suggest that the majority of research on continental shelf archaeology will be undertaken on the regional scale, with only occasional, more detailed analyses of local scale studies being possible. In this sense, the adoption of a top-down approach could be used to maximise the regional data and, through appropriate analysis, utilise it to effectively target local detailed surveys (Dix et al 2004).

In terms of formal education, palaeolandscapes provide excellent case studies for cross-curricular work looking at environmental change and how it affects populations over time.

CONDITION AND FORCES FOR CHANGE

Since the last glacial maximum, rising sea levels submerged many areas that were once terrestrial habitats. These are under intense pressure from a range of developments including bottom trawl fishing, mineral extraction and the direct impact of construction. Specific threats range from the laying of pipelines to, more recently, the development of wind farms, the wider issues of mineral extraction and the extensive, generalised, impact of fishing and commercial trawling (Dix et al 2004). The cumulative knowledge that such developments are producing through Environmental Impact Assessments (EIAs) should enable a deeper understanding of this Character Type before it is lost to modern human actions and erosion processes.

The erosion-losses of unconsolidated cliffs from around many stretches of the English coastline are widespread and often rapid, but the change from wide-scale sedimentation to active erosion is less common. Pressures on this Character Type are also increasing with the erosion on the sea-floor of drowned soils that were once habitable land.

RARITY AND VULNERABILITY

Submerged Palaeolithic and Mesolithic landscape features are relatively rare in England, Bouldnor Cliff being an example (see Momber 2004). As such, these deposits are regarded as of national, and even international, importance. Wherever possible, advice is given by historic environment curators to leave these deposits undisturbed due to the extreme

fragility of peat deposits and associated faunal remains (and potential human occupation evidence such as structures). Furthermore, Neolithic and Bronze Age submerged landscape components are also relatively uncommon in England. Some examples have been found in areas such as the Solent as well as in tidal rivers and estuaries in England (e.g. Wootton Quarr (Isle of Wight), and Humber Estuary, amongst others). Prehistoric landscape remains in the intertidal zone are commonly exposed to eroding processes, giving a frequent emphasis on needs to monitor their exposures and record newly exposed ones, Wootton Quarr (Isle of Wight) and Langstone Harbour (Hampshire) being good examples.

Understanding the submerged prehistoric landscape components of the UK Continental Shelf is key to understanding the prehistory of Europe. Submerged prehistoric landscapes can survive with sufficient integrity to provide evidence for settlement patterns, working sites, fish weirs, hearths, food remains, craft and burials (see Flemming 2004; Momber 2004). Submerged prehistoric landscape features represent a nationally and internationally valuable resource holding evidence for how humans used and perceived these past landscapes, re-populated north west and northern Europe after the last glaciation, and adapted to the post glacial environment. They contribute to a more comprehensive understanding of the past and shedding new light on current issues including coastal and climate change.

Natural erosion processes occur along the English coast. However, some places are more severely affected than others (e.g. the coast of East Anglia). These processes appear to comprise the greatest vulnerability of this fragile Character Type.

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1.10.2 Character Type: Cultural topography (landward)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Cultural Topography (landward) includes the following Sub-types:

- Cliff
- Dunes
- Lake, pond
- Reservoir
- Watercourse
- Wetland

- Lagoon

This Character Type refers to those aspects of cultural topography whose physical expressions occur predominantly to landward of Mean High Water and which possess various aspects of maritime cultural character .

A cliff is defined as a relatively tall, steep and largely exposed face of the local geological formation, usually of rock though in some areas cliffs may form from erosion of softer materials such as boulder clay. Cliffs are formed by the processes of erosion and weathering and are frequent along coasts and rivers. Their form, appearance and profile varies considerably with their composition. Along much of southern England's coastline, cliffs are usually formed by sedimentary rocks such as sandstone, limestone and chalk, the White Cliffs of Dover (chalk) being a well-known example. In south western England, the hardness and jointing patterns of igneous and metamorphic rocks, such as the granite, serpentine, and slate of Cornwall, can form completely different cliffscapes. In East Anglia cliffs are primarily formed from clay and sand, making them very soft and subject to rapid erosion. Cultural aspects of cliffs include their use as vantage points for the military and for maritime safety lookouts, and recreational uses such as rock climbing and coastal walks. Many have provided ready opportunities for quarrying and other extractive industries. Many distinctive cliffs have specific names and serve as familiar coastal landmarks for users both of the sea and land.

Dunes refer to areas containing hills or ridges of unconsolidated wind-blown sand. The surface of many of the ridges and the intervening slacks may or may not be stabilised by surface vegetation. Cultural aspects of coastal dunes include settlement features and ancient land surfaces sealed by the onset of dune formation and, in some cases, their preservation of sequences of prehistoric and later land surfaces within their fabric during their long development. Their tendency to occur behind landing beaches often produces extensive military defences and structures within dune systems, while the remoteness of some extensive dunes has been used for explosives works such as those at Hayle Towans, Cornwall. Many are wildlife reserves and currently provide a recreational resource for coastal visitors.

Lakes and ponds refer to inland bodies of fresh water, included in HSC where they have a distinct maritime character. 'Lakes' generally refer to the larger examples, and 'ponds' to the smaller, but there is a gradation between the two. Similarly with the extent to which they are artificial: most ponds and lakes have become artificially defined to some extent even if their origins lie in relict glacial meltwater lakes, while some ponds are wholly artificial. Cultural aspects are many and varied. Ponds, for example, are used for a breadth of recreational and inspirational activities by anglers and artists, while many larger lakes also support a range of watersports.

Reservoir refers to a body of water, wholly or partly artificial and sometimes covered, used to collect and store water for a particular function (<http://thesaurus.english-heritage.org.uk>). Many larger examples were designed to provide supplies of drinking water and continued to be used as such, while others have become redundant and now serve primarily as wildlife reserves or watersports centres.

Watercourse refers to a channel used for, or formed by, the conveyance of water. Watercourse can be largely natural in formation such as rivers, or artificial such as aqueducts or drainage channels (<http://thesaurus.english-heritage.org.uk>). Watercourses

serve a wide variety of cultural roles including transport of goods and people, water supply, land drainage to enable agricultural intensification, and recreation in the form of angling, kayaking and so on. Watercourses have always had an important place in the perception of the landscape, with river names preserving some of the most archaic of surviving place name elements. By offering channels for communication and obstacles to movement they still frequently form territorial boundaries, a role which dates back as far as we can perceive such boundaries in the landscape. Water was often given a special reverence in early religions which led to the ritual deposition of many individual items and hoards in natural watercourses

Wetland refers to an area whose soil is saturated with moisture, either permanently or on an intermittent cycle, such as fens, marshes and peat bogs. The dominant vegetation of wetlands varies considerably and the vegetation cover may be broken by areas of open water. The surviving extent and distribution of wetlands has been significantly affected by human activity, particularly through land drainage and reclamation for agricultural use and urban expansion. Past and present economic activity includes wildfowling and the cutting of peat for fuel and garden soil enhancement. Many wetland areas are now managed as wildlife reserves and enjoyed recreationally. A notable example of this is the Norfolk and Suffolk Broads, now afforded the equivalent status of a National Park.

Lagoon refers to a body of shallow salt, brackish or fresh water, totally or partially enclosed from the sea by a sand bar, spit or reef running across the entrance. In cultural terms, activities on many lagoons and their adjacent enclosing land are now controlled by wildlife and geomorphological conservation designations, themselves a cultural intervention. The enclosing bars of lagoons' may carry routeways, in some cases metalled roads, taking advantage of the direct route across an otherwise indented coastline. Lagoons are often visited by people for leisure, recreation and inspiration, sometimes with associated facilities to serve them. Lagoons have also on occasion served as areas for military training.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Frequent components of this Character Type include:

- military defences (e.g. pillboxes, anti-tank cubes, signal stations, fortifications, radar stations)
- maritime safety services (e.g. coastguard lookouts)
- navigation aids (e.g. lighthouses, fog stations, landmarks)
- specifically associated infrastructure and features related to industry (e.g. quarries, mines, lime kilns, railway tunnels)
- specifically associated infrastructure and features related to recreation (e.g. nature reserves, walk trails)
- specifically associated infrastructure related to fishing
- settlements

Prehistoric remains in the form of peat deposits can be found embedded within cliff areas. The early Lower Palaeolithic sites on the East Anglian coast (specifically at Happisburgh and Pakefield) are some examples. These sites lie within sediment units exposed on beaches and the bases of cliff sections. Recent marine geophysical and geoarchaeological work has demonstrated that some sediment units be traced offshore, specifically, off Pakefield (Murphy 2007; Wessex Archaeology 2008). From at least the 16th century onwards, cliff tops with strategic sea views have been important for military, coastguards and fishing

purposes. Military sites found on cliff tops include look-outs, pill-boxes, batteries, radar stations, castles and forts. Coastguard look-outs and lighthouses can also be found.

Dunes of wind-blown sand and shell deposits occur along low-lying stretches of shoreline. Some dune systems along the English coast are designated to promote their conservation from various perspectives. For example, Winterton Dunes is an extensive dune system on the east coast of Norfolk, which has been designated as a National Nature Reserve and is within the Norfolk Coast Area of Outstanding Natural Beauty (AONB). Winterton has suffered from extensive coastal erosion and is threatened by sea level rise. In general, dunes are post-glacial creations. They are dynamic features and their development is due to the succession of periods of sand movements and stabilizations. For example, a stabilised land surface may be used for pasture, cultivation and settlement before being affected by further sand blow. Later on, this sand surface may become stabilised and re-used again for pasture, cultivation and settlement. Inundations of blown sand may be rapid and may occur as a result of a single storm, given the conjunction of the right conditions. It has been recorded that depths of 2-3m of sand have covered agricultural land in a single event at Gwithian, Cornwall in historic times (Nowakowski *et al* 2007, 58). Prehistoric and historic remains can be buried within dune systems. Consequently, the time-depth within dune systems should not be overlooked.

Lakes can be formed by a number of natural processes. Tectonic uplift and subsequent erosion of a mountain range can create bowl-shaped depressions that accumulate water and form lakes. The advance and retreat of glaciers can gouge troughs and depressions in the surface where water accumulates. For example, the Lake District features (North West England) result from successive periods of glaciation. These features include the ice-carved wide U-shaped valleys, many of which are now filled with the lakes that give the park its name, impounded by areas of glacial moraine.

Lagoons can be formed through both natural and man made processes as demonstrated by the series of features on the Suffolk coast. Three large lagoons between Benacre and Easton Bavents were formed by the dynamic processes of the coastline whilst a fourth was formed through gravel extraction during the Second World War. Further lagoons on Orfordness were the result of clay extraction.

Reservoirs generally refer to an artificial lake which is used to store water for different uses. Reservoirs are often created by building a sturdy dam. Once the dam is completed, the stream fills the reservoir. When a reservoir is predominantly human-made (rather than being an adaptation of a natural basin) it may be called a cistern. In England, Thames Water has many underground reservoirs beneath London built in the 1800s by the Victorians, most of which are lined with thick layers of brick.

Watercourses have been utilised since prehistoric times in England and settlement patterns have been found close to freshwater sources. Recent evidence from dried up channels of major rivers like the Thames suggests that rivers and lakes may have been used as funeral areas in the later Bronze Age and Iron Age. In East Anglia the extensive watercourses and wetlands known as the Broads were partially formed by the process of peat extraction. This began locally in the 12th century to provide fuel and was undertaken on such a scale that large pits were formed and subsequently flooded, forming the landscape we see today.

Natural rivers and lakes were used as critical water-supply resources as well as waterways for the transportation of people and goods. Most of these have been later modified to

consolidate and stabilise their channels or to make navigation more reliable by the construction of artificial channels and flash locks. The expression of many rivers in the present land and seascape is also modified by the considerable geomorphological changes wrought to most river valley floors by deep deposits brought down from millennia of agriculture and, in some areas, by debris resulting from extensive extractive industries along the river catchments.

VALUES AND PERCEPTIONS

In England, some cliffs have a territorial iconic value. For example, those that face towards Continental Europe, such as the White Cliffs of Dover, forming an outwardly visible national symbol of the country's stand against the threat of invasion during the Second World War.

Dune systems is often valued highly for their sense of remoteness and their unmanaged feel, aspects of character altered when in proximity to housing and where dunes have become subject to golf course developments. Public perception often overlooks that the history of the dune systems is often linked to the marine environment and forms a local economic resource in several respects.

The sense of spiritual fulfilment which lakes often engender has a very long history in the perception of our cultural landscape, together with a special reverence for water evident in early religions. Many ritually deposited items and hoards have been found in present and former lake beds.

Ponds are often individually named as distinctive familiar features in the landscape; many are used for a breadth of recreational and inspirational activities by anglers, artists, those visiting to enjoy the views and to picnic, with many larger lakes supporting a range of watersports.

Watercourses and water bodies in general have been a critical resource for survival, supplying necessary water for communities. They have, and remain, frequently used culturally to define territorial boundaries, or conversely to defined territorial heartlands: foci for settlement and a sense of community. They are also a source of enjoyment through many recreational activities such as swimming, waterskiing, boating, surfing, and diving. Lakesides, beaches and waterparks are also popular places for relaxing and inspiration, which may be expressed through art. Many people find the sound of flowing water to be calming. Some keep fish and other water creatures in aquariums or ponds for show, fun, and companionship. Water fountains have also been created for public or private decorations.

From industrial and transport perspectives, rivers and estuaries have long been important routeways, used over the millennia as crucial transport systems conveying people and goods. In some cases watercourses have been essential to the economic development of whole regions, as for instance, the Orwell in Suffolk was and still is extensively used to transport goods to and from Ipswich, a riverine route established as early as the Anglo-Saxon period.

Wetlands have been used as a cultural resource for their products for millennia. They have for example been used to source reeds, rushes and sedge for use in thatching, animal feed, etc, and for hunting activities such as wildfowl trapping.

Cultural perceptions have also often seen wetlands as areas at the margins of territories, a position ripe for endowment with spiritual significance, enhanced by a special reverence for water evident in early religions. Many ritually deposited items and hoards, and human bodies, have been found in wetlands. In the present day, the marginal place of wetlands is reflected in their frequency as the setting for novels and literature designed to invoke fear.

This Character Type generally provides rich wildlife habitats which, in turn, attract a large number of recreational wildlife watchers. Extensive natural environment designations also illustrate the high environmental values which people apply to this Character Type.

RESEARCH, AMENITY AND EDUCATION

The geological history of cliffs has been extensively researched. However, a broader perspective is needed from a point of view which integrates the different aspects of human activities on the landscape/seascape. This may be particularly appropriate in areas such as East Anglia where evidence of early hominin activity has recently been found in eroding cliff deposits at Pakefield and Happisburgh.

In terms of amenity and educational purposes, cliffs are frequently visited by walkers and climbers, amongst others. Therefore, there is potential to enhance the understanding, appreciation and enjoyment of the heritage encountered by these people on the cliffs.

Dunes can often contain well preserved and stratified buried prehistoric and historical remains. The study of the formation of dunes and their link to the marine environment and climate history could provide an important contribution to the understanding of past human activities. Further research on the geomorphology of sand dunes would enhance this capability. Due to the dynamic nature of dune systems, regular monitoring surveys, particularly after major storm events, are appropriate to identify material remains. In areas with acidic igneous and metamorphic geologies, such as Cornwall, areas containing wind-blown sand may be the only locations where bone is widely preserved in historic and prehistoric contexts, so providing an opportunity for the study of past populations that cannot be conducted outside such coastal areas.

Recreation has used dunes mainly as adjuncts to desirable beaches or as bunker-filled golf courses. However, there is potential for encouraging the appreciation of the dunes themselves, their flora and their historic dimension via online resources and carefully-sited in situ information provision, operating in conjunction with nature conservation needs. On the west Lancashire coast, for example, many of the extensive areas of sand dunes are protected as nature reserves, both for their flora and for the red squirrel populations surviving in the coniferous woodlands planted to protect the dune systems.

The effect of water quality (pollution) on the historic environment may be a factor affecting the preservation of terrestrial, intertidal, and submerged prehistoric and historic features. Pollution alters the chemical composition of water and soil, often making them more acidic and therefore more likely to damage prehistoric and historic features. However, little research has been undertaken on water pollution and its effect on the marine historic environment (Fulford *et al* 1997).

CONDITION AND FORCES FOR CHANGE

Cliffs will continue to experience the gradual erosion by natural forces as well as the culturally induced long-term threat of sea level rise along the English coast. Human forces for change include the construction of sewerage schemes and coastal defences, amongst others. The effects of these construction processes as well as the movement of water and sediments could damage the potential historical and archaeological remains in this Character Type.

Fixed dunes and dune heath are regarded as priorities for conservation under the European Community (EC) Habitats Directive (www.ukbap.org.uk). The Sand Dune Survey of Great Britain (1993-1995) gives the total area of sand dunes as 11,897ha in England. Major dune systems are widely distributed, being found around the English coast (except the English Channel (other than Sandwich Bay) and the Thames Estuary). Dune systems are complex and dynamic entities prone to instability and sudden large-scale shifts. This can have significant impacts on the surrounding environment as well as important consequences for recognising, dating, and conserving archaeological remains within these areas. The main threat to dunes appears to be from the expansion of recreation facilities as well as erosion processes and sea level rise. This dynamic and complex environment will naturally change and develop through time. Both natural and cultural processes will directly impact upon this Sub-type and its surroundings such that dune environments will be unlikely to continue evolving as they have done in the past.

Clean water supply is critical for inland areas but there are also concerns along coastal areas about the discharge of water and sewage into the sea, and maintenance of water quality. The effect of water quality (pollution) on the historic environment may also be a factor affecting the preservation of terrestrial, inter-tidal, and submerged prehistoric and historic features.

RARITY AND VULNERABILITY

As already noted, this Character Type is under pressure from a broad range of human activities and their interaction with natural processes which will combine to affect their roles in contributing to our seascape perceptions.

In terms of rarity, along the English coast some cliffs, lagoons and wetlands fall within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some occasions they are designated as a Heritage Coast. As an example, Tintagel Cliffs (Cornwall) are a SSSI (<http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/sssi/default.aspx>) and the area of Tintagel also possesses a wealth of cultural roles, both in terms of its material heritage with nearby Tintagel Castle and many associated features, and for its less tangible popular reverence for many centuries on account of its parts in the legends surrounding King Arthur and the Knights of the Round Table.

Today, a large proportion of the sand dune resource in England is valued and considered rare enough to be designated as SSSI, SAC SPA, and/or National Nature Reserve (NNR). For example, Winterton Dunes, an extensive dune system on the east coast of Norfolk which has been designated as a National Nature Reserve and is within the Norfolk Coast Area of Outstanding Natural Beauty (AONB). Dunes are generally rich in buried prehistoric and historical archaeological deposits. These are usually particularly well-preserved since dunes

offer a non-acidic environment. Industrial and early recreation sites, such as golf courses, may also survive well within this environment. Dunes are relatively rare formations, and the prehistoric and historic features found within them and other associated remains could also be rare. The geological, ecological and cultural values embodied by dunes and the other expressions of this Character Type overlap and inter-relate: all are relevant when considering initiatives for change and development which affect them. A consideration particularly affecting lakes, ponds, reservoirs, watercourses, wetlands and lagoons is their vulnerability to activities and events far upstream, and the downflow of concentrate materials such as pollutants and sediments.

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1.10.3 Character Type: Cultural topography (inter-tidal)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Saltmarsh
- Sandy foreshore
- Shingle foreshore
- Rocky foreshore

- Sandflats
- Mudflats

This Character Type refers to those aspects of cultural topography whose physical expressions are predominantly in the intertidal zone, including along estuaries. For HSC, the inter-tidal zone is perceptual at least as much as a matter of technical definition: the relationship between the actual extent of the [perceived 'inter-tidal' zone and the levels of Mean High Water and Mean Low Water will vary from place to place due to many factors.

Saltmarshes are areas in the upper inter-tidal zone whose vegetation cover is dominated by salt-tolerant herbaceous plants. The tide is the dominating characteristic of a salt marsh, the cyclical inundation by salt water defining the plants and animals that can survive in these areas. The extent and distribution of saltmarsh has been strongly affected by human activity, especially land reclamation for agricultural use and urban expansion, and by the impacts of pollution. A particular issue is 'coastal squeeze', where lines of fixed sea defences prevent the inland expansion of saltmarsh in the face of rising sea levels and losses to erosion. Now seen as a valuable buffer mitigating the coastal impacts of rising sea levels and increased storminess, some areas of saltmarsh are being deliberately allowed to expand by breaching former sea defences. Economic uses of saltmarshes have included seasonal grazing and wildfowling. In some areas they supported a prolific salt-making industry, boiling off the brine to leave sea salt and leaving tangible remains include 'red hills': mounds of burnt debris and briquetage. Past and ongoing human activity has also affected the creation of deposits supporting saltmarsh in at least some areas: millennia of material washed downslope from agricultural soil disturbance and extractive industries on land have had profound geomorphological effects on many of our river valleys and contributed to the quantity and chemical composition of the silts deposited in estuaries. Large areas of saltmarsh have historically been reclaimed for agricultural use.

The foreshore is broadly equated in HSC with land sloping down through the intertidal zone from the landward coastal margin; the extent of the foreshore is defined by the perception of intertidal levels. The English foreshore remains a well-used and well-visited resource. It also contains a rich and diverse legacy of prehistoric and historic remains which are vital to enable a deeper understanding of the long-term relationship with the sea and of those maritime influences which have contributed to the forging of England as a major mercantile, industrial and imperial nation.

A foreshore surface may be covered by exposed sediments of various grain sizes, by loose rock or bedrock, or it may have a vegetation cover as in a 'Saltmarsh'. In a 'Sandy foreshore', the predominant cover is exposed fine rock sediments of a grain size generally perceived as 'sand'. It is the perception that matters more than the technical definitions of sand by particle size (eg http://www.bgs.ac.uk/planning4minerals/Resources_3.htm). Human activity has had a considerable effect on the current distribution of sandy foreshores, with deliberate retention of sand in some areas by the use of groynes, and corresponding depletions elsewhere by beach replenishment works and by quarrying of beach sand for the construction industry to name a few. Many sandy foreshores are now visited for leisure and they form one of the principle areas by which most people engage directly with the intertidal and marine zones. Other cultural activity now or previously affecting this Type includes shellfish and bait gathering, and impromptu areas for landing and loading cargo. As easy landing places, many sandy foreshores form the focus for military coastal defence systems. Their shelving profile also makes them high risk zones at

times of extreme high spring tides and storm surges, therefore many are backed by coastal sea defences. The distribution of sand on foreshores varies on long and short cycles, giving potential in some areas for the occasional exposure of buried ancient land surfaces, occupation layers and structures, and associated palaeoenvironmental deposits.

A 'shingle foreshore' has a predominant surface cover of exposed rock sediments of a grain size generally perceived as 'shingle' or 'pebbles'. Human interventions affecting the current distributions of shingle foreshores include the deliberate retention of shingle in some areas by the use of groynes, and corresponding depletions elsewhere by quarrying of shingle for beach replenishment works, and the landscaping and construction industry. Many shingle foreshores are now visited for leisure. Some shingle foreshores form banks or spits, creating sheltered marine areas which become the focus for leisure activities. Many have the potential for attracting marine and bird life, and are the focus of wildlife watching. Shingle foreshores are often aligned in ridges of differing ages, the oldest generally located furthest from the present shoreline, giving valuable time depth. Shingle foreshores can also often extend to form 'spits' of land, slightly detached from the shore such as Orfordness in Suffolk.

Rocky foreshore refers to the predominant surface of exposed bedrock outcrops and associated boulders and large pebbles. Rocky foreshores are the focus for a range of cultural activities, as they have been in previous centuries. Many form easily accessible geological exposures for quarrying and mining and, from a recreational aspect, for the collection of geological and fossil specimens. Seaweed harvesting for agricultural fertiliser and, in some areas, for soda-ash manufacture, was once widespread, and various shellfish species were gathered for food and bait. Many rocky foreshores, especially in bays along rocky coastlines, contained areas cleared as small landing places, often with rough quays built from the cleared rocks. Some coastal quarrying areas were provided with trackways cut into the foreshore bedrock to facilitate loading onto beached vessels. Recreational use of rocky foreshores also includes coastal angling and rock-pooling.

Sandflats are relatively mobile, thick sand deposits, submerged at high tide and exposed at low tide, and often expressed as areas of sandbanks detached from the shore by tidal channels. Their form results from the complex interaction between hydrodynamic and sediment transport processes. Where sediment deposition results in deposition of finer particle sizes - clays and silts - the outcome is 'Mudflats', which can also be differentiated from sandflats in the ecological communities they support and, for HSC, their cultural implications. The processes giving rise to sandflats vary in their outcomes through time, producing shifting positions and sizes of sandbanks within an overall area of sandflats. Sandflats are common features of estuaries and shallow bays but can also occur on the open coast where prevailing currents and marine topography regularly produce appropriate depositional conditions. Common cultural activities on sandflats include shellfish harvesting for food and bait while some support areas of shellfish farming. Activities on many areas of sandflats are now controlled by various wildlife conservation designations, themselves a cultural intervention. More obviously destructive intervention derives from the impact on sandflats of dredging navigation channels to coastal ports. Pollution from coastal industries and nitrogen run-off are also identified as affecting sandflat ecology.

Mudflats are relatively mobile, thick deposits of clays, silts, organic detritus and some very fine sand content, submerged at high tide and exposed at low tide, and often expressed as areas of muddy banks in sheltered areas along estuary sides, to seaward of saltmarsh and along the fringes of sandflats. The processes giving rise to mudflats vary in their outcomes

through time although the conditions producing mudflats lead to greater stability in their position and extent than is the case with sandbanks in sandflats. Culturally, in many estuaries, past and ongoing human activity has contributed to the deposits now evident as mudflats: millennia of material washed downslope from agricultural soil disturbance and extractive industries on land have had profound geomorphological effects on river valleys and contributed to the amounts and chemical composition of the silts deposited in our estuaries. In some areas, for instance the rias of Cornwall, past mining activity has introduced so much extra silt that tidal limits have retreated seawards, often for considerable distances, leaving former ports (e.g. Tregony on the Fal) cut off from the sea. Mudflats also contribute hazards to estuarine shipping. Common cultural activities on mudflats include shellfish harvesting for food and bait while some support areas of shellfish farming. Activities on many areas of mudflats are now controlled by various wildlife conservation designations, themselves a cultural intervention. More obviously destructive intervention derives from the impact on mudflats of dredging navigation channels to coastal ports, while the bow-wave wash from passing shipping has been invoked as a cause of mudflat erosion on some cases. Pollution from coastal industries and nitrogen run-off are also identified as affecting mudflat ecology.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

This Character Type contains abundant traces of past and present maritime human activities. Palaeolandscape components, often in the form of peat deposits, can also be found within this Character Type. The Lower Palaeolithic sites on the East Anglian coast (specifically at Happisburgh and Pakefield) are some examples. These sites lie within sediment units exposed on beaches and the bases of cliff sections. Recent marine geophysical and geoarchaeological work has demonstrated that some sediment units have been traced offshore, specifically off Pakefield (Murphy 2007; Wessex Archaeology 2008). Intertidal peat deposits in the Isles of Scilly, formed in a saltmarsh environment, have been dated to the Middle Bronze Age and Late Iron Age while subtidal deposits from a freshwater, wooded environment have been dated to the Late Mesolithic (Camidge *et al* 2010). Buried prehistoric land surfaces are inherently fragile and can contain unique palaeoenvironmental evidence (as well as artefacts and ecofacts) that can be enormously informative about past human activities. Furthermore, palaeoenvironmental evidence can relate those activities to an area's vegetational history or to the processes of submergence and coastal or estuarine change. These are examples illustrating the time-depth that this Character Type contains in some areas of England.

Intertidal areas often formed convenient routes of travel for people and/or animals and early evidence for this has been found in several intertidal contexts. For example, the Neolithic trackways on the Isle of Wight at Wootton Quarr (Waller 2006); a Hightown Neolithic trackway near the mouth of the Mersey River with radiocarbon dating of 3960-3690BC (Gonzalez and Cowell 2007); the Post Track and Sweet Track in Somerset, dated, dendrochronologically, to 3838 BC and 3807/3806 BC respectively (Pollard and Healy (eds) 2008, 75); and the Formby prehistoric footprints (Merseyside) (Huddart *et al* 1999).

Most features within this Character Type are by-products of the use of the coasts and estuaries for fishing, shipping and industry, such as quays, piers or fish-traps, commonly now abandoned and visible only as low footings of walls or lines of decaying or fragile timbers or stakes. Wrecks or hulks of ships and boats can survive on sandy foreshores and rocky headlands but, in the latter, they will mainly be fragmented. The wreck of the Amsterdam sunk in 1749, for example, is located on the foreshore near Hastings. At low

tide, remains of the hull are exposed with local people walking around the area almost oblivious to its presence.

VALUES AND PERCEPTIONS

In England, this Character Type remains highly valued as a place for inspiration and recreational activities including a variety of beach and watersports, fishing and sunbathing. The liminality and bleak, often hazardous nature of this character type has led to its use as a backdrop for literary works such as M R James' ghost stories, many of which were set on the isolated Suffolk coast. The bio-diversity of these areas also makes them popular places for botanical rambles and wildlife watching.

Culturally, some of these inter-tidal areas, such as sandflats, have long been perceived as severe hazards to coastal and estuarine shipping from their mobility and the resulting difficulties in maintaining accurate charts. But even if their expression may be dynamic, many areas of sandflats have a distinct presence through time and are specifically named. Their notoriety to ship's pilots may be matched by dangers of stranding, or as quicksands for walkers using sandflats at low tide to short-cut otherwise long coastal journeys.

Intertidal studies have been viewed as extremely valuable from a maritime archaeological perspective due to their often rich survivals of organic material and closely-associated palaeoenvironmental evidence (Fulford et al 1997 and Flemming 2002).

RESEARCH, AMENITY AND EDUCATION

This Character Type is relatively poorly researched; a deeper and more comprehensive understanding of the historic character it encompasses is needed to inform Shoreline Management Planning. Ongoing programmes of work such as the Rapid Coastal Zone Assessment Surveys (RCZAS) and the National Mapping Programme (NMP) are already contributing to this, establishing a wealth of knowledge about the extant cultural survivals in our coastal zone.

A more comprehensive understanding of the intertidal zone will also allow the development of fit-for-purpose management strategies as well as their implementation through integrated management plans. The provisions for an English coastal access route, contained in the Marine and Coastal Access Act 2009, offer an excellent opportunity to combine this with raising public awareness and understanding of the many differing cultural perceptions that bear on the coast.

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing the gradual erosion by coastal processes, enhanced by the long-term implications of sea level rise and increased wave height and storm events along the English coast. Cultural forces for change include the construction of new sewerage schemes and coastal defences, harbour dredging, and many others. The material effects of these processes as well as the movement of water and sediments often occur far from the actual site of the cultural activity itself. The potential existence of buried archaeological features within the foreshore is also a consideration when dealing with coastal developments. Human activities such as salvage, the random recovery of archaeological 'souvenirs' and some fishing activities could be extremely damaging to the non-renewable and fragile nature of prehistoric and historic remains.

Unwanted effects from cultural activities, such as oil and other toxic pollution, also affect intertidal ecosystems, often to their severe detriment: these too may be affected by events far upstream, which may concentrate pollutants and toxic sediments. Contaminants can be introduced which do not disintegrate rapidly in the marine environment, such as plastics, pesticides, furans, dioxins, and heavy metals.

The Marine and Coastal Access Act 2009 makes provision to improve access, creating a right to walk around England's coast; to address uncertainty arising from lack of consistency, security and clarity in rights of public access to foreshore, beaches and coastal land (HM Government 2009). This will contribute clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. It is also stated that access will be made resilient to coastal change. As noted above, the information resource created for this route offers an excellent opportunity for raising public awareness and understanding of the marine, intertidal and landward perspectives that combine uniquely along the coast.

RARITY AND VULNERABILITY

Relatively little-disturbed intertidal areas are relatively rare, fragile and valuable maritime archaeological resources with often rich survivals of organic material and closely-associated palaeoenvironmental evidence. They are also perceived as offering rare opportunities for peace, solitude and inspiration with little obvious intrusion from other people either materially or intangibly through noise for example. Where located close to existing centres of population and commerce, their lack of development both enhances those perceived cultural qualities and their vulnerability as prime areas for residential and commercial expansion.

These areas also represent typically important zones for wildlife. They are often of particular importance to migratory birds. For example, in England mudflats have been classified as a Biodiversity Action Plan priority habitat. A Biodiversity Action Plan (BAP) is an internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. Their cultural value may also be recognised by the creation of a Historic Environment Action Plan (HEAP) to work in conjunction with the BAP, as for example on the Isle of Wight (http://www.iwight.com/living_here/archaeology/heap.asp).

Along the English coasts some intertidal areas fall within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some occasions they are designated as a Heritage Coast.

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1.10.4 Character Type: Cultural topography (marine)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type includes the following Sub-types:

- Coarse sediment plains
- Fine sediment plains
- Mud plains
- Mixed sediment plains
- Sand banks with sand waves
- Exposed Bedrock

This Character Type refers to those aspects of cultural topography whose physical expressions are predominantly seaward of Mean Low Water.

Coarse sediment plains are extensive areas of seafloor whose surface sediments predominantly comprise different grades of pebbles, rocks, boulders etc with lower sand and very low silt and clay contents. Of cultural relevance is their role as a spawning ground and habitat for particular commercially-exploited fish species and hence their correlation with particular fisheries and their management considerations by government, conservation bodies and fishing communities. Bottom trawling methods also have significant impacts on marine habitats and biodiversity in this Sub-character Type. Coarse sediment plains also provide distinct preservation conditions for their share of the occasional seafloor wrecks present across all the seas. Their relationship to marine topography has implications for the potential form and survival of underlying palaeolandscape components. They will also incorporate some of the 'background noise' of pollution, especially by littered debris, which now affects all marine areas from sea surface to sea floor.

Fine sediment plains refer to large areas of seafloor whose surface sediments predominantly comprise different grades of sand and very low silt and clay content. Of cultural relevance is their role as a spawning ground and habitat for particular commercially-exploited fish species including flatfish and hence their correlation with particular fisheries and their management considerations by government, conservation bodies and fishing communities. Bottom trawling methods also have significant impacts on marine habitats and biodiversity in this Sub-character Type. Fine sediment plains also provide distinct preservation conditions for the occasional seafloor wrecks present across all the seas. Their relationship to marine topography has implications for the potential form and survival of underlying palaeolandscape components. They too will also incorporate some of the 'background noise' of pollution which now affects all marine areas and tiers.

Mud plains refer to extensive areas of seafloor whose surface sediments predominantly comprise fine sediment grades with high silt and clay contents. Occurring mainly in sheltered seas around England, they have cultural relevance as the chief habitat for a range of commercially-exploited shellfish species, including *nephrops spp.* (Langoustines/Dublin Bay prawn), and hence their correlation with particular fisheries and their management considerations by government, conservation bodies and fishing communities. Trawling methods also have significant impacts on marine habitats and biodiversity in this Sub-character Type. Mud plains provide distinct preservation conditions for the occasional seafloor wrecks present across all the seas. Their relationship to marine topography has implications for the potential form and survival of underlying palaeolandscape components. They will also incorporate their share of the 'background noise' of pollution.

Mixed sediment plains are extensive areas of seafloor whose surface sediments predominantly comprise heterogeneous sediment grades, from pebbles and gravels to sands, silts and clays. The overall composition can be highly variable, as can the form of their grades' mixing. In addition to well-mixed sediments, they may include component mosaics and/or layering. Their highly variable composition and form distinguishes this Sub-character Type from the coarse and fine sediment plains and their more definable cultural implications for fish habitat, shipwreck preservation and palaeolandscape form, however bottom trawling methods still have significant impacts on marine habitats and biodiversity in this Sub-character Type. These areas also incorporate their share of the 'background noise' of pollution.

Sand banks with sand waves refer to an area of sand banks containing extensive wavelike structures and megaripples formed by rapidly moving currents of water on the sandbanks' surface. These may occur around the margins of sandflats and be barely submerged at

various states of the tide or they may occur in deeper water. They can pose hazards to shipping and many in shallower waters appear on charts. They form a spawning ground and habitat for various commercially-exploited fish species including flatfish and shellfish, hence their correlation with particular fisheries and fishery management considerations by government, conservation bodies and fishing communities. Shellfish harvesting, dredging and bottom trawling methods have significant impacts on marine habitats and biodiversity in this Sub-character Type. Sand banks with sand waves also provide distinct preservation conditions for wrecks present within them. Their relationship to marine topography has implications for the potential form and survival of underlying palaeolandscape components. They will also incorporate their areas' share of the 'background noise' of pollution.

Exposed bedrock refers to areas of the seafloor whose surface predominantly comprises bedrock exposures along with associated rocks and boulders but little finer sediment deposition. Variation in depth and surface irregularity of the bedrock exposures will correspond with the dangers they pose to shipping. Bedrock exposures are liable to snag fishing gear and may figure as 'rough' or 'catchy' areas in fishing ground perceptions. Their potential hazard to shipping may increase wreck debris to be found in this Sub-character Type, while it will also contain its share of the 'background noise' of pollution.

This Character Type varies considerably in the UK Continental Shelf, its variability being linked to the survival of prehistoric and historic features within it. Understanding this Character Type will enable an assessment of its archaeological as well as its historic character. For example Lizard Point (Southern England) is a headland highly exposed to sea conditions. It is characterised by a rocky foreshore with a rapidly dropping bathymetry, creating overfalls off the tip of the Lizard. Hence, Lizard Point is considered as having a high potential for ship losses based on the combination of rocky foreshore, potentially dangerous sea conditions, and overfalls. The seabed around the headland is bedrock, producing a very low potential for preservation of archaeological material due to its rocky nature. This would encourage scattered preservation within gullies rather than the presence of large segments of wreck material (for further details see Merritt *et al* 2007). Another example is Hurst Spit, a gravel spit running into the Western Solent. The area is exposed to prevailing winds and the seabed is characterised by gravels. The archaeological potential for the western side of the spit is low due to a high density of gravel. However, the eastern side is characterised by fine grained estuarine silts running out from the Lymington River and is therefore characterised by a high potential for good archaeological preservation. The only stratified Mesolithic site in a submerged location in England (Bouldnor Cliff) has been discovered in this area (Momber 2004).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The cultural aspects of this Character Type are several. The effects of human activities on marine biodiversity have been present for millennia since man began serious exploitation of marine resources, but their scale and intensity increased enormously during and since the later 19th century. So too has the character of their impact on sea floor deposits and wildlife as fishing methods have developed to feed the rapidly growing populations of England and its neighbours, with rapid inland transport and refrigeration allowing fish to move from being a coastally-consumed product to one serving the inland population too. The resulting intensification of marine fish resource exploitation has far outcrippled the carrying capacity of many fish species whether sought or caught unintentionally as 'by-catch'.

Many offshore marine areas are also areas that were once dry land at times of low sea level during the glacial periods and within several millennia of them, when much water was

locked up in the ice sheets. That now submerged land was then human habitat whose land forms, buried soils and direct material remains, in the form of flint or bone tools and prey species' bones, are increasingly being recognised and researched from present activities affecting this Character Type.

Later activity above, on and in the sea has also produced a scatter of wreck and air-crash debris, along with considerable quantities of litter, affecting all expressions of this Type, however 'natural' they may otherwise appear.

Prehistoric and historic deposits exist widely across the UK Continental Shelf. Understanding the characteristics of the geological deposits (age and origin) including the geological processes that have formed the sediment deposits can provide insights into the potential type and location of its associated cultural features. Understanding the geological characteristics of the deposit therefore provides the essential foundation for the evaluation of archaeological or palaeoenvironmental potential. Depending on the mode and age of formation, for example, sand and gravel deposits may seal, contain and/or underlie single or multiple-episode archaeological deposits. Soft aggregates are mostly derived from the Middle and Late Pleistocene, which is contemporary with the first human colonisation and subsequent occupation of England and North-west Europe until the end of Last Ice Age (i.e. Palaeolithic period) (see Wenban-Smith 2002). Pleistocene fluvial, glacial and periglacial and beach gravels form much of the Palaeolithic archaeological record. Furthermore, Late Devensian and Holocene gravels provide much of the buried archaeology of valley landscapes (Brown 2004). Processes such as climate change and the fluctuation of sea levels over the last 2 million years contributed to the deposition of sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by rivers systems that are now submerged (BMAPA 2000; ODPM 2005). These processes have periodically exposed seabed as dry land, thereby creating a space for human occupation and the potential for associated archaeological deposits. The archaeological potential of these marine deposits is immense, and there is still a need to enhance our understanding of these drowned landscapes and palaeoenvironments which are still relatively poorly understood.

Areas of mud and silt deposits can generally be found within estuarine contexts such as the entrances to Foulness in the Crouch Estuary and around the entrance to the Swale, stretching out towards Margate. Another case is the Wash estuary, which has a predominantly sandy seabed, with fine grained silts and mud along the foreshore surrounding the river entrances. The approaches are characterised primarily by a gravel seabed although the areas where the banks have formed tend to be sand or gravelly sand. The preservation of archaeological remains in these contexts could be considered as high although in gravelly contexts remains could be scattered and/or broken. Conversely, the seabed on the approaches to the Severn Estuary, although wide and exposed, is characterised by solid bedrock deposits which are not conducive to burial and *in situ* preservation.

VALUES AND PERCEPTIONS

This Character Type is highly valued ecologically due to its biodiversity. For example, the Wash (Norfolk/Lincolnshire), on the east coast of England, consists of extensive fine sands and drying banks of coarse sand. This diversity of substrates, together with a variety in degree of exposure, means that there is a high diversity relative to other east coast sites (<http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140>).

Lately, this Character Type has received increasing attention from archaeologists recognising the archaeological potential that it could represent and therefore its contribution to the understanding of past communities' dynamic and varied use of the landscape they inhabited.

RESEARCH, AMENITY AND EDUCATION

The English Heritage-Aggregates Levy Sustainability Fund (ALSF) *Enhancing Our Understanding: Navigational Hazards* project used the UK's extensive hydrographic archives, including charts, sailing directions and pilotage notes, and modern seabed geology mapping to identify and map 'Areas of Maritime Archaeological Potential' (AMAP): areas where high potential for shipwreck losses coincide with areas of high preservation potential (Merritt *et al* 2007). This project provided the foundations for the development of a quantitative system for assessing the archaeological potential for shipwreck material in the marine environment according to different sediment types. Application to shipwrecks as well as other archaeological deposits such as submerged prehistoric landscapes would enable a deeper understanding of the archaeological potential of the marine environment.

The Submerged Palaeo-Arun River Project funded through English Heritage-ALSF has reconstructed the palaeo-morphology of submerged and buried landscapes of palaeo-Arun valley on the northern English Channel, integrating geophysical, geomorphological and sedimentological investigation of offshore river systems (Gupta *et al* 2004). This research facilitated the development of models which allow complex submerged landforms and buried subsurface variations that have extensive archaeological potential to be better understood. The new data provided by this study has contributed to the emerging field of submerged prehistoric archaeology, as well as developing procedures to assess the potential of the archaeological resource in offshore areas.

Collaborative projects between industry and the heritage sector through the analysis of further geophysical data and sediment characteristics and dynamics will contribute to clarify issues regarding archaeological potential and its preservation in the marine environment.

The amenity value of this Character Type could be further explored through, for example, interactive CDs and web resources. This Character Type also offers potential for educational initiatives to raise public awareness about the connection between both the natural and historic environment within a marine context.

CONDITION AND FORCES FOR CHANGE

The historic cultural character of this Character Type is both added to and under pressure from offshore development activities. Depending on the industrial activities, geophysical surveys (and in some cases core sampling and diver inspections) are a requirement for offshore developments (e.g. wind farms and aggregates extraction, amongst others). These surveys can potentially increase the knowledge about the historic environment of a regional and local area. Furthermore they could enable the construction of detailed palaeoenvironmental and palaeogeographic reconstructions. Models (on local and regional scales) could then be developed for the location of particular types of site, for example. In an ideal world, this information will then feed into the local and national monuments records

and inform future curatorial decisions. This will provide the opportunity for beneficial cumulative knowledge regarding the marine zone.

English Heritage-ALSF funding, with cooperation from the British Marine Aggregate Producers Association (BMAPA) has produced *Protocol for Reporting Finds of Archaeological Interest* from aggregate extraction activities by BMAPA companies: the protocol has produced a large number of valuable and varied finds reports since its inception in August 2005 (http://www.wessexarch.co.uk/files/projects/BMAPA-Protocol/protocol_text.pdf).

RARITY AND VULNERABILITY

Some prehistoric and historic features within this Character Type could be considered rare where time-depth is visible (e.g. Bouldnor Cliff submerged landscape, off the Isle of Wight).

This Character Type is under pressure from both natural and culturally induced processes such as erosion, sea level rise and global warming. The ecosystems within this Character Type are also under pressure from human activities such as intrusive fishing activities (e.g. trawling) and offshore developments (e.g. wind farms, and aggregate extraction amongst others). The effects of these activities as well as the movement of water and sediments could damage the prehistoric and historic features present and largely yet to be revealed within this Character Type.

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1.11 BROAD CHARACTER: WOODLAND

1.11.1 Character Type: Woodland

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Woodland includes the following Sub-types:

- Ancient woodland
- Plantations

The 'Woodland' Character Type has relevance for HSC where its character and the activities underlying it have a distinctly maritime flavour or connection. Examples may include woodland established along the edges of tidal rivers, cliffs and former coastal rough ground to minimise erosion. Coastal woodlands, often uniquely named with clearly defined ownership and management rights, were often important in providing timber and other materials for boat building and other coastally-focused activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea, aiding position-finding from ships.

Ancient woodland is formally defined as land that has had continuous woodland cover since at least 1600 AD (http://www.english-nature.org.uk/pubs/gis/tech_aw.htm). There are two main varieties (and many further subdivisions of those):

- 'Ancient semi-natural woodland' - ancient woodland sites that have retained the native tree and shrub cover that has not been planted, although it may have been managed by coppicing or felling and allowed to regenerate naturally; and
- 'Ancient replanted woodland' - ancient woodland sites where the original native tree cover has been felled and replaced by planting, usually with conifers and usually during the 20th century.

The Ancient Woodland Inventory is a digital database of ancient woodland but has a number of limitations, for example only ancient woodlands over 2ha in extent on the 1920s base maps are included (see http://www.english-nature.org.uk/pubs/gis/tech_aw.htm for full discussion).

Plantations are areas deliberately planted, often cyclically-replanted, with trees on new sites as a crop to supply industrial and domestic demands for wood. Very few plantations date prior to 1700 and those from the 18th and 19th centuries were generally of small scale, unintensively managed and of native or exotic deciduous species. The majority of existing plantations result from the creation of the Forestry Commission in 1919 in response to Britain's shortage of timber after the First World War. The establishment of 20th century plantations accelerated after the Second World War, driven by the perceived need for self-sufficiency in timber coupled with rapidly increasing investment in, and mechanisation of forestry processes. These modern plantations commonly contain only one or two species of tree, usually conifers, and often extend over considerable areas, subdivided by access roads and rides into compartments of trees planted at of one time.

Although woodlands in general do not inherently possess a distinctly maritime character, in some circumstances they certainly do and are included in HSC where they extend down to the water's edge in tidal rivers or on the coast where they have been established on the cliffs and former coastal rough ground, often managed to minimise erosion (Tapper and

Johns 2008). Woodlands were important places, providing timber and other materials for boat and ship building and a range of other timber, brushwood and fuel resources needed by local coastal communities.

The maritime expressions of woodland comprises mainly the remnants of traditionally managed woodlands, usually found in the steep-sided valleys extending inland from rivers or, in some cases, via tributaries. It incorporates both major varieties of ancient woodland and some plantations. Traditional management techniques include coppicing (harvesting wood by cutting trees back to ground level) and pollarding (harvesting wood at about human head height to prevent new shoots being eaten by grazing species such as deer). Both techniques encourage new growth and regular harvesting for poles and fuel while allowing the sustainable production of timber and other woodland resources.

During the 20th century, the use of these traditional management techniques declined whilst the large-scale mechanised forestry management increased, especially in plantations and areas of ancient woodland replanted with conifers. These changes in management methods resulted in major changes to ancient woodland's character. There was also a wider loss of ancient woodland to agricultural land.

From the later 20th century, conservation initiatives by bodies such as the Woodland Trust and the National Trust have reintroduced traditional woodland management techniques to many of the woodland areas they control, including their coastal estates.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Many of the cultural imprints of coastal woodland are expressed in its management and the form and structure of the woodland vegetation (as a whole, not only the trees). Against that overall cultural background, typical discrete artificial elements may include material traces from that woodland management itself, such as charcoal burners' platforms, but also:

- banks, tracks and paths;
- drainage ditches;
- fences.

Large tracts of the coastal zone would have been under woodland cover as vegetation recovered after the last glaciation, but the effects also of post-glacial sea level rise and coastal salt spray is always likely to have given it a distinct character in species structure and openness from woodland further inland. Clearance from the Neolithic period onwards has considerably reduced coastal woodland cover in many areas. Where they do survive extensively in the present coastal land and sea-scape is often a reflection of woodland that served local needs until relatively recently or areas which have not been deemed profitable or feasible to manage for other purposes, for example on very steep or boulder strewn coastal slopes.

The term ancient semi-natural woodland is applied to those woodland areas which are considered to have been in existence from at least AD 1600. These woodland areas remain to the present day without having been fully cleared for uses other than woodland management or timber production.

The surviving ancient woodlands would have long been managed and have formed important elements of the working landscape for many centuries. Medieval farmers and

craftsmen would have exploited them as pasture grounds, sources of fuel, coppice wood and timber.

One of the processes which featured in the creation of new plantations was the planning of large estates in the 18th and 19th centuries. Many were established as game cover in East Anglia, where pheasant shooting became ubiquitous in the 19th century and others were planted to 'beautify' the landscape, including along the coast (Williamson 2005, 109).

VALUES AND PERCEPTIONS

Patterns of coastal woodland provide one of the distinctive landscape components visible from the sea. Those patterns are culturally defined and combine with variation in topography and other cultural features and aspects to give a sense of place and position to mariners and coastal users alike.

Many woodlands have some public access, though that is less true of privately-owned plantations. They are often regarded as being highly tranquil places, enhanced along the coast and estuaries by the visual play of the coastline itself, glimpsed intermittently through the trees. In some areas such as North Norfolk the presence of the now-ubiquitous pine forest has become an accepted part of the coastal landscape inexorably linked to the adjacent foreshore. Recreational activities such as walking focus as much on the woods as the beach.

Conifer plantations are often perceived as dark, threatening and relatively sterile in terms both of more traditional historic environment survivals and biodiversity. That is more apparent in perception than reality however. A number of studies have revealed a high level of archaeological survival within conifer plantations: archaeological destruction within such areas needs to be confirmed rather than assumed. Conifer plantations are host (and a refuge) to a range of wildlife including much of the native deer population and several nationally rare species including the nightjar and, in the conifer plantations along the dunes of west Lancashire, the red squirrel (www.countryside.org/interact/scapemap/).

RESEARCH, AMENITY AND EDUCATION

Woodlands contribute strongly to present coastal seascape character and they have a considerable amenity value. The Woodland Trust hosts a number of events and campaigns to raise awareness of woodlands and provides activities and learning resources on its website (www.woodland-trust.org.uk).

From both amenity and educational points of view, access to coastal woodlands could still be improved, with better presentation of their historic cultural aspects. Woodlands already provide extensive resources of recreational space which attract many visitors, with the Forestry Commission actively promoting public access. An example of the public outreach that can be achieved, the New Forest National Park is described as "an outdoor classroom for all ages" containing a unique landscape, abundant wildlife and important cultural heritage. Its website (www.newforestnpa.gov.uk) highlights the key topics and issues facing the Park and contains educational student and teacher areas.

Opportunities to raise public awareness of the inter-related cultural, ecological and other aspects of coastal woodlands will be substantially enhanced by the provisions contained in

the Marine and Coastal Access Act 2009 to create a right of public coastal access around England's coastline.

CONDITION AND FORCES FOR CHANGE

Coastal woodlands are under many pressures, including management neglect, sea level rise, and an increase in saturated soils and soil salinity which can be detrimental. Increased storminess, which has been linked to global warming, also has serious effects on coastal woodland exposed to the adjacent open space of estuaries and the sea. That effect comes from enhanced coastal erosion, greater penetration of salt spray and direct wind-blown toppling of trees, especially serious for shallow-rooted species such as beech.

On the positive side, the neglect of traditional woodland management techniques is now being addressed in some areas by conservation bodies such as the National Trust and the Woodland Trust, as noted above.

The Marine and Coastal Access Act 2009 provisions for a right of public coastal access around England's coastline offer great opportunities for awareness-raising as commented above but also management issues: erosion problems could be rapid and serious on woodland soils and will need informed and sensitive management along the route and in its maintenance.

There is increasing pressure for the replanting of woodlands in England. This could be a positive force for change if this initiative is guided by an understanding of the known or likely areas of earlier woodlands. A recent change of policy by the Forestry Commission now favours restructuring plantations through their gradual transformation from conifer to broad-leaf (www.forestry.gov.uk).

RARITY AND VULNERABILITY

Coastal woodland tends to occur along only certain areas of the English coastline, with good representation particularly along the southern coastline of Devon and Cornwall, along the New Forest shoreline and parts of the East Anglian coast. To these areas, coastal woodland contributes enormously to seascape and landscape character, whether viewed from landward or seaward or from within. It is also a highly valued cultural resource, ecological resource and an economic resource drawing many visitors to its areas.

Its vulnerabilities are still chiefly down to neglect, visitor pressure and climatic change. However the cultural conservation values attached to woodland in general for their biodiversity and landscape contributions have become much better recognised and more widely appreciated in recent years. Conservation management techniques are now becoming more widely implemented and the bodies taking the lead in those, especially the National Trust, have substantial coastal woodland holdings on their estates. It is also perhaps to be hoped that many former threats of character change from conifer afforestation of deciduous woodland may have receded for the long term.

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1.12 BROAD CHARACTER: ENCLOSED LAND

1.12.1 Character Type: Reclaimed land

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Reclamation from sea
- Reclamation from tidal marsh
- Reclamation from wetland

The 'Reclaimed land' Character Type refers to areas of land enclosed, drained and taken in from along the coast for a variety of mostly agricultural purposes. It does not include areas of land reclamation designed specifically for urban settlement or port expansion.

Reclamation from sea relates to that for which the topographic or other evidence indicates the land was reclaimed directly from the sea by enclosure and drainage.

Reclamation from tidal marsh relates to that for which the topographic or other evidence indicates the land was reclaimed from tidal marsh, usually salt marsh, by enclosure and drainage. Under 'managed realignment' policies, some areas of this Sub-character Type are being returned to saltmarsh as a buffer against rising sea levels and storm surges.

Reclamation from wetland relates to that for which the topographic or other evidence indicates the land was reclaimed from former wetland that was no longer, or may never have been, tidal. Examples may include reclamation from former fen bogs.

Distinctively flat with wide horizons, areas of coastal enclosed reclaimed lands are often very extensive, sometimes extending far inland and reclaimed over a considerable period. Field patterns in reclaimed land are often defined by networks of drainage ditches rather than upstanding field boundaries, and may in some areas, and from certain periods, reflect the sinuous courses of pre-reclamation saltmarsh creeks. For example, in East Anglia, land reclaimed before 1700 tends to have a serpentine drainage system based on the underlying saltmarsh character, whilst areas drained in the 18th and 19th centuries are usually rectilinear. Time depth within long-established areas of land reclamation may be evident from the ditch patterning and the size of fields they produce, coupled in some areas with successive lines of former sea wall behind the latest. Some areas of reclamation are maintained by pumping stations, formerly wind-pumps, transferring water into larger

channels enclosed by levees draining major areas. In East Anglia, large tracts of reclaimed land are still used as grazing marsh, traditionally grazed by cattle in summer and sheep all year round.

Some areas of land reclaimed from former tidal marsh are having their sea walls deliberately breached under 'managed realignment' policies to return them to saltmarsh as a buffer against rising sea levels and storm surges.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

In England, reclamation (sometimes referred to as 'land claim') on estuaries and coasts has been carried out at least since Roman times, usually on a piecemeal basis. During these early phases, agricultural expansion was often a drive for land reclamation before industrialisation. In East Anglia, large-scale reclamation of coastal wetland began in the Saxon period although rising water levels in the 12th century meant this had to be defended if it was to be saved (Williamson 2006, 19).

Marshland was more widespread in medieval England than it is today, especially around Yorkshire, Somerset, East Anglia and other low-lying coastal areas. Marshland sustained some settlement on higher ground but for the most part comprised meandering creeks, stagnant pools, reedbeds, bog, grassland and outcrops of woodland amongst others (Given-Wilson 1996).

The threat of flooding in marshland areas did not discourage some communities from reclaiming marsh for arable land, especially in the 12th and 13th centuries. In East Anglia this reclamation mirrored the same process in the Netherlands and it is possible that Dutch specialists were employed (Williamson 2006, 194). For example, there was extensive land reclamation around the silt ridge in the northern Fenland and the fringes of Romney Marsh. This was often considered common land although some was divided and apportioned to the local community. In many areas, medieval reclamations were developments of earlier efforts with dykes, sea-banks, sluices, weirs and linear drainage channels developing as familiar features in the modern landscape. Yet the history of marshland is a history of inundation as much as reclamation. For example, the flooding of Kent and Sussex marshes in 15th century made significant inroads into earlier gains. These processes partly reflect a rising sea level but also a lessened commitment to maintaining drains and sea-banks in the long period of agricultural depression after the Black Death (Given-Wilson 1996: 31).

In 1585 the General Drainage Act was introduced which meant that large landowners could overrule local proprietors and suppress common rights that obstructed the path of drainage schemes, illustrating the high value accorded to land reclamation by such landowners at this time.

From the 17th century, extensive land reclamation took place around the Wash. It would appear that initial phases of reclamation sought to enclose salt marshes and mudflats with earthen banks for agricultural purposes. These works have been extensive and progressive in England through the centuries, accounting for much of the estuarine habitat loss (Healy and Hickey 2002). The final drainage of the Fens took place in the 19th century following a wave of parliamentary enclosure, leaving a varied landscape (Williamson 2006, 211). The development of wind and later steam and electric pumps facilitated this process. At the end of the 18th century c.50 'drainage mills' were present in the Broads area, by the 1880s there were 110 (ibid, 213).

The most extensive reclamation and enclosure of land took place from the late 18th century onwards, through parliamentary enclosures. Particularly in regions with large areas of common waste, this period saw the systematic enclosure, draining and 'improvement' of coastal marshes and wetlands, as well as reclamation from the sea. Around Morecambe Bay, in Lancashire and Cumbria, for example, extensive tracts of salt marsh were enclosed, along with the draining of wetlands in the lower reaches of rivers valleys stretching up towards the Lake District mountains.

In East Anglia despite the agricultural recession of the late 19th century when much land reverted to wetland, reclamation continued on some scale through the 20th century, particularly on the Suffolk coast. This was accelerated by the great floods of 1953 which encouraged the populace to construct sea walls and install pumps, transforming the landscape (ibid, 217).

England, like other countries, has a long history of reclaimed land, areas which have often been defended with hard construction techniques like dykes and embankments. During and since the 1990s, this has been brought into question. 'Softer' approaches to reclaimed land, which work with nature rather than against it, have been introduced under 'managed realignment' policies. For example, salt marshes are becoming markedly reduced in area because of what is known as the 'coastal squeeze' phenomenon. This arises when, to protect coasts, sea walls are erected between the land and an intertidal habitat. Due to sea level rise, that intertidal habitat is constrained on one side by the sea and on the other by sea walls. Managed realignment allows the intertidal habitat to naturally move inland where the topography allows, so that it can continue to protect the coast (Luisetti *et al* 2008).

VALUES AND PERCEPTIONS

In some areas of England, coastal land reclamation has been perceived as a habitat loss and reduction in the feeding and over-wintering areas available to various bird species. Conversely, reclaimed land is highly valued by farming interests as an agricultural resource. In the east of England, it has proven to be extremely productive arable land, whilst in the more pastoral landscapes of the north and west it provides good quality grazing land for dairy cows and other stock.

People's interests in and perceptions of industrial history and archaeology are form deep attachments in some areas of England. In East Anglia, the land-drainage wind pumps themselves have become a familiar and characteristic part of the landscape, with many being preserved. Along parts of the coastline in the north-east of England, the coal industry's legacy of physical dereliction and social deprivation has been addressed by a succession of reclamation and infrastructure projects, combining with surviving elements of the industrial landscape to form part of the nation's post-industrial heritage. A good example is provided by the management work of the Durham Heritage Coast Partnership (www.durhamheritagecoast.org/). As with all such landscape management initiatives, such reclamation schemes aimed at remediation of land affected by mineral extraction require sensitivity and an integration of many interests and perceptions (<http://www.northumberlandnationalpark.org.uk/understanding/geology/minesandquarries/abandonedquarries.htm>).

Coastal grazing marsh created by reclamation is also considered to be an important habitat for breeding wading birds and some plant species, making them highly valued by ecologists and wildlife watchers. In the 1980s, when Halvergate Marshes in Norfolk came under threat

of drainage, a campaign of direct action by Friends of the Earth culminated in the establishment of the area as the country's first 'Environmentally Sensitive Area' (ESA).

RESEARCH, AMENITY AND EDUCATION

Multi-disciplinary projects can offer many educational opportunities to investigate the reclamation of saltmarsh and wetlands from medieval times onwards. This might explore farming processes, such as irrigation systems and the management methods used on reclaimed land where it contains historic features including relict field systems and ridge and furrow on the commons.

Pressures for change leading to the re-flooding of former reclaimed land also have considerable effects on people's often long-held landscape perceptions. Public awareness raising initiatives accompanying such proposals for change may be more effective if they recognise those landscape sensitivities, informing and framing the needs for such changes in their historic and cultural contexts.

CONDITION AND FORCES FOR CHANGE

Derelict land has been gradually 'tidied-up' by farmers or expanding housing developments and in certain areas the remains of early industry have been either damaged or destroyed by cliff falls or by subsequent industrial activity. However, the reclamation of some derelict land has provided the opportunity for ecological enhancement, particularly wetlands and woodlands.

In some areas, reclamation of land to the seaward creates a sharp transition between land and sea, giving an artificial edge and reducing a sense of interconnection and gradation between the sea water, the intertidal zone and the land.

In East Anglia, reclaimed land which had traditionally been used as grazing marsh has been increasingly converted to arable land. However there and in some other areas of England, rising sea level may directly affect agricultural land which is currently located on reclaimed marshland if public funding is withdrawn from sea defence maintenance, as is widely happening under Environment Agency policy, or if that policy moves in favour of managed realignment for those areas.

Even before the advent of present 'managed realignment' policies, some reclaimed land had been progressively abandoned or allowed to re-flood for a number of reasons. For example the area around Minsmere was drained in the 19th century only to be flooded in 1940 as an invasion defence.

The increase in the use of managed realignment to control rising sea levels and storm surges, along with the reversion of saltmarsh and wetlands for improvements to biodiversity, are major forces for change affecting this Character Type. At Silverdale, Lancashire, on the east side of Morecambe Bay, large areas of drained and improved former saltmarsh have had existing drains blocked and areas of open water created to create wetland habitats for the internationally important wetland bird population of the Bay. Under Environmental Stewardship schemes, the 'rewetting' of former wetlands and saltmarsh remains a policy priority for the region. In East Anglia, 'managed realignment' policies allowing some reclaimed land to revert to saltmarsh means that reclaimed grazing marsh is becoming rare.

RARITY AND VULNERABILITY

Land that was reclaimed in the medieval period sometimes still exhibits features dating to that period such as strip fields and later features, creating an important cultural landscape which is highly vulnerable if that land is further developed.

It has been estimated that around 50% of the population of the industrialised world lives within 1 km of the coast, a substantial proportion being located around estuaries. This gives rise to concerns about the management of the coastal resource, including the issues of shoreline erosion and sea defence, habitat degradation, pollution and reduction of coastal biodiversity (Healy and Hickey 2002: 366).

Some areas of England play an important role in wildlife conservation and this factor will be a key consideration in programmes of land reclamation, as will habitat creation requirements under the EC Habitats Directive for areas of future land reclamation which are approved.

Where land reclamation is proposed, the landscape inputs to the necessary Environmental Impact Assessment (EIA) will consider that the design of any reclaiming bund structures not only respect historic and natural environment conservation needs but also relate to the overall shape and scale of the existing shoreline, which, in cases of extensions of existing reclaimed land, will also be culturally defined.

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1.13 BROAD CHARACTER: UNIMPROVED GRAZING

1.13.1 Character Type: Coastal rough ground

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Coastal Rough Ground Character Type includes:

- Rough grassland
- Scrub
- Heathland

Coastal Rough Ground (CRG) includes various forms of very unintensively managed and often unenclosed land which characterise the coastal land periphery of many areas. Such coastal rough ground often contrasts with highly intensively managed areas immediately adjacent inland but also, as a summer grazing resource, it forms an important and distinctive part of the coastal agricultural economy. It also frequently provides a refuge for rare and endangered ecological communities specific to coastal margins. Hence, it is often subject to wildlife conservation designation, especially heathland. Of particular relevance for HSC, coastal rough ground provides the Character Type accommodating much of our coastal access provision and most of our long distance coastal footpaths: the places in which many people experience directly their coastal landscape and seascape perceptions. Typical forms of coastal rough ground are rough grassland, scrub and heath.

Rough grassland encompasses those areas of CRG dominated by unintensively managed grassland. Maintenance of such grassland may be the result of long traditions of coastal rough grazing but in some areas it is now being deliberately re-introduced as a conservation measure to prevent land reverting to scrub.

Scrub encompasses those areas of CRG covered by scrub vegetation: areas dominated by shrubs or bushes of woody plants and sometimes including small trees. Scrub may vary considerably in its openness or impenetrability, and coastal scrub may be dominated by distinctive scrub species. The effect of salt spray blown by strong winds may shape stands of coastal scrub into dramatic asymmetrical shapes that can have a strong impact on visitor's perceptions of such areas and their distinctiveness. In some areas, the development of coastal scrub from rough grassland increased from the late 20th century as grazing stock levels have declined; in response, scrub growth is now being inhibited deliberately by the re-introduction of grazing as a conservation measure.

Heathland encompasses those areas of CRG dominated by dwarf shrubs including heathers and gorses in varying proportions, sometimes in a mosaic with patches of grassland and locally damp areas. Usually on acidic soils in relatively wet areas, they provide a habitat for many rare plant and animal species for which their surviving areas are extensively are frequently covered by wildlife conservation designation and conservation management initiatives.

Historically, coastal rough ground has been mostly used as common grazing. Although many visitors may see these as 'wild, windswept and remote' places, these are highly cultural habitats, the product of thousands of years of human activity, particularly summer grazing management and in many areas, the focus of much extractive industry. They are also now a focus for recreation; long distance coastal footpaths often pass through areas of coastal rough ground.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Many of the cultural imprints of coastal rough ground are expressed in the character of the vegetation and soil profile, coupled with a low density of built features. However where they do occur, typical structural elements may include:

- military defences (e.g. pillboxes, anti-tank cubes, Roman signal stations, fortifications, radar stations)
- prehistoric and historic sites
- finds and field systems (flint scatters, barrows, coin hoards, settlements)
- maritime safety services (e.g. coastguard lookouts)
- navigation aids (e.g. lighthouses, fog stations, landmarks)
- industrial extraction and processing sites (e.g. quarries, mines, limekilns)
- recreational facilities (e.g. caravan and chalet parks, golf links)

Typical vegetation over much coastal rough ground would commonly have been herb-rich rough grassland. After widespread abandonment by farmers during the later 20th century, management neglect has often led to scrub growth, now itself sometimes the subject of conservation management measures.

Much coastal rough ground would have previously been managed as a resource within the farming economy in conjunction with other neighbouring Historic Landscape/Seascape Character Types, principally medieval and post-medieval enclosed land and available areas of common grazing on higher land. As a resource of summer grazing and fuel grounds, it formed an essential element of the coastal mixed farming landscape.

Heathland in particular is formed on areas of sandy soil which are easy to cultivate and were therefore attractive to early farmers with primitive technology (Williamson 2006, 174). The combination of acid soils and grazing pressure encourages a process known as 'podzolisation' in which organic matter and minerals are leached out of the soil (ibid). This subsequently allows the development of the characteristic underscrub vegetation dominated by heather (ibid). Traditionally the heathland was used for intensive sheep grazing, maintaining its character by not allowing natural processes to convert the land back into woodland.

Other processes and practises which shaped this type of landscape include the harvesting of the natural vegetation for fuel, thatch and animal husbandry, and warrening (rabbit farming). Heathland would therefore have appeared more managed in the medieval and post medieval periods (ibid, 60). Latterly large areas of heath were turned over for permanent cultivation. This process began in the 18th century but became widespread after WW2 when arable cultivation dramatically increased to boost the economy.

VALUES AND PERCEPTIONS

Coastal rough ground is often well visited by way of coastal paths. Not only does it provide a recreational and leisure resource for locals and visitors, it also forms the area from which many derive their coastal landscape and seascape perceptions. As a result it probably has a formative influence on people's seascape perceptions far in excess of its proportion of the coastal land area.

Despite that influence, the cultural roles played in the formation and current management of coastal rough ground are probably overlooked by many visitors, feeling these areas offer an escape from urban life and pressures and may well not wish to see that they are still in a highly artificially created land and seascape. This appeal is reinforced by tourist industry literature that presents these areas as 'wild, windswept and remote' places.

The unintensified character of their management has led to many of these areas being highly valued for their archaeological richness and their levels of biodiversity. Many of these areas contain high numbers of Scheduled Monuments and features recorded on Historic Environment Records (HERs), while concerns about the lowering of biodiversity from management neglect is leading to scrub growth being inhibited deliberately by the re-introduction of grazing in some areas: clearly emphasising the cultural dimension of these areas, and of biodiversity levels. The ecological importance arising from this land's management also attracts many wildlife watchers.

RESEARCH, AMENITY AND EDUCATION

In recent years, archaeological and historic survey, research and documentation of this Character Type has increased our understanding greatly, but there remain many aspects still to be addressed.

Its generally good accessibility has led to this Character Type being key to shaping many people's landscape and seascape perceptions. Its accessibility and recreational use give it a huge potential for informative and educational initiatives, especially where they raise awareness of the cultural dimension of the seascape and the overlapping perspectives to, from and along the coast that are themselves one of the unique land/sea-scape characteristics of the coast in general. Opportunities to realise this potential are substantially enhanced by the provisions contained in the Marine and Coastal Access Act 2009 to create a right of public coastal access around England's coastline.

CONDITION AND FORCES FOR CHANGE

This Character Type is generally well used by walkers and other visitors and this is likely to continue to increase. Some erosion problems could arise as a result and will need informed and sensitive management. That applies too in the routing and maintenance of the England's coastal access route provided for in the Marine and Coastal Access Act 2009. That Act also states that the access will be resilient to coastal change (HM Government 2009). But as noted above, the Act's access provisions also create major public-awareness raising opportunities. While the content will need careful balance to ensure both cultural and natural character perceptions and environmental dimensions are conveyed, the siting of such information provision, where not offered through online resources, will also need to derive from broader visitor management plans for the route.

In some areas such as Suffolk, pressures for change also arise from increased moves to cultivate traditional grazing land and the wide-scale establishment of conifer plantations in areas such as Suffolk.

RARITY AND VULNERABILITY

Agricultural economic forces and recreational pressures have left much coastal rough ground at risk from neglect and visitor erosion in recent years. While still present, this risk is now recognised and the various cultural and ecological values which bear on this Character Type are now prompting measures to reverse its management decline and maintain its character. Creation and maintenance of the new public access route across England's coastline will need care and sensitivity to harmonise with coastal rough ground's management needs.

Very little of England's ancient heathland survives (<http://www.forestry.gov.uk/england-heathland>), leading to the designation of most remaining areas such as the Suffolk Coast and Heaths AONB and the National Park status of the New Forest.

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2. Character Text Descriptions Regional Perspective

The following Regional Perspective HSC Character Type texts were prepared in February 2011 by Seazone Solutions Ltd and Maritime Archaeology Ltd. The texts were supplemented, revised and edited by Dave Hooley, English Heritage Characterisation Team

2.1 BROAD CHARACTER: NAVIGATION

2.1.1 Character Type: Navigation feature

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The region's maritime trade and transport links with continental Europe are known to have developed from the Bronze Age onwards with the English Channel being a thoroughfare for continental trade. Shipping industry and trade routes continued to grow through the centuries and the Southern England region is now one of the world's busiest seaways. Shipping in the Channel is monitored and controlled by the Coastguard, stationed in the Portland and Solent areas. Marine GPS systems allow ships to be preprogrammed to follow navigational channels accurately and automatically, avoiding risk of running aground.

The established navigable shipping channels are of vital importance to the region's trade, and their continued maintenance is a high priority (Solent Forum, 1997). One of the legal duties of the harbour authorities is ensuring that the region's ports are safe and clearly marked, and are of sufficient dimension to accommodate the area's shipping (Solent Forum, 1997).



Shipping in Southampton Water (© Hampshire & Wight Trust for Maritime Archaeology)

Extensive maintenance dredging operations of the channels of port areas such as Southampton Water and Chichester Harbour frequently occur which impacts the seabed subsurface.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The region has a long history of maritime trade links with continental Europe. Transport links are known to have developed from the Bronze Age and Iron Age onwards, with trade increasing dramatically in the Roman period. With this increase came a corresponding growth in the amount of shipping needed to carry it (MA Ltd, 2007).

Coastal shipping played a significant role in trade around the British Isles in Medieval times. Large quantities of goods were moved from around the coast to the larger ports and from there they were shipped to the continent (Friel 2003). Southampton played an important role in coastal and continental trade during this period.

By the early 1600s trading areas had expanded to include new markets in the Baltic and the Mediterranean. This increase in trade mostly centred on London and several other larger ports along the south east. By the seventeenth century England's overseas growth greatly increased, and the Industrial Revolution played a further role in the development of ports, with Southampton and Portsmouth becoming major centres for trade (MA Ltd, 2007).



Port of Southampton (© Hampshire & Wight Trust for Maritime Archaeology)

A short post-war shipping boom was experienced between 1918 and 1921, but was soon followed by an economic downturn in the 1950s, when the British shipping industry had to compete with subsidised German, American and Japanese fleets (Friel 2003) as well as increased competition from air transport. The advent of containerised shipping in the 1960s, and the search for economic benefits in world trade saw the development of bigger tankers and larger bulk carriers (Friel 2003).

The Southern England region is now one of the world's busiest seaways. Whilst in the Channel, shipping is monitored and controlled by the Coastguard, who has stations in the Portland and Solent areas. The volume of traffic is considerable. Within a 15 mile radius of the Channel Light Vessel there are around 47,000 commercial vessel movements a year. This reduces to around 19,000 per year within a 15 mile radius of the St Catherine's Lighthouse, located on the south coast of the Isle of Wight (James et al, 2010).

The mainland ports are providers of services within a competitive market of international trade, and the requirements for port activity are a product of the demands of the ports' customers, and the ports' commercial choices and decisions. The main requirements include

- maintained depths of water within the port's berths
- safe, clearly marked deep-water approach channels of sufficient dimensions to accommodate the customer's shipping. Creation of these channels requires capital dredging, and there is a requirement that their dimensions are assured through a programme of survey and maintenance dredging.
- adequate arrangements to ensure safety of navigation, including appropriate pilotage, radio and radar coverage, and a system of enforceable bye-laws (Solent Forum 1997).

Navigation channels are most frequent in the western side of the Southern England region, for example in the Solent area where commercial shipping is extensive. Southampton Port is one of the busiest commercial ports in the country and the northern part of Southampton Water is characterised by two channels; the deep navigable channel of the River Test and

that of the River Itchen. The main shipping channel is marked on either side by navigation aids, primarily buoys in both the Test and Itchen rivers (Solent Forum, 1997). The Port of Southampton has a programme of expansion underway with the deepening of the main channel of Southampton Water to improve access for the new generation of larger container shipping (www.southamptonvts.co.uk/pinfo/DevelopmentProjects.htm).

The continued maintenance of established navigable shipping channels is of the highest priority as they are essential for the region's trade. Maintenance dredging is a legal duty of harbour authorities and is required to conserve water depths in significant lengths of, for example, the Solent's navigation channels (Solent Forum, 1997).

The mouth of Chichester Harbour is relatively narrow, with extensive spits of sand and gravel which are subject to frequent wave action modification during storms. Maintenance dredging of the channel and harbour entrance is a frequent activity (Solent Forum, 1997)



Dredging operation (© Hampshire & Wight Trust for Maritime Archaeology)

The disposal of material from navigation dredging is regulated by the Ministry of Agriculture, Fisheries and Food (MAFF). MAFF's policy is to permit disposal at sea only where there are no suitable options for disposal on land. One of the region's main disposal sites is the Nab disposal ground to the east of the Isle of Wight (Solent Forum, 1997).

VALUES AND PERCEPTIONS

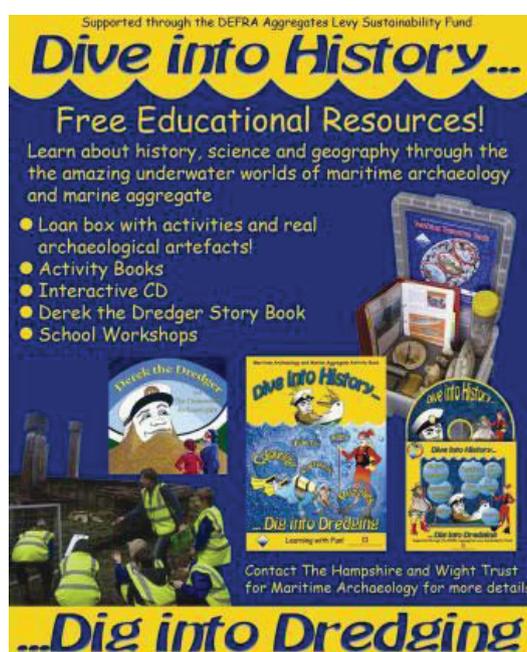
Clear navigation channels and dredged areas form an important part of working ports or harbours in the region. Dredging craft are often found moored in harbours ready for service becoming part of the landscape/seascape of the Southern England local coastal communities.

RESEARCH, AMENITY AND EDUCATION

The history of navigation channels and dredging is an important aspect of the history of the human past and how these navigable routes have been utilised. Many navigable channels may now have been lost or buried in the region.

This Character Type offers limited use for amenity usually because the channels are actively worked. Nevertheless recreational watercraft, small boats and anglers use many of the channels in the region.

The educational potential of this Character Type is considerable. For example, the 'Solent Aggregates to Outreach' project has successfully demonstrated the direct educational potential of dredging related subjects and the historic environment (www.hwtma.org.uk/index.php?page=aggregate-to-outreach; Hampshire & Wight Trust for Maritime Archaeology 2007; also see <http://ads.ahds.ac.uk/project/alsf/>). Therefore, further educational tools could be developed raising awareness to schools about our common historic environment whilst demonstrating that collaboration between regulators, the heritage sector and the aggregates industry (in this case) is highly beneficial.



**HWTMA's educational resources focussing on the aggregate industry
(© Hampshire & Wight Trust for Maritime Archaeology)**

CONDITION AND FORCES FOR CHANGE

Dredging has impacted on the historic character of the region, in particular, dredging of the Solent area. Finds of archaeological interest have been revealed by these dredging activities (www.hwtma.org.uk/index.php?page=aggregate-to-outreach; Hampshire & Wight Trust for Maritime Archaeology 2007; also see <http://ads.ahds.ac.uk/project/alsf/>).

Dumping of dredged materials can introduce contaminants to the marine environment (Department of Trade and Industry 2002a, b).

Whilst the current pattern of maintenance dredging has altered the sediment regime and environment, there is no evidence that it is leading to long-term damage. However, information about the extent of maintenance dredging is limited, and its lack of monitoring is a legitimate source of concern. Where maintenance dredging may affect an SSSI, there is a legal requirement to inform English Nature of proposals to dredge (Solent Forum, 1997).

RARITY AND VULNERABILITY

This Character Type has a wide variety of well preserved components from the early modern period onwards in the region. In areas that are continually dredged today, the potential of prehistoric and historic remains is low due to dredging having an intrusive impact on the seabed and river banks.

Marine dredging activities could impact on the historic character of a region. However, dredging companies who have been successful in a tender round run by The Crown Estate must obtain a Dredging Permission (DP) from the government, a procedure which includes the submission of Environmental Impact Assessments (EIA). If a favourable DP is granted, The Crown Estate will issue the applicant with a production licence (www.thecrownestate.co.uk). This procedure allows the assessment of the potential of prehistoric and historic remains and secondary impacts of dredging and dumping prior and during any further works through, for example, desk based assessments and Written Scheme of Investigations amongst others.

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2.1.2 Character Type: Navigation activity

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type identifies areas characterised by distinctive human activity directly relating to the passage of shipping traffic, such as navigation routes, anchorages and ferry crossings, including intimately associated areas and features such as buoyage at anchorages, and ferry crossing terminals.

Southern England's coastal and marine region constitutes one of the world's busiest seaways. Within a 15 mile radius of the Channel Light Vessel (located at 49°55'N 2°54'W in the English Channel) there are around 47,000 commercial vessel movements a year. This reduces to around 19,000 per year within a 15 mile radius of St Catherine's Lighthouse, located on the south coast of the Isle of Wight (James et al, 2010).



St Catherine's lighthouse, Isle of Wight (© T Millership)

Some of the UK's major ports operate in this region, many of which have long histories of operation, due to this region's significant role in shipping and continental/international trade for many centuries. Southampton is one of the major ports of the country. The modern port

was opened in 1843 and since then has grown to become the flagship port operated by Associated British Ports (www.abports.co.uk). It handles in excess of 42 million tonnes of cargo annually. Other major ports in the region include Portsmouth Commercial Port and Newhaven in Sussex.



Port of Southampton (© Hampshire & Wight Trust for Maritime Archaeology)

A number of ferry services also operate from this region. These include local passenger ferries across rivers and waterways such as the Hamble River and Southampton Water, as well as continental ferry services which operate from Poole, Portsmouth, Weymouth and Newhaven, taking vehicles and passengers to the Channel Islands, France and Spain.

Associated Sub-Character types such as anchorages and harbour pools are also present throughout the region.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Evidence from the historic environment illustrates that there were wide ranging trading links between southern England and the continent from the Early Bronze Age (MA Ltd, 2007), with the calm and sheltered waters of the Solent ideal for coastal navigation and fishing. This focus of activity is also expressed in the form of Bronze Age barrows, several flanged and socketed axes, palstaves and pottery fragments that have been found just off the coast and along the shore of this area (MA Ltd, 2007).

By the Iron Age there was a comprehensive trading network between Britain and continental Europe. With the invasion of Britain, under the Emperor Claudius in AD 43, this trade increased dramatically (Cunliffe, 2001). With this increase came a corresponding increase in the amount of shipping needed to carry it (MA Ltd, 2007). The waters around the Solent linked the continental Roman Empire with major Romano-British provincial settlements in Chichester, Southampton and Portchester Fort (directly bordering Portsmouth

Harbour) which served the Roman Navy. Additionally, vessels would have landed in a variety of less well-known locations throughout the Solent (*Magnus Portus*), which has a number of large maritime villas on its shores (Drummond & McInnes 2001).

With the decline of the Roman Empire, Britain was effectively left to defend itself from the raiding Saxons and Franks. The early medieval period is characteristically sparse in terms of direct evidence for maritime trade (MA Ltd, 2007).

In the seventh to ninth centuries a centralised settlement pattern and greater political control developed in England. It is at this time that the first of England's seaports were established. The large number of Anglo-Saxon towns that were also ports or had associated ports, such as Hamwic (Southampton) demonstrates the importance of continental sea trade for the Saxons (Friel 2003). Material expression of this maritime transport during this period has been located in Langstone Harbour (www.hwtma.org.uk).



Archaeological investigations at Langstone Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

Coastal shipping played a significant role in trade around the British Isles in medieval times, with most of the trading routes being either coastal, along the channel, or cross channel. Large quantities of goods were moved from around the coast to the larger ports and from there they were shipped to the continent (Friel 2003). Southampton played an important role in coastal and continental trade during this period. In the twelfth century Southampton was almost exclusively involved in the wine trade between Gascony and England. By the fifteenth century Southampton had expanded its trading links to include Italian city states, notably Genoa (Wheatley 1990). These trading links are reflected in the recorded shipping losses in the Wight area with the majority being French vessels, with Italian, Portuguese and Flemish and several coastal vessels of English origin also having been recorded. Poole

Harbour also had large continental trade similar to that of Southampton which is expressed in the number of shipping losses in the area.

By the early 1600s English merchants had gradually expanded their trading areas to include new markets in the Baltic and the Mediterranean. This resulted in an increase in trade, most of which was centred on London and several other larger ports along the south east. By the seventeenth century England's overseas growth greatly increased, which not only benefited the capital, but can be seen to have developed the regional centres which directly traded with it (Friel 2003). This period of prosperity is reflected in the country's merchant fleet, which grew in size between 1580 and 1680, and continued to do so into the eighteenth century (Adams 2003; Ransley et al 2010).

The trade in goods to supply the growing port of Portsmouth, and coastal trade taking goods along the south coast towards London, is reflected in both the quantity and diversity of shipwrecks in the post medieval period. The Yarmouth Roads wreck is a good example of a trading vessel from this period. Located within the Solent in 1984 the site is the wreck of a late 16th or early 17th century merchantman, possibly the Spanish Carrack *Santa Lucia* lost in 1567 (Watson & Gale 1990). This wreck site is protected under the Protection of Wrecks Act 1973.

Within the Wight area the Industrial Revolution played a major role in stimulating the development of ports, with Southampton and Portsmouth becoming major centres for trade. This also resulted in a large amount of shipping lost off these shores. The majority of these vessels are English, reflecting the vast scale of England's merchant fleet at this period.

A short post-war shipping boom (between 1918 and 1921) was later followed by an economic downturn in the 1950s. This resulted in a rapid decline in the British shipping industry, facing increased competition from subsidised German, American and Japanese fleets (Friel 2003) as well as competition from air transport. By the 1960s world shipping had undergone a technological revolution with the advent of containerised shipping. The search for economic benefits in world trade saw the development of bigger tankers and larger bulk carriers (Friel 2003).

Today, the South Coast region is one of the world's busiest seaways with around 47,000 commercial vessel movements a year within a 15 mile radius of the Channel Light Vessel (James et al, 2010). Whilst in the Channel, shipping is monitored and controlled by the Coastguard, stationed in the Portland, Solent and Dover areas.



**Busy shipping lanes in Southampton Water
(© Hampshire & Wight Trust for Maritime Archaeology)**

During the Early Modern period, both the White Star and American Line chose Southampton as their transatlantic terminus, which resulted in an increase in shipping to the port. Southampton continues to enjoy a significant transatlantic ocean liner business, as illustrated by the increasing number of cruise terminals in the city.

Other examples of navigation activities in the region include local, regional and continental ferry services. Local passenger ferries have existed within the region for centuries, for example the service across the Hamble River between Hamble-le-Rice and Warsash dates back to at least the medieval period and still utilises the same hards for landing. Other smaller local ferry services include that connecting Chichester to Itchenor and Emsworth, Keyhaven to Hurst Castle, Portsmouth to Gosport, Hythe to Southampton, and Southampton/Portsmouth to the Isle of Wight. Continental ferry services operate from Poole, Portsmouth, Weymouth and Newhaven.



Newhaven-Dieppe ferry (© Maritime Archaeology Ltd)

Historic anchorage areas occur in many places along this coastline. Tidal conditions and associated shore-side settlement or facilities meant that ships sought suitable areas to moor up and/or drop anchor. With the shelter provided by the Isle of Wight and suitable seabed conditions, the Solent has been used as an anchorage from the Roman period onwards (www.hwtma.org.uk/anchorages). While at anchor a surprisingly amount of material is either lost over board or deliberately jettisoned. This has left a legacy of anchorage related material on the seabed. Some of the many examples of anchorage sites in the Solent include the smaller anchorages of Yarmouth and Ryde Roads, the naval use of Spithead which has left a range of seabed traces as has the use of many of the smaller anchorages such as Yarmouth and Ryde Roads, and a number of sites within Portsmouth Harbour where HMS *Victory* is known to have been moored after its active service (www.hwtma.org.uk/victory).

The region continues to support a large number of anchorages due to the high level of shipping and recreational vessels in the modern period. There are noticeably more in the west of the region (the Solent) area which is busier in terms than the more tranquil eastern part of the region (East and West Sussex). Anchorages are found on the (more sheltered) north east and north west coasts of the Isle of Wight. The north west coast is sheltered from prevailing south westerly winds by the Isle of Wight and to some degree by the presence of Hurst Spit at the entrance to the West Solent channel. The channel is much deeper and wider than the Eastern Solent, providing an extensive area for safe anchorage. Historic charts record numerous anchorages in the area contrasting with a distinct lack in hazards. The mainland foreshore features extensive muddy intertidal areas while the Isle of Wight coastline is more narrow and rocky but the lack of offshore hazards and environmental constraints in much of the area makes it a characteristic safe haven for shipping. (Merritt et al 2006)

There are numerous anchorages along the main channel of Southampton Water as well as the Hamble, Itchen and Test Rivers (Merritt et al 2006), and many are found at the

entrances to harbours such as Poole and Portsmouth, Langstone and Chichester Harbours where the number of anchorages recorded outside the harbour entrances increased in number on later charts with the development of Portsmouth's naval importance (Merritt et al 2006).



Spithead anchorage, Portsmouth Harbour
(© Hampshire & Wight Trust for Maritime Archaeology)

A harbour pool is the area of water including and adjacent to a port or harbour, falling under the jurisdiction and activity-controls, of a port/harbour authority. Examples of these in the region include the authorities governing Cowes, Portsmouth, Hamble, Newport, Poole, Newhaven and Southampton Authorities. Their role is to ensure the safety of navigation, the regulation of moorings, works and dredging, enforcement of harbour byelaws and the collection of dues and charges.

VALUES AND PERCEPTIONS

Historically, navigational activities have served as a means of linking different places and people. The people living along its coasts exploited the sea as a means of communication and were culturally, economically and possibly politically linked closely together (Clarke, 1985). The presence of continental ferry routes and the growth of the transatlantic ocean liner business have meant that the region is now even more closely linked with other global communities. It has also meant a growth in the local and regional economy, with residents appreciating the employment opportunities these businesses offer.

As well as the larger commercial trade, the anchorages support recreational activity in the region, meaning that such navigation activities are valued through their tourism benefits.

RESEARCH, AMENITY AND EDUCATION

Wrecks give an indication of navigation and shipping activities. The distribution of wrecks is very dense along the English coast.

In addition to wrecks, distributions of artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites. The potential for anchorage areas, even in what are now busy modern harbours, has been investigated by the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org.uk). With the shelter provided by the Isle of Wight and suitable seabed conditions, the Solent has been used for the mooring of ships from the Roman period onwards. A legacy of anchorage related material remains on the seabed due to artefacts being either lost overboard or deliberately jettisoned. To date there have been few detailed studies of these sites meaning their full archaeological importance is not always recognised (www.hwtma.org.uk/anchorages). The HWTMA is researching these sites through field investigations and associated research. The 'Dive onto Victory' project, in particular, has been important in demonstrating the density and diversity of an anchorage collection (www.hwtma.org.uk/victory). Some of the smaller known historic anchorages such as Yarmouth and Ryde Roads on the Isle of Wight were investigated in the 1990s in a pioneering project to use controlled trawls to recover material (www.hwtma.org.uk/spithead).



**Artefacts recovered during Dive onto Victory fieldwork
(© Hampshire & Wight Trust for Maritime Archaeology)**

In addition to the archaeological evidence there are a range of historical sources which can add to understanding of these sites. The use of historic charts, sailing directions and paintings can add a new dimension to research.

The development of historic anchorages is linked to particular geographical, environmental and cultural factors which have all had an impact on the archaeological material on the

seabed. The international character of ships and shipping mean a range of social, political and economic factors are reflected in the collections the ships leave behind. To investigate these aspects work is ongoing to identify comparative collections from around the globe.

Initiatives integrating research into Information and Communication Technologies (ICT) could be a way of bringing this Character Type into schools to raise regional awareness about the England's maritime legacy and its characteristics. Furthermore HSC aims to raise public awareness in order to engage people with the scale of navigation and shipping activities in their local areas, providing a new perspective about offshore activities that often go unrecognised onshore.

CONDITION AND FORCES FOR CHANGE

The impact of this Character Type on today's landscape/seascape could be considered as ongoing since navigation and shipping activities change through time as shipping techniques evolve. It could be expected that navigation activities would reflect the dominant industries of the time. Therefore, documenting these industries and activities (including fishing and recreational activities) will enable a greater understanding of navigation areas and routes associated with them as well as the maritime character of an area.

Initiatives such as the 'Dive on Victory' project undertaken by the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org.uk/victory) have also helped in raising awareness of the historic aspect of this Character Type by involving local residents and volunteers in the project research and presentation of the results.

Another consideration that might impact on this historic Character Type is increasing disturbance of the sea-floor environment. Preservation of material remains from this Character Type varies considerably, depending on several factors which include, amongst others, materials used for the construction of the vessels, type of cargo, local environmental conditions, currents, water temperature, whether the wreck is exposed or buried, whether the burial environment is aerobic or anaerobic and current activities in the area.

RARITY AND VULNERABILITY

In view of the long history of the navigation activities in the waters of and off southern England, ports, harbours and anchorages occur across the region's coasts and seas.

Wrecks and historic anchorages provide an indication of navigation activities in the region. For example, the significant number of wrecks (over 800) in the Solent area. There is a high concentration along the region's coast with many wrecks deriving from the early modern period (1750-1900) related to coastal trade and fishing.

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2.1.3 Character Type: Navigation hazard

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

A substantial proportion of the navigational hazards in the region can be related to the presence of features such as sandbanks, rocks, areas of turbulent water and strong tidal currents (MA Ltd, 2007). The Navigational Hazards Project (Merritt et al, 2007) identified a number of areas within the region that are particularly hazardous. These, together with the large amount of shipping traffic in the region, have resulted in a high number of wreck sites.

The entrances to many of the harbours and ports in the region eg Chichester Harbour Southampton Water (the approach to the Port of Southampton) encompass many navigational hazards and are characterised by navigational aids which aid safe shipping. An elaborate hairpin route is needed by large ships entering or leaving Southampton due to the shoals (Glasspool, 1998). Typical offshore ledges and shoals elsewhere in the region include Bembridge Ledge, Princessa Shoal and Nab Shoal, all west of Bembridge Point on the Isle of Wight.



**Navigational aid highlighting hazards within Southampton Water
(© Hampshire & Wight Trust for Maritime Archaeology)**

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Navigational Hazards Project (Merritt et al, 2007) identified a number of areas within the region that are or were of a particularly hazardous nature. The south east coast of the Isle of Wight has a partially sheltered rocky shoreline (Merritt et al, 2006) while the area surrounding Bembridge Point is characterised by a partially sheltered rocky foreshore with large rocky ledges extending out from the shoreline. There are several offshore ledges and shoals to the west of Bembridge Point including Bembridge Ledge, Pricessa Shoal and Nab Shoal (Merritt et al, 2006).

The coastline around Selsey Bill in Sussex is characterised by numerous offshore hazards. A band of rocks and banks known as the Grounds and the Owers create a natural barrier around the Looe, offshore from the Bill. The coast is exposed to south westerly prevailing winds increasing the dangers of these offshore features (Merritt et al, 2007).

Areas of shallow water include the eastern approaches to the Solent which tend to be characterised by the presence of fine grained sands and silts in the channel, known to be highly mobile (Merritt et al, 2007). The risk lies in the shallowness of the area, its mobility and the extensive foreshore banks lying on either side of the approaches to several major harbours and ports including Southampton, Portsmouth and Chichester (Merritt, 2007). Between the entrance to Cowes and the entrance to Southampton Water is an extensive area of sandbanks the largest of which is known as Brambles Bank which is known to dry out at low water (Merritt, 2007). Other key banks recorded (of which there are many) include Ryde Middle Bank which lies in the middle of the channel to the south east of Brambles Bank, East Knoll, Horse Sand Mother Bank (Merritt, 2007).



Exposed shingle bank in Southampton Water (© Hampshire & Wight Trust for Maritime Archaeology)

The narrow entrance to Chichester Harbour is dominated by yacht traffic, which navigates carefully to avoid the Chichester Bar a shallow spit which can present a significant hazard at

all states of the tide. These waters have been utilised since before the Roman occupation which has resulted in a wealth of recorded shipwreck losses.

The hazardous nature of certain areas of water can also relate to the state of the sea. For example, the shoreline around St Catherine's Point on the Isle of Wight is characterised by eddies, overfalls and races that are recorded in the 18th century Mackenzie charts (Merritt, 2006). There are eddies running off the end of Hurst Spit during a flood tide and the currents through the entrance to the channel can initially run fast (Merritt, 2006).



St Catherine's lighthouse on St Catherine's Point, Isle of Wight (© T Millership)

The Needles and their surrounding area have been defined (Merritt, 2006) as one of the smaller but more hazardous areas. This area encompasses the Needles, the gravel banks extending out eastwards to the deeper Dolphin Bank from the extremity of the Isle of Wight and the extensive Shingles Bank to the north on the other side of the channel running past Hurst Spit. The Needles have been charted in all of the charts studied during the Navigational Hazards Project from the earliest Waggoner to the most recent 1935 Admiralty chart reviewed for the pilot study (Merritt, 2006). Another prominent navigational hazard in the region is Old Harry Rocks, two chalk sea stacks located at Handfast Point on the Isle of Purbeck in Dorset.



The Needles, Isle of Wight (© T Millership)

The region's maritime trade and transport links with continental Europe are known to have developed from the Bronze Age onwards with the English Channel being a thoroughfare for continental trade. Today, the Southern England coastal and offshore region is one of the world's busiest seaways. This large amount of traffic, together with the hazardous nature of some of the waters in the region has resulted in a high number of wreck sites.

A density analysis of the wreck distribution was undertaken by the South Coast REC project (James et al, 2010) which also shows a high number of sites in the eastern Solent area which contains the approaches to Southampton and Portsmouth, at the entrance to the western Solent, near the Isle of Wight, and in the area around Poole Harbour and (James et al, 2010). These areas were also identified as 'high hazard' areas in the ALSF-funded Navigational Hazard Project (Merritt et al, 2007).

The rocky features along the north eastern tip of the Isle of Wight are well-known to modern sailors, but have claimed a large legacy of shipwrecks in the past. Twenty five wrecks and obstructions have been recorded in the area, five of which occur within the harbour itself.

VALUES AND PERCEPTIONS

Navigation hazards have been a consideration for mariners since prehistoric times and these hazards were only perceived by those who knew about them. However, the state of the tide affected whether or not those hazards were exposed or hidden. These hazards became visible in people's consciousness due to their dangers. Very often, tales and myths will be associated with them.

The creation of nautical and maritime charts generally expressed and recorded the knowledge of the surveyed area at the time but they also represented a tool for recording hazards and other dangers associated with the sea.

Wrecks were fatal for many but also highly dramatic events for those who lived to tell the tale and add to local stories of hazards on the high seas. They are now also perceived as recreational opportunities, with the many wrecks of the region being dived upon by amateur dive groups and professional organisations. Many wrecks are also valued for their addition to habitat diversity in their areas.

An unusual recreational opportunity occurs on the Brambles Bank in the Solent each year. With the exceptional fall of tide that comes with the equinoxes in March and September, the Brambles actually shows above the surface (Glasspool, 1998) and a cricket game between the Royal Southern Yacht Club and the Island Sailing Club is held on it annually.

RESEARCH, AMENITY AND EDUCATION

Thousands of wrecks have been recorded in the region. Wrecks are fragile and non-renewable resources serving as exceptional opportunities to discover our common past as well as important habitats for aquatic life since they act as artificial reefs for entire and unique ecosystems. In this sense, wrecks are also seen as beneficial sites of increased biodiversity by marine ecologists. Further collaborative work between marine biologists and archaeologists would enable a deeper understanding of species living in wreck sites, how they contribute to wreck preservation, and contextualising this information within regional sea dynamics.

Shipwrecks also attract divers, representing unique recreational tools as well as educational ones, allowing a more comprehensive understanding of the different uses and dangers of the sea. Shipwrecks could also be understood as tools linking different places and people providing unique knowledge about our past. This knowledge could be exploited as educational and recreational tools, bringing a distinctive insight to regional and national history.

The Hampshire and Wight Trust for Maritime Archaeology (HWTMA) (www.hwtma.org.uk), and others, have undertaken investigations of many of the shipwrecks of the region over the past twenty years. They have produced publications, talks and teaching packs which communicate their findings to a wide audience. A recent educational resource developed by the HWTMA is the Maritime Bus which travels across the region, engaging people of all ages with the wrecks and other maritime archaeology remains of the area.

Through the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage, Bournemouth University undertook the 'Mapping Navigational Hazards as Areas of Marine Archaeological Potential' project. The project offers a methodology for identifying and mapping areas of maritime archaeological potential by characterising areas exhibiting trends in ship losses due to environmental, structural and meteorological navigational hazards, which have been described in historical sources such as charts and pilotage documents (Merritt et al 2005, 2007). Further research like the Navigational Hazards project could further develop quantitative systems for assessing the archaeological potential for wreckage material in the marine environment.

CONDITION AND FORCES FOR CHANGE

Thousands of vessels have wrecked over the past centuries on the Southern England coastline. Their preservation will depend, amongst other factors, on the construction

materials and the natural environment where they wrecked. In general, the best survival of wooden parts of ships occurs with those that were buried in silt or sand soon after sinking. An example of this is the Mary Rose (Portsmouth Historic Dockyard). Steel and iron, depending on their thickness, may retain the ship's structure for decades. As corrosion takes place, sometimes helped by tides and weather, the structure collapses. Today's prevalent marine conditions will also affect the degree of survival especially regarding the movement of sediments or scouring by currents.

Hazards, such as banks, shoals and rocky outcrops amongst others, are subject to natural erosional processes. However, their rate of change and extent may be influenced by human-made activities or constructions that change the marine conditions. The shifting of sandbanks and shoals means the character of the landscape/seascape is in continuous change. These changes often reveal material remains that are being covered and uncovered or embedded within such bedforms. The latter may also be revealed, in advance of exposure, by seismic surveys.



**Exposed shingle bank in Southampton Water
(© Hampshire & Wight Trust for Maritime Archaeology)**

RARITY AND VULNERABILITY

Navigation hazards, whether natural or human-made represent a resource for characterising the time-depth of regional landscape/seascape. There may be a link between the occurrence of natural obstacles and the presence of wrecked craft, lost gear or accumulated prehistoric or historic deposits. Local environmental conditions will also indicate whether there is potential for preservation of prehistoric or historic materials.

The vulnerability of this Character Type is that sandbanks in shallow areas near coastal settings are known to be extremely mobile and may require frequent repeated survey in the vicinity of ports to ensure the safety of navigation (BGS 2002).

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2.1.4 Character Type: Maritime safety

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The 'Maritime Safety' Character Type includes features or structures sited at important position-finding or dangerous points on or near the coast for the guidance and warning of mariners, but they can also be located well inland. Usual components include marine navigation aids such as areas of buoys, beacons and lights, together with land-based navigation aids such as lighthouses, fog stations, daymarks (eg churches, beacons, chimneys, distinctive topography, distance marks and lights).

Southern England's coastline contains numerous daymarks which help to guide ships safely along the coast and into ports and harbours. Examples of these in the region include features deliberately designed as daymarks, such as lighthouses' white towers, as well as other distinctive place-marking features brought into use for that role such as prominent hillforts, chalk formations, monuments and modern television masts to name only a few.

The region has a number of lighthouses which have a permanent visual presence in today's landscape. Many are also used as amenity resources, being open to the public, for example St. Catherine's Lighthouse on the Isle of Wight.



St Catherine's Lighthouse, Isle of Wight (© T Millership)

There are many areas of hazardous water in the region which are marked by a range of safety features such as buoys, beacons and lights. One example is the Nab Tower situated on the Nab Shoal with its fog signals and a flashing light which is used to ensure safe passage of ships around the shallow water of the Solent margins. The busy stretch of Southampton Water is home to commercial shipping, yachts, small craft and water sports and its limits of safe and navigable waters are therefore marked on either side by navigation aids, primarily buoys.



Navigation aid at Egypt Point, Isle of Wight (© T Millership)

Much of the region, particularly the western area, is designated a safety area (an area with advised or designated restrictions on navigation, or exclusion from permitted navigation altogether, to promote maritime safety) due to factors such as the heavy shipping traffic and features such as submerged rocks such as the Bembridge Ledge.

There are Royal National Lifeboat Institution (RNLI) Stations throughout the region, for example at Poole, Yarmouth, Lymington, Hayling Island, Eastbourne and Hastings.



RNLI station, Hastings (© Maritime Archaeology Ltd)

HM Coastguard stations are also important features located throughout the region, examples being found at Shoreham-by-Sea, Chichester Harbour, Hastings and Hayling Island.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The use of landmarks, or 'daymarks', to guide ships safely along the coast and into ports and harbours is a common aspect of maritime safety and probably the oldest and most basic method of navigation. Some are purpose-built, others reflect a cultural perception and role of topographic features and patterns such as distinctive hills or other prominent landscape features, for example the Devil's Dyke hillfort (also known as Poor Mans Wall) in West Sussex. Some such hills have had monuments erected on them which gives them even more prominence and distinction in the landscape. West of Freshwater Bay on the Isle of Wight lies Tennyson Down, a grassy ridge of chalk which rises to 480ft above the sea. It is named after the poet, Tennyson, who lived nearby for nearly 40 years and now has a monument dedicated to him erected on top of it. Similar is Culver Down with its giant stone needle raised in 1849 to the memory of Charles Pelham, Earl of Yarborough, and first Commodore of the Royal Yacht Squadron.



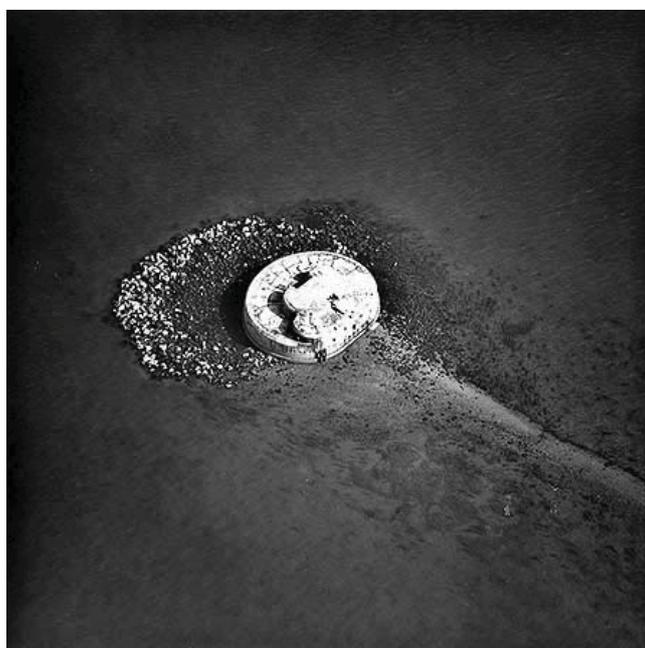
Stone needle on Culver Down, Isle of Wight
(© Hampshire & Wight Trust for Maritime Archaeology)

Distinctive chalk formations in the region would also have been used for this purpose. Examples include Old Harry Rocks which are two chalk sea stacks located at Handfast Point on the Isle of Purbeck in Dorset, and the Needles, a row of three distinctive stacks of chalk that rise out of the sea close to Alum Bay on the western edge of the Isle of Wight. The formation takes its name from a former fourth needle-shaped pillar called Lot's Wife that used to stand in its midst until it collapsed in a storm in 1764.



The Needles, Isle of Wight (© T Millership)

Artificial features which lend distinctiveness to a particular stretch of coastline were also used as daymarks, including church spires, windmills, beacons and chimneys. The Spithead forts, built in the Solent in the 1860s to protect Portsmouth from bombardment from the sea, also form daymarks. Modern structures which could well be used as daymarks today include the Spinnaker Tower in Portsmouth, twin towers of Brighton Power Station and television masts at Brighton and Newhaven.



St Helen's Fort, one of the Spithead Forts in the Solent (© English Heritage)

The region has a number of lighthouses including Anvil Point (Dorset), the Needles Lighthouse which lies at the top of the chalk stacks off the Isle of Wight, Hurst Point Lighthouse (Hampshire) and the old and new lighthouses at Beachy Head in Sussex. The modern lighthouse here lies at the foot of the headland, with the base of an earlier one, built in 1834 and known as the Belle Tout, still standing on the clifftop though recently moved back from the cliff edge. These are used to guide vessels through particularly hazardous waters in the region.

There are many areas of hazardous water in the region, due to factors including shoals and flats (such as the Brambles Bank), submerged rocks and wrecks. Consequently a large number of safety features such as buoys, beacons and lights have been installed to guide sea traffic away from the hazards and into safe harbour. For example, the Nab Tower situated on the Nab Shoal with its fog signals, and a flashing light which is used to ensure safe passage of ships around the shallow water of the Solent margins.

The safe navigable channel into Southampton Water was already marked by a beacon by the time of the Beaufort survey in the mid 19th century (Merritt et al 2006). This busy stretch of water is home to commercial shipping, yachts, small craft and water sports and the main shipping channel is marked on either side by navigation aids, primarily buoys. Navigational buoys are also placed to guide vessels around the shoals and sandbanks along the main shipping routes and into harbours such as Chichester and Cowes.



Busy shipping lanes in Southampton Water
(© Hampshire & Wight Trust for Maritime Archaeology)

Much of the region, particularly the western area, is designated a safety area due to factors such as the heavy shipping traffic (eg at Southampton Water, Chichester Harbour), hazards during certain weather conditions (at Brighstone Bay off the Isle of Wight which is exposed to high winds) and features such as submerged rocks (eg the Bembridge Ledge).

Royal National Lifeboat Institution (RNLI) stations are present at frequent intervals along the mainland coastline and around the Isle of Wight. Examples include Poole and Swanage in Dorset; Yarmouth, Cowes and Bembridge on the Isle of Wight; Lymington, Portsmouth and Hayling Island in Hampshire; and Eastbourne, Hastings and Newhaven in Sussex. A map of all RNLI stations can be found at (www.rnli.org.uk/rnli_near_you/find_a_station). The stations vary in size and capabilities according to the assessed character and demands of the coastline which each station serves. In general, characteristics such as capability to withstand heavy weather, fuel capacity, navigation, and communication devices carried, range etc. will all vary with size.

Maritime search and rescue in the region (and throughout the UK) is coordinated by HM Coastguard, which includes the mobilisation, organisation and tasking of adequate resources to respond to people either in distress at sea, or in inland waters, or to people at risk of injury or death on cliffs and shoreline. Coastguard stations are located throughout the region, examples being found at Shoreham-by-Sea, Chichester Harbour, Hastings and Hayling Island.

VALUES AND PERCEPTIONS

Navigation aids out at sea, such as buoys, lights, and beacons are most obvious to those who use the sea, although at night they also have more visual impact on the landscape/seascape when viewed from land. Those that employ sound, such as fog horns and bells, have an immediate effect alerting about the dangers ahead but similarly have a landward dimension too, their often haunting sound sometimes carrying far inland.

Coastguard and lifeboat stations are an integral part of the Southern England coast and are greatly appreciated by the public and visitors to the region for their safety and life saving roles.

Some of the features that can be considered as daymarks are also tourist attractions. The Needles are a major tourist draw, with the scenic boat trips that operate from Alum Bay and offer close-up views of the stacks being very popular. The rocks and Needles lighthouse have become icons of the Isle of Wight and are featured on many of the souvenirs sold throughout the island. Some features are also linked to local legends, for example those surrounding the Agglestone Rock, a 17 foot high sandstone block perched on a conical hill outside Studland in Dorset. One legend tells of the rock being carried from Isle of Wight by the Devil who planned to drop its 400 tons on Salisbury Cathedral but the burden proved too great and the task was abandoned; another that the devil threw the rock from the Isle of Wight with the intention of hitting Corfe Castle (www.soton.ac.uk/~imw/Studland-Tertiary.htm).

RESEARCH, AMENITY AND EDUCATION

Further research would be beneficial through archaeological fieldwork and landscape approaches can complement documentary sources on the development, history and chronology of landmarks and navigational aids in the region.

Lighthouses are often used as public educational and amenity resources, for example St Catherine's lighthouse on the Isle of Wight is open to public at discretion of the keeper.

This Character Type lends itself well to local, regional and national case studies appropriate for the Secondary National Curriculum especially geography which looks at how places and landscapes are formed and how people and their environment interact.

CONDITION AND FORCES FOR CHANGE

Terrestrial navigation markers are increasingly becoming disused, since these traditional methods are being replaced with radio, satellite navigation, digital marine charts and seismic technologies. The same is occurring with the automation of lighthouses with questions being raised about the relevance of lighthouses due to increased modern use of Global Positioning Systems (GPS). The use of these systems has become standard for most maritime activities. However some argue that visual and lit markers should be retained as a back-up in case of failure of electronic systems. Proposals to decommission lighthouses are often met with fierce opposition from local community interests and conservation groups, reflecting the iconic roles such features have for coastal land- and seascape perceptions.

Although navigation aids, particularly those at sea, are often replaced and renewed, their mooring sites may still hold evidence of successive use and re-use. This is exemplified in the use of fixings, piles and other materials to anchor these features to the seabed. In April 2010, a £500,000 underpinning project was announced, designed to stop the Needles lighthouse falling into the sea (due to the condition of the chalk strata on which the lighthouse was built) (www.iwcp.co.uk/news). The plan is for civil marine contractors to dig a trench around the base of the lighthouse, install a ring of stabilising posts, and infill it with concrete.

The growth in shipping traffic has been accompanied by an increase in the volume of recreational activity. This has led to concerns about navigational safety, and to the creation of bye-laws and regulations to reduce conflict. The two most notable examples are the small craft channel at the entrance to Portsmouth Harbour, and the 'moving prohibited zone' at the Brambles Turn at the mouth of Southampton Water. These arrangements have become widely accepted within the sailing community (Solent Forum 1997).

RARITY AND VULNERABILITY

Navigation aids can be understood as providing an intimate connectivity between land and sea. As such, navigation aids are fundamental to understanding the present and past human-use of the sea and offer a new perspective to our understanding of maritime safety. Plotting the location and understanding the development of coastguard stations along the coast would give valuable information about the development of hazards and preventative methods for coastal trades of all types (Val Baker et al 2007).

Navigational aids are vulnerable due to their location as well as technological advances. Technology is replacing traditional methods, and the monuments and features associated with these former methods are becoming obsolete. Many features have already disappeared and may be discernible only through the archaeological studies and interpretations.

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2.2 BROAD CHARACTER: INDUSTRY

2.2.1 Character Type: Extractive industry (minerals)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Extractive Industries (minerals) includes the following Sub-types:

- Aggregate dredging
- Aggregate quarrying
- Quarrying
- Mining (coal)
- Mining (metals)
- Mining (other)
- Mining (unspecified)

This Character Type dominates in many areas of the region's coastal and marine zones, with examples of a broad range of mining and quarrying present. Along the coastal zone these range from chalk and gravel in Hampshire, Purbeck Marble in Dorset, and limestone and chalk on the Isle of Wight.

The Southern England marine region is an important source of marine aggregates with a long-standing history of extraction, much of the dredged aggregate also being brought ashore on the region's coast. Sand/gravel from this region accounted for about 20% of total sand and gravel supply in England and Wales (Highley *et al*, 2007).



Dredger in action (© Hampshire & Wight Trust for Maritime Archaeology)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY



Gravel piles on aggregate wharf (© Hampshire & Wight Trust for Maritime Archaeology)

Purbeck Marble (quarried from cliffs on the Isle of Purbeck in Dorset) has been in great demand for centuries. It was first quarried in the Roman period, and was used later in the construction of the region's cathedrals eg Chichester. Once quarried, the stone was transported further by ship or barge to be used in buildings further afield.

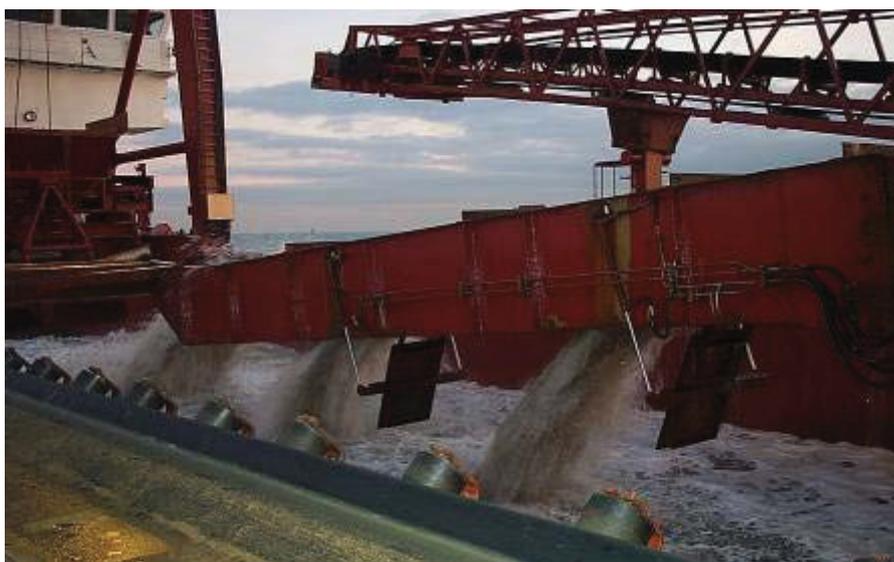
Quarr limestone from the Isle of Wight was used in the late 11th century to build Canterbury and Chichester cathedrals. However, by the seventeenth and eighteenth centuries the quarries at Quarr were no longer producing the best quality stone and their pre-eminence had been displaced by the beach limestone quarries at Bembridge (www.aggregate.com/PageFiles/20/AboutUs-History-Isle-Wight-BardonVectisPt1.pdf). Here, limestone was being quarried from below the high water mark on the Bembridge Ledges off the northeast tip of the Isle of White from Tyne Ledge at the entrance to Bembridge Harbour around past the Foreland to Whitecliff Bay (Fenn, 2009). The Tertiary Bembridge Limestone which is exposed on the ledges was easily split along its bedding planes in to blocks which could be used in masonry. The locality was accessible by boat and therefore the limestone was readily transported by sea, not only for use on the island but across the Solent on the mainland. It was only the coming of brick making on an industrial scale in the 19th century that brought an end to offshore quarrying (James et al, 2010).

The quantities of ballast required for laying and maintaining the Island's railway tracks in the early twentieth century meant that commercial quarrying of chalk was increasingly becoming a viable proposition. Though granite and limestone chippings were preferred for ballast, chalk was taken from Ashey quarry for the Ryde and Newport railway, providing access to the island's north east coast.



Large quantities of chalk ballast were required for the Isle of Wight's railways such as that at Ryde (© Hampshire & Wight Trust for Maritime Archaeology)

This region is an important source of marine aggregates with a long-standing history of extraction. The South Coast is one of seven Crown Estate regions in England and Wales where marine aggregates are dredged within designated licensed dredging areas. Marine aggregates are an important source of sand and gravel accounting for about 20% of total sand and gravel supply in England and Wales (Highley *et al*, 2007). In 2006 the total marine aggregate production in England and Wales was 24.3 million tonnes, of which nearly a third was produced in the South Coast region (James et al, 2010).



Aggregates dredger in action (© Hampshire & Wight Trust for Maritime Archaeology)

In 2008, 3.93 million tonnes of aggregate for construction purposes was dredged in the South Coast region (www.thecrownstate.co.uk/dredge_areas_statistics). Of this, much was landed at eight wharves along the south coast from Poole to Shoreham. The most significant wharves are at Southampton and Shoreham which together take 70% of the tonnage landed in the region (www.thecrownstate.co.uk/dredge_areas_statistics).

In 2009 there were twenty four licensed dredging areas in the Southern England region. These are clustered in three groups, two of which surround the Isle of Wight, with the third group east of Selsey Bill (the 'Owers Bank'). In addition, seven licence application areas are currently being evaluated (James et al, 2010).

The location of these licensed dredging and application areas is primarily controlled by the marine distribution of sand and gravel of suitable quality and in sufficient quantity to sustain the economic extraction of marine aggregate. Other factors also have to be accounted for, including relevant legislation and effects on the cultural and natural environment and on economic activity including fisheries and shipping. The majority of the licensed areas are aligned along ancient river channel systems with their associated infill and marginal terraces, areas with high potential for surviving palaeoenvironmental remains (see 'Cultural Topography/Marine' Character Type text)..

VALUES AND PERCEPTIONS

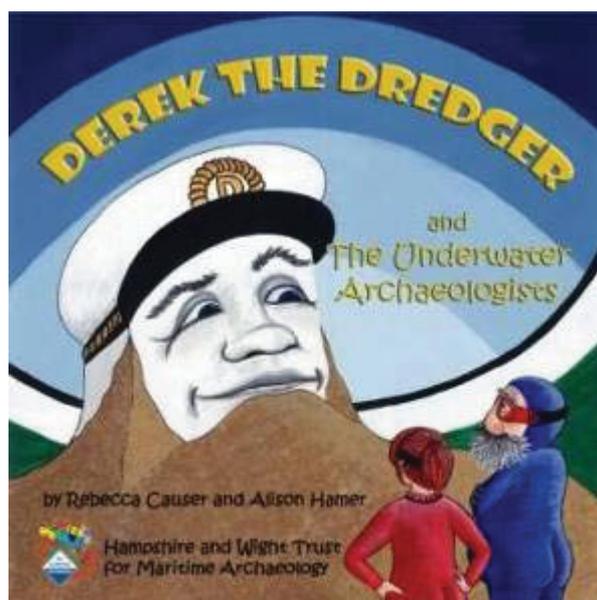
The region contains many tangible and non-tangible reminders of England's past quarrying and mining activities. The remains of these industrial processes on the present landscape/seascape can generate complex contrasting feelings in different people depending on their experience and background. Some people may view industrial remains as 'blots' on a seemingly 'natural' landscape' while others value them as reminders of the hard labouring life and part of the region's contributions to the country's industrial development. Their coastal distribution biases are also reminders of the vital roles of maritime transport in that development and in the growth of those industries concerned.

Abandoned quarries are commonly seen as eyesores or hidden sites for illicit waste disposal. Overgrowth of vegetation may spoil, or eventually totally obscure geological and other historical features, removing their perception for many but in some cases enhancing their ecological value. The mining of Purbeck Marble has produced a number of cliff-edge quarries, the remains of which can be seen at Tilly Whim. These are typical old stone quarries right on the cliff edge called after a special type of wooden crane used to load stone onto boats, known as the 'whim'. The nearby 'Dancing Ledge' offers another example of man's shaping influence on Purbeck's landforms. A massive piece of stone was cut out of the cliff and shipped to Kent in order to construct Ramsgate Harbour, leaving behind a flat ledge the size of a ballroom dance floor (www.dorset.co.uk/Purbeck).

RESEARCH, AMENITY AND EDUCATION

From the 1990s, the growth and development of the offshore extraction and construction industries have increasingly affected the submerged archaeological resource. The high palaeoenvironmental potential of these submerged environments is increasingly being recognised at national and international level by both heritage organisations and seabed developers (see www.jnapc.org.uk). As a result, initiatives promoting environmentally-sustainable extraction have been developed. For example, the Aggregates Levy Sustainability Fund (ALSF) demonstrates how this scheme has enabled English Heritage to support a range of timely initiatives, providing new insights into understanding, mitigation, assessment, evaluation and potential of the marine historic environment through characterisation, remote survey and field investigation.

Educational programmes have enabled children to learn more about the region's industrial past. This process continues with the work from organisations like The Hampshire and Wight Trust for Maritime Archaeology which has carried out a number of these projects. It has also produced a wide range of educational initiatives including two 'Derek the Dredger' children's books, emphasising aspects of aggregate extraction, marine archaeology, marine biodiversity and how such industries work together; and the 'Aggregates to Outreach Teaching Pack' with curriculum-linked lesson plans and collection-handling (see www.hwtma.org.uk). The HWTMA is producing a teaching pack on the 'Mystery Wreck': remains of an unidentified wooden shipwreck that lies within a licensed dredging area in the Eastern Solent.



Derek the Dredger children's book (© Hampshire & Wight Trust for Maritime Archaeology)

A wealth of research has been produced on extractive industries addressing such issues as reducing the environmental footprint of quarrying and the sustainable provision of aggregates (see www.sustainableaggregates.com/index.htm). HSC provides a strategic-level understanding of the known cultural processes that have shaped an area proposed for aggregate licensing, allowing an assessment of maritime cultural seascape to be brought to the landscape considerations of the necessary Environmental Impact Assessment (EIA) along with an early estimation of the cultural research agenda to be implied by such extraction. At a more detailed level, geophysical survey enables assessment of the material historic environment data present within defined offshore aggregate extraction areas.

CONDITION AND FORCES FOR CHANGE

The condition of remains from the region's coastal and marine extractive industries is extremely variable: some sites have been almost entirely destroyed, and others are still in active use or being developed. Where derelict such an area may have become subject to character change: perhaps developed for housing or other commercial activities, damaging or removing remains of early industry, or to a wildlife conservation site where the effect is more one of neglect and masking.

In the past some gravel sites have become landfill waste sites eg those outside Hamble and Lymington. Others, such as Testwood near Totton have become nature reserves.

There is likely to be a greater reliance on marine aggregates in the future as pressure on land-based sources continues to increase, although marine sand and gravel themselves are a relatively finite resource in economic quantities (James et al, 2010). The Crown Estate issues prospecting area licences to companies to undertake geological and geophysical surveys for the assessment of sediments and geology in an area, and its potential as an aggregate resource. In 2009 there were four prospecting areas in the Southern England

region, three surrounding the Isle of Wight, and one in the south east corner of the Owers Bank area (James et al, 2010).

RARITY AND VULNERABILITY

In terms of rarity, extraction industries are restricted by the distribution of their resource: in some cases as for Purbeck Marble in Dorset, that is very restricted indeed.

In terms of vulnerability, raising awareness of the region's industrial remains is a prerequisite for efforts for their conservation and for their continued role in the cultural legibility of the region's coastal and marine seascape for present and future generations.

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2.2.2 Character Type: Energy industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type is predominantly represented in the Southern England region by the onshore oil field at Wytch Farm (coastal Dorset), the large oil refinery at Fawley, and renewable energy sources in the form of proposed offshore wind farms. Other forms of energy industry are concentrated elsewhere in England (eg oil and gas exploration in the North Sea, coal mining in the Midlands and the North), with no examples present in this region. There are no nuclear power stations in the Southern England region from Hastings to Purbeck.

Wytch Farm oil field in the Purbeck district of Dorset is Western Europe's largest onshore oilfield and comprises three oil reservoirs that lie under Poole Harbour and Poole Bay. It has a sea-water pumping station, a gathering station where crude oil and liquid petroleum gas (LPG) from the reservoirs is separated and an export pipeline that takes oil via the refinery at Fawley across Southampton Water to the coastal terminal at Hamble (www.bpnsi.com/index.asp?id=7369643D312669643D313531). A well site on the cliffs at Kimmeridge, also in Dorset, still produces 65 barrels of oil a day. This is taken by road tanker to the gathering station at Wytch Farm



Poole Harbour around which there are several exploratory oil wells

(© Hampshire & Wight Trust for Maritime Archaeology)

The oil refinery at Fawley, on the west shore of Southampton Water is the largest in the UK, covering 5 square miles. Over 11 million gallons of petrol, diesel, jet fuel and petrochemical feedstocks are produced every day by the refinery.



**View of Fawley oil refinery across Southampton Water
(© Hampshire & Wight Trust for Maritime Archaeology)**

In January 2010, the Crown Estate announced the building of two offshore wind farms in this area as part of Round 3 UK offshore wind farm development. These will be located off Hastings, and west of the Isle of Wight, and are expected to begin generating electricity from 2015 onwards (www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy.htm)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Oil and gas occurrences have long been known in the 'Wessex-Channel basin' which covers the Weald and Wessex areas in Southern England and extends into the English Channel (BGS, 2006).

A number of oil seeps have been documented inland, but most occur along the Dorset coast, from near Osmington in Weymouth Bay to Durlston Head and include the Mupe Bay oil seep and the occurrences of gas bubbling on the seabed between Durlston Head and Anvil Point. Many oil and gas seepages are also known from East Sussex, the first discovery of which was in a water well being excavated in 1836 (BGS, 2006).

The practice of refining oil began with the simple distillation of many raw materials in Europe in the 18th Century, with mineral oils derived from oil-bearing shales first exploited in the UK on a small scale for kerosene (lamp oil) in the early 19th Century. Oil shales of significant oil production capacity occur in England, with the Kimmeridge Shales (Dorset) being worked from 1848. The last oil shale works in Britain closed in 1964 (BGS, 2006).

The Wytch Farm oilfield and processing facility in Dorset is the largest onshore oil field in Western Europe. Discovered in 1973 by the nationalised British Gas Corporation, Wytch Farm began producing oil in 1979 (BGS, 2006). The oil field consists of three separate reservoirs (Bridport, Sherwood and Frome) that lie under Poole Harbour and Poole Bay. Its

facilities include a sea-water pumping station and a gathering station where crude oil and liquid petroleum gas (LPG) from the reservoirs is separated (www.bpnsi.com/index.asp?id=7369643D312669643D313531). Oil is also transported to Wytch Farm for processing from two smaller onshore coastal oilfields – by pipeline from Wareham and by road from Kimmeridge where a well site on the cliffs produces 65 barrels of oil a day. A pipeline takes oil from Fawley refinery, across Southampton Water, to the coastal terminal at Hamble, where it is then exported by tanker (www.bpnsi.com/index.asp?id=7369643D312669643D313531).

Fawley refinery, situated on Southampton Water is now the largest in the UK, and has a mile-long marine terminal. Refining activity on the site dates back to 1921 when it was owned by the *Atlantic Gulf and West Indies Company*. Esso acquired the site in 1925, and rebuilt and extended it in 1951. The site was initially chosen for a refinery because of the large amount of land available for development, the low population of the area and access to the large amounts of water required for the refining process. It also made it possible for crude oil to be brought to the site in ocean tankers by sea. Proximity to Southampton was also a factor, as at the outset much of the plant's output was used to supply liners using Southampton docks. The site houses a chemical facility operated by Exxon Mobil and Nalco which produces a wide range of products for the plastics, synthetic rubber and solvents industries, as well as speciality chemicals, lubricating base oils and additives. The refinery handles around 2,000 ship movements and 22 million tonnes of crude oil and other products every year. It processes around 330,000 barrels of crude oil a day and provides 20 per cent of UK refinery capacity (www.exxonmobil.com/UK-English/about_what_refining_fawley.aspx).



Construction of Fawley oil refinery (© Eric de Mare, English Heritage)

The UK's offshore wind industry was launched in December 2000. Offshore wind farm developments require a lease from the Crown Estate, which has vested rights under the Energy Acts of 2004 and 2008 to lease areas of the UK continental shelf out to 200nm for renewable energy production and for methane gas and carbon dioxide storage. The Crown

Estate has made areas of seabed available for offshore wind farms to be built through three rounds of licensing. Successful Round 1 and Round 2 applicants were announced in April 2001 and December 2003 respectively, with leases awarded for 33 sites. Successful Round 3 applicants were announced in January 2010 and include two within this region:

- The Hastings Zone: won by E.On Climate and Renewables UK, potential yield of 0.6 gigawatts
- The Isle of Wight Zone: won by Eneco New Energy, potential yield of 0.9 gigawatts (www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy/round3.htm).

The turbines will be erected in water depths of up to 60m and will be positioned up to 205km off the coast. It is hoped that about a third of the country's energy will be provided by these new wind farm zones by 2020 (www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy/round3.htm).

VALUES AND PERCEPTIONS

Wind energy is one of the most popular energy technologies - an analysis of opinion polls carried out in the UK in the decade since the first wind farm started operating reveals a consistently high level of support (www.bwea.com), and wind energy now receives more good press than bad, a complete reversal of situation in mid 1990s (Hill 2001). However, it can provoke mixed feelings among the local populace. Within the Southern England region, there has been opposition to the proposed offshore wind farm development to the west of the Isle of Wight. Concerns included the threat to local wildlife, the impact on tourism and the perceived change to the character and appearance of the area through highly visible landmarks within the seascape.

Other energy industries can be viewed as noisy, dirty and environmentally unfriendly. This issue is being addressed by some companies, for example at Wytch Farm where local liaison committees have been formed to consult fully with all statutory and non-regulatory bodies and to keep local residents informed of all relevant activities through (www.bpsni.com).

RESEARCH, AMENITY AND EDUCATION

Public access to most energy generation sites is limited due to health and safety restrictions but they often have highly visible effects on land and seascape perceptions which generate much public debate which need to be informed. This need for understanding is growing fast: policy trends show an expansion of renewable energy with an encouragement of wind power, especially in offshore locations where more consistent strong wind speeds are available. The Collaborative Offshore Wind Research into the Environment (COWRIE) is a company set up by The Crown Estate to raise awareness and understanding of the potential environmental impacts of the UK offshore wind farm programme, including recognition of the impact of future developments on seascape and the historic environment. COWRIE recently published a guidance note for best practice in survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the UK (Oxford Archaeology & George Lambrick Archaeology and Heritage 2008; Wessex Archaeology 2007). Historic Seascape Characterisation (HSC) will be able to complement that for future planning with information on the typical historic character of areas under consideration for renewable energy developments, adding area-based context to the more traditional point-based records of the historic environment.

Some public education programmes from the wind industry's perspective in the Southern England region can be found on the British Wind Energy Association and Cowrie websites (www.bwea.com and www.offshorewindfarms.co.uk) which contain educational documents relating to wind energy development, schools information and fact sheets. First Wind (www.firstwind.com) is also committed to teaching the benefits of wind and other renewable energies. They offer teachers and school the opportunity to tour an operating wind farm to learn how wind energy is produced, how a turbine works and how the wind farm affects their local community.

From an educational perspective, society's need for sustainable sources of energy and address the long-term cultural causes of climate change, together with the conflicting views surrounding both issues, constitute a stimulating educational case-study, where the discussions can be related to the local environment, economy and historic cultural landscape/seascape.

CONDITION AND FORCES FOR CHANGE

Pressures on Government to increase reliance on renewable sources of energy to reduce CO2 emissions from fossil fuel use are growing fast; this will produce continuing and significant changes in the patterns and forms of energy generation of energy in the region, onshore and offshore. (www.bwea.org.uk). Potential sources of renewable energy of relevance to this area include wind, wave and tidal power (www.crownestate.co.uk).

The UK has potentially the largest offshore wind resource in the world, with relatively shallow waters and a strong wind resource extending far into the North Sea (www.bwea.com). Round 3 offshore wind energy generation aims to deliver a quarter of the UK's total electricity needs by 2020 (www.crownestate.co.uk). This will contribute to the UK Government's target of cutting CO2 emissions by 34 per cent of 1990 levels by 2020 (www.direct.gov.uk/en/NI1/Newsroom/DG_179190).

The announcement of the construction of wind farms off Hastings and the Isle of Wight in Round 3 offshore wind farm development marks a significant increase in the generation of offshore renewable energy in the region.

RARITY AND VULNERABILITY

Wytch Farm is the only oil field within this area. It is coincident with major environmental designations with the development facilities being wholly located within the Dorset Area of Outstanding Natural Beauty (AONB) and the oilfield underlies areas designated as Heritage Coast, Ramsar sites and Special Areas of Conservation (SAC) and Special Protection Areas (SPA), as well as other national and local designations including Studland and Brownsea Island nature reserves.

Oil refining is carried out at relatively few locations in the UK, with a strong coastal bias, the location of refineries being largely dictated by proximity to deep water ports and product markets. Fawley is the largest refinery in the UK.

Remains of oil and gas installations in the area could potentially be vulnerable to present and future coastal and offshore developments, and the new marine licensing system will give the MMO powers to order the removal of redundant installations at sea.

The offshore energy industry is rapidly increasing in the region with the proposed construction of the two new offshore wind farms, off Hastings and the Isle of Wight, in Round 3 of the UK offshore wind farm development. The future expansion of offshore wind industry depends on Government energy and climate change policy.

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2.2.3 Character Type: Processing industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type varies throughout the region and also develops through time. For example the differing geology across Hampshire enabled a range of extractive industries, which in turn influenced the varying processing and manufacturing industries dependent upon them, eg brick, tile and pottery industries, the production of lime mortar and fertiliser and salt production which was an important industry in Hampshire for centuries.

Of particular relevance for HSC, the Isle of Wight has long been associated with the making of sailcloth, boats and other maritime-related industries, although this has somewhat diminished in recent years. The island's major manufacturing activity in this respect now is in composite materials used by boat-builders.

The iron industry in Sussex developed from the Iron Age through to the late post-medieval period but the county's present economy relies on service industries, including tourism, rather than processing industries.

This coastal and marine region as a whole contains ten designated licensed disposal sites offshore. Between 2000 and 2008, the six presently open sites received 264.5 million tonnes of Dredge Material Disposal (DMD).

Other examples of this Character Type along the region's coast include chemical works in Shoreham and Portslade by Sea, together with numerous sewage works.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Isle of Wight has long been associated with maritime-related industries such as the making of sailcloth and boats. This has diminished in recent years, and the island's major manufacturing activity now is in composite materials used by boat-builders.

Although Hampshire did not develop an extensive industrial manufacturing base in the eighteenth and nineteenth centuries, and the economy remained largely agriculture-based, the processing of agricultural products did industrialise and agricultural machinery industries developed. Ship-building at Southampton and Portsmouth also generated supporting industries including rope making, canvas sail making, coopering and victualling (Hampshire County Council, 2010).

The iron works at Funtley, near Fareham, manufactured high quality forged iron for both the shipbuilding and naval supply industries and also reprocessed iron scrap brought in from the dockyard. The New Forest supplied much of the timber needed for the shipbuilding and iron works, as well as wood for charcoal as required by other industries in the region (Hampshire County Council, 2010).

The salt industry has been important along the region's coast since at least the Iron Age. Salt was an important commodity, used as part of the tanning process and as a preservative, the only means by which meat and other foodstuffs could effectively be stored for any length of time. Since the Iron Age, salt was extracted from sea-water by evaporation at coast locations including the area between Lymington and Hurst in Hampshire (salterns occurred at Lymington, Oxy, Pennington and Keyhaven). The salt was then carried inland using donkeys or packhorses along routes such as the Salt Way (www.newforestexplorersguide.co.uk). Evidence from the Roman period is still limited, although medieval saltern sites have been discovered either side of the mouth of the Beaulieu River. Saltworking sites are also reflected in place names such as Salterns Copse, and Salterns Hill near Bucklers Hard. Other evidence of salt production further east includes Iron Age salterns in Langstone Harbour and on the margins of the Hayling Island, Roman salt works at the mouth of the Hamble, and medieval saltern sites on the farmland north of Chichester Harbour (Hampshire County Council, 2010).



Lymington salterns (© Hampshire & Wight Trust for Maritime Archaeology)

By the early 18th century there were extensive areas of salterns in Langstone and Chichester Harbours (Gatcombe Haven/Great Salterns), south east Hayling and Northney. The Lymington salterns survived into the nineteenth century until the coastal salt trade became uneconomic due to competition from salt mines in Cheshire, and greatly improved transport using the newly introduced railways. Over 170 salt pans have been recorded from

this area, but little other evidence now remains apart from the survival of some of the banks at Hayling Island - Great Salterns is now a golf course and Northney has been developed into a marina (Hampshire County Council, 2010).

Havant and Emsworth were a focus for early industries such as tanning and parchment making (as well as salt making). Emsworth was also important for its rope making net and sail making. However, by the turn of the 19th century many of these local traditional industries were in decline (Hampshire County Council, 2010).

Rich deposits of ironstone in Sussex have been exploited from the early Iron Age but made heavy demands on local timber resources. By the Elizabethan period, ancient timber was particularly valued by the Royal Navy who wanted it to build ships. To protect the important shipbuilding industry of the region laws were passed in 1581 to prevent the setting up of any new iron works in some parts of Sussex, and to preserve trees within 12 miles of the coast (www.westsussex.info/iron-industry.shtml).

The disposal of material at sea is a regulated activity and currently requires a license under the Food and Environment Protection Act 1985; from April 2011 it will require a Marine Licence from the Marine Management Organisation (MMO). Certain areas of sea bed are designated as licensed disposal sites for Dredge Material Disposal (DMD), and ten such sites exist within the Southern England region (James et al, 2010). The boundaries of these sites and the type and amount of material deposited each year are strictly monitored.

Other examples of this Character Type in the Southern England region include chemical works in Shoreham and Portslade by Sea, together with many sewage works scattered throughout the area.

Many of the ports and harbours of the region are surrounded and supported by non-specific industrial production, for example in the industrial estates surrounding Poole Harbour, Shoreham by Sea, Southwick, Newhaven and Southampton.



Industry and warehouse storage at Southwick (© Maritime Archaeology Ltd)

VALUES AND PERCEPTIONS

Components of this Character Type are generally meaningful for society as a whole as they represent places of work where people earn a living. Many also have a strong cultural significance as reminders of the maritime and naval connections of the region. The Isle of Wight, for example has a long heritage of industry connected to boat-building which would have employed many generations of the same family.

Salt production was an important industry in Hampshire for centuries. The Lymington-Keyhaven Nature Reserve contains the best preserved examples of medieval and later salt workings in southern England (www3.hants.gov.uk/countryside/lymington-keyhaven/rh-countryside-newpage.htm) which can be visited by local residents and visitors wanting to learn more about the area's heritage.

Sewage and sewage treatment works are generally accepted as essential public amenities. However, opposition to new works and pipelines has recently been increasing due to aesthetic, environmental and heritage reasons.

A number of charities and public groups are engaged in campaigning against the pollution of the region's beaches, and organising clean-up operations eg the Dorset Wildlife Trust's Beachwatch beach clean (www.dorsetwildlifetrust.org.uk/article686.html) and Surfers Against Sewage (www.sas.org.uk).

RESEARCH, AMENITY AND EDUCATION

The coastal and marine processing industries, especially sewage disposal, underline the often poor understanding of the roles which the sea performs for our everyday lives on land.

Some research has been undertaken, for example the salt industry of Hampshire was the subject of a recent excavation by Wessex Archaeology and the New Forest National Park Authority

(http://news.bbc.co.uk/local/hampshire/hi/people_and_places/history/newsid_8828000/8828851.stm). There is much scope for better understanding the roles of salt-making in defining the region's coastal landscape distinctiveness and of the key part played by demand from the Portsmouth naval base in maintaining its late economic survival.

CONDITION AND FORCES FOR CHANGE

Condition of the region's industrial processing areas varies enormously: some historic sites have been erased from the present landscape while others remain in active use and development. Where derelict it may have changed its character through development for housing or other commercial activities. For example, the salt boiling houses of the Lymington salt works (Grade II listed buildings) are due for conversion into office and storage space after excavation. (http://news.bbc.co.uk/local/hampshire/hi/people_and_places/history/newsid_8828000/8828851.stm)

Some production areas are being actively conserved for their historic value. Those in close proximity to the coast face challenges for long-term preservation from coastal erosion aggravated by with the effects of global warming, increased storminess and rising sea levels. Some of Hampshire's medieval and seventeenth century farmsteads and relict salt-making features are particularly prone to inundation from sea level rise and habitat creation to compensate for coastal squeeze (Hampshire County Council, 2010).

RARITY AND VULNERABILITY

In terms of vulnerability, raising awareness of the region's industrial remains is a prerequisite for efforts for their conservation and for their continued role in the cultural legibility of the region's coastal and marine seascape for present and future generations.

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2.2.4 Character Type: Shipping industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Southern England coastal region has a long history of boat and ship building associated with its maritime trading industry. The shipbuilding industry has diminished in the late 20th century in parts of the region but boat yards continue to repair the numerous leisure vessels.

The region's maritime trade and transport links with continental Europe are known to have developed from the Bronze Age onwards, with the English Channel being a thoroughfare for continental trade. Today, the Southern England coastal and marine region remains one of the world's busiest seaways, serving areas beyond as well as the region's ports.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Many boatyards are in operation on the Isle of Wight and along the river banks and estuaries of the mainland coast. The Hamble River has been a centre for warship and merchant shipping construction and refurbishment since early medieval period (Hampshire County Council, 2010) and continues to support several boatyards. The area has numerous associations with famous vessels including warships such as the *Grace Dieu* (flagship of Henry V), the *Great Harry* (King Henry VIII's flagship), *HMS Elephant* (Nelson's flagship at the battle of Copenhagen), and construction of other men o'war during the 18th and 19th centuries. Some of the famous and long-established boatyards were located at Bursledon and Warsash. Here, the surrounding woodland provided an important source of timber until the late 19th century when iron and steam ship building saw the decline of wooden shipbuilding. In 1799 the construction of Bursledon bridge limited the viability of yards to the south of the crossing but they continued to build small local craft, together with small submarines and gun boats during WWII and they later supported the new yachting industry (Hampshire County Council, 2010).

Southampton's commercial and naval shipbuilding industry first developed in the Middle Ages when King Edward III's demand for a naval fleet was increased by the Hundred Years War. Southampton remained an important shipbuilding location right up to the modern period when John I. Thornycroft & Company moved there, building and repairing many ships for the Royal Navy (Rance, 1986). The company merged with Vosper & Co. in 1966 to become Vosper Thornycroft (Brown, 2004). Subsequently renamed VT Group, their Southampton yard closed in 2004 and relocated to Portsmouth which itself has a long

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history of shipbuilding. Portsmouth was the first naval dockyard in Britain, with the first dry-dock for warships constructed inside the dockyard in 1496. Today, the city remains home to a number of commercial shipbuilding and ship repair companies.



Portsmouth Naval Dockyard (© Hampshire & Wight Trust for Maritime Archaeology)

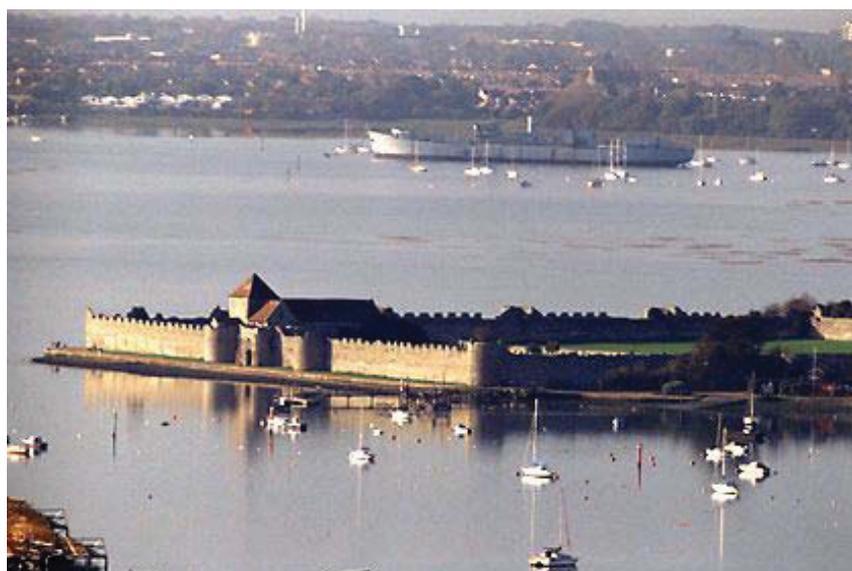
Another important centre of boat and shipbuilding in the region was Buckler's Hard in the Beaulieu estuary where wooden walled ships were built from 1698 to 1827. It was ideally suited for the role with the deep river being well sheltered and secure from coastal attack. It was also encircled with extensive woodlands, a vital source for the large amounts of wood required by the industry (Hampshire County Council, 2010). Among the ships they supervised were *HMS Euryalus* and *HMS Agamemnon* for Nelson's fleet. However, with the closure of the yard in 1818 naval repairs and ship building was concentrated in Bursledon and Portsmouth (Hampshire County Council, 2010). The village, now managed by the Beaulieu estate, is currently being restored to its eighteenth century appearance (www.bucklershard.co.uk).



Bucklers Hard in Hampshire has a long history of boat building (© English Heritage)

Ship building was also an important industry across Sussex, for example at Newhaven and Hastings, where oak from the Weald (considered to be some of the finest timber in Europe) was used for ships, together with iron from the local iron manufacturers.

The region's maritime trade and transport links with continental Europe are known to have developed from the Bronze Age with the English Channel a thoroughfare for continental trade (McGrail, 2001). By the Iron Age there was a comprehensive trading network between Britain and continental Europe and this trade increased dramatically in the Roman period (Cunliffe, 2001) with the waters around the Solent linking the continental Roman Empire with major Romano-British provincial settlements in Chichester, Southampton and Portchester Castle (directly bordering Portsmouth Harbour). Vessels would have landed in a variety of locations throughout the Solent (*Magnus Portus*) which has a number of large villas along its shores (Drummond & McInnes 2001).



Portchester Castle, Portsmouth (© Hampshire & Wight Trust for Maritime Archaeology)

The early medieval period is relatively sparse in direct evidence for maritime trade (MA Ltd, 2007), but from the seventh to ninth centuries the first of England's seaports were established. The large number of Anglo-Saxon towns that were also ports demonstrates the importance of continental sea trade (Friel 2003). Direct evidence for maritime transport during this period has been located in Langstone Harbour where the remains of a log boat have been excavated and recovered (www.hwtma.org.uk).



Archaeological investigations at Langstone Harbour

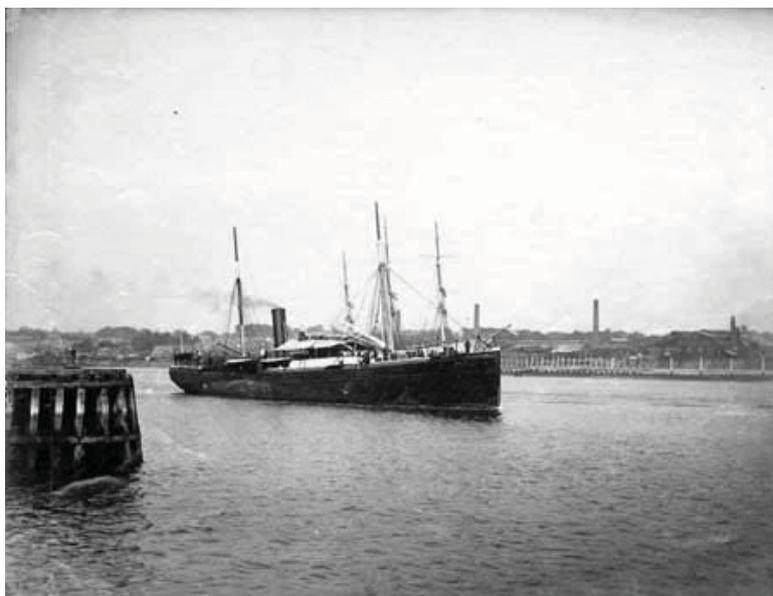
(© Hampshire & Wight Trust for Maritime Archaeology)

Coastal shipping played a significant role in trade around the British Isles in the medieval period. It was far cheaper and easier to move large quantities of goods by river and sea than by land. Goods for export were moved from along the coast to the larger ports and from there they were transhipped to the continent (Friel 2003: 68). In the twelfth century Southampton was almost exclusively involved in the wine trade between Gascony and England, and by the fifteenth century had expanded its links to include Italian city states, including Genoa (Wheatley 1990). These trading links are reflected in the recorded shipping losses in the Wight area with the majority being French, Italian, Portuguese and Flemish vessels as well as those of English origin. The continental trade centred in Poole harbour is similarly reflected in the documented shipping losses in the area.

By the seventeenth century England's overseas growth greatly increased, with new markets in the Baltic and the Mediterranean (Friel 2003). This period of prosperity is reflected in England's merchant fleet, which grew five times its size between 1580 and 1680, and continued to grow into the eighteenth century (MA Ltd, 2007).

The trade in goods to supply the burgeoning port of Portsmouth, and coastal trade taking goods along the south coast towards London, is reflected in both the quantity and diversity of shipwrecks in the post medieval period. The Yarmouth Roads wreck is an example of a trading vessel from this period. Located within the Solent in 1984 it is the wreck of a late 16th or early 17th century merchantman, possibly the Spanish Carrack *Santa Lucia* lost in 1567 (Watson & Gale, 1990). This wreck site is protected under the Protection of Wrecks Act 1973.

Within the Wight area the Industrial Revolution played a major role in the development of ports, with Southampton and Portsmouth pre-eminent. This is also reflected in the large amount of shipping that was lost off these shores in the 19th century, the majority of which was English, reflecting the vast scale of England's merchant fleet at this period.



Shipping at Southampton, 1890 (© English Heritage)

During the Early Modern period, both the White Star and American Line chose Southampton as their transatlantic terminus for passenger liners, which resulted in an increase in shipping to the port. The cruise liner industry remains an important industry in Southampton, with Cunard's continued use of the city as its principal British port.



**Southampton Docks 1946 with Queen Mary cruise ship in the foreground
(© English Heritage)**

Today, the region is one of the world's busiest seaways and the volume of traffic is considerable. Within a 15 mile radius of the Channel Light Vessel (located in the English Channel at 49°55'N 2°54'W) there are around 47,000 commercial vessel movements a year. This reduces to around 19,000 per year within a 15 mile radius of the St Catherine's Lighthouse, located on the south coast of the Isle of Wight (James et al, 2010). Whilst in the Channel, shipping is monitored and controlled by the Coastguard, stationed in the Portland, Solent and Dover areas.

VALUES AND PERCEPTIONS

The region is proud of its long history of shipbuilding. This is most clearly demonstrated at Buckler's Hard (www.bucklershard.co.uk), where warships for Nelson's Navy were built, and which is now being restored to its original appearance by the Beaulieu Estate.

Overall, shipbuilding has inspired many artists and writers. In general, the imprint that the shipbuilding industry has left on today's landscape adds distinctiveness to the region that is highly valued by many as part of England's heritage.

The significance of the maritime heritage of the region's port cities is also well-recognised. A good example is the building of the new Sea City museum in Southampton due to be

opened in 2012 which will celebrate Southampton's role as a maritime gateway to the world.

The continuing expansion of the commercial shipping industry can provoke mixed feelings in the region. It is recognised that the industry contributes greatly to the economy (local and national) and is a major employer in the region, which is welcomed by many local residents, but the pressures to create additional port facilities to accommodate that industry on relatively undeveloped land, as for example at Dibden Bay, also provokes serious opposition from many. Much commercial shipping activity remains offshore and appears physically remote from most coastal land, but the increase in larger ships lying off or entering harbours, as at Poole, has visual effects which some see as conflicting with their roles also as tourist destinations (LDA Design, 2010).

RESEARCH, AMENITY AND EDUCATION

Shipbuilding traditions have been explored as a social product (Adams 2003) which has helped to contextualise small scale shipbuilding at national and regional levels.

This Character Type also has an amenity value which links to recreational and leisure activities such as sailing. Other amenity and educational values can be seen through the range of museums and historic shipyards such as Portsmouth Historic Shipyard and the 'living museum' at Bucklers Hard where the village, Maritime Museum and historic cottage interiors are the focus for educational programmes on shipbuilding and 18th Century social and domestic life (www.bucklershard.co.uk).

In addition the study of ship building, associated infrastructure and wreck sites offers a wealth of cross-curricular opportunities incorporating science, maths, English, history and environmental studies. There are hundreds of shipwrecks in the region which are being investigated by organisations such as the Hampshire and Wight Trust for Maritime Archaeology (HWTMA). The HWTMA has been undertaking investigations on these wrecks for nearly twenty years and continues to produce educational resources for these in the form of publications and teaching packs (www.hwtma.org.uk). The region is considered to have a high potential for marine archaeological remains due to the degree of trade occurring.

CONDITION AND FORCES FOR CHANGE

The historic shipping industry is expressed directly through its components and less directly through its imprints on the orientation and patterning of the region's infrastructure. The components include docks, basins, wrecks, wharfs, quays, jetties and slipways, warehouses and, dockworkers' cottages; and the infrastructure includes effects on the region's transport systems and settlement patterns. At certain locations, the components are now subject to conservation, preservation or refurbishment, eg at Buckler's Hard in Hampshire (www.bucklershard.co.uk). The imprint of this Character Type has also been economic, providing employment, income and investment resources and serving the import/export needs of manufacturing industry across much of England.

Forces for change for this Character Type include the potential increase in size or type of vessel using the region's shipping routes which would result in a greater density of shipping. This could increase potential erosion from ship wash and risks of toxic contamination, as well as increased levels of noise (LDA Design, 2010).

RARITY AND VULNERABILITY

The shipbuilding industry in the Southern England region has had key roles at national and international levels. The ships constructed in the region have been integral to developing the country's international trade links as well as to its part played in historic naval warfare, for example the Mary Rose (www.maryrose.org).

From its role as containing some of the country's main trading ports, today the region's commercial shipping industry is an expanding global business, bringing economic benefits well beyond the region to the country as a whole.

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2.3 BROAD CHARACTER: FISHING

2.3.1 Character Type: Fishing

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The thriving fishing industry of the Southern England region has been documented from the seventh century onwards. Early methods of fishing include net-fishing and shellfish collection. In both coast and inland towns, the conduct of fishmongers' trade was strictly regulated.

The commercial fishing industry now operates from 27 ports and harbours along the Southern England coast. The wide variety of fish along this coast has encouraged local fishermen to be versatile and many of the inshore boats are equipped to work a number of fishing methods corresponding to seasonal fisheries. This flexibility has also allowed them to exploit new species and to cope with frequently changing market conditions (Walmslet & Pawwon, 2006).



The Hastings fishing industry continues to thrive (© Maritime Archaeology Ltd)

Methods of fishing in the offshore Southern England region include shellfish dredging, bottom trawling and pelagic trawling. These waters are in the transitional waters between

Atlantic and Eastern Channel so that there is diverse mix of species, some of which are close to their limits of distribution. Fish species include valuable commercial species such as plaice, sole, bass, herring and mackerel (LDA Design, 2010).

Bait digging takes place on the intertidal zones of the region for example at the Hamble River, Pagham Harbour, and the Keyhaven and Pennington Nature Reserve.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The coastline of Southern England has been inhabited for millennia, and although there is little direct evidence from this region for very early fishing techniques, it is very likely that the maritime resource would have been exploited.



Fishermen's stores, Hastings, 1956 (© English Heritage)

The thriving fishing industry of the region has been documented from the seventh century onwards. Although undoubtedly apocryphal, [Bede](#) records that [St Wilfrid](#) taught the people of Sussex the art of net-fishing when he visited the county in 681. At the time of the [Domesday survey](#) the fisheries in the area were extensive.

The value of the fisheries in Christchurch was recognised in the thirteenth century, with manorial records from 1299 recording a total of £11 5s from salmon, 'white fish', lamprey and '*de piscaria cum alveis*'. Christchurch lamprey fisheries continued to be active into the fifteenth century (Hewitt, 1912).

There are numerous historical references to the fish trade in the accounts of Southampton. In 1310 a fleet of nine fishing boats entered Southampton with mackerel valued at £13 18s 4d, with 3s 3/4d paid in customs duty (Hewitt, 1912). In both coast and inland towns, the conduct of fishmongers' trade was strictly regulated. In the Ordinance of 1409 it was decreed that no fishmonger was to sell his fish secretly and in summer not before 6th hour (and in winter, the 7th hour) in the morning on pain of forfeiture of the fish sold (Hewitt, 1912). The Ancient Ordinances of Guild Merchant of Southampton decreed that "none might sell fish unless caught it himself or bought it beyond Calshot". Fish brought to the port in boats or ships was not to be brought ashore unless requisite permission given by bailiffs (Hewitt, 1912).

From the early 1800s, fishermen off the shores of the Isle of Wight were engaged in fishing for shrimps, crabs, prawns and lobsters (Hewitt, 1912). By the early nineteenth century, the Emsworth Channel was frequented 'by persons from Portsmouth' for eel-spearing, and flounder-catching. Although the fishery at Langstone Harbour was considered 14 years earlier to be 'in a declining condition', a large variety of fish was available including mullet, bass, turbot, cod, whiting, dabs and occasionally herring (Hewitt, 1912).

In the Modern period the wide variety of fish along this coast has encouraged local fishermen to be versatile. Many of the inshore boats are equipped to work a number of fishing methods (Walmslet & Pawwon, 2006), and this flexibility has allowed them to exploit new species and to cope with frequently changing market conditions. Typical examples in recent years have been the expansion of the spider crab market, a whelk boom, increased demand for cuttlefish, a halving of oyster prices and the expansion of the velvet crab fishery (Walmslet & Pawwon, 2006).

Valuable fishing activities in inshore waters include including line fishing, netting, potting and shellfish collecting. These generally involve small to medium sized boats, and are of significant commercial and recreational value (LDA Design, 2010).

Potting for crabs occurs for most of the year, with prawns also caught by this method in some of the harbours and bays, especially Poole Bay. Other shellfish collected include whelks which have become an important resource over the last few years (Walmslet and Pawwon, 2006), and were the most important commercial species in terms of volume landed in the South East in 2006 (Cappell and Nimmo, 2007). Whelks are landed at ports including Eastbourne, Poole and Portsmouth, Selsey and Shoreham (James et al, 2010).

Periwinkles are collected from the Medina River on the Isle of Wight and also by hand along the Sussex coastline between 15th May and 15th September in accordance with a Sussex SFC byelaw (James et al, 2010).



Fishing boat and equipment in Newhaven (© Maritime Archaeology Ltd)

Netting is an important economic activity. Along the Sussex coastline it undertaken by beach boats who set nets from the low water mark or larger boats (over 10m) working from harbours such as Newhaven and Shoreham. The main fishing activity is with trammel and gill nets to take mainly sole and plaice with some rays, cod and bass (Walmslet & Pawwon, 2006). There are licensed salmon and sea trout seine net fisheries in the Beaulieu River, Christchurch Harbour and Poole Harbour, and there are licensed fisheries for eels in many of the estuaries and harbours within this district. Problems with weed and the success of using sand-eels as bait for bass has prompted many commercial fishermen to switch from netting to rod and lining.

Methods of fishing in the offshore Southern England region include shellfish dredging, potting, bottom trawling and pelagic trawling. Fish species include valuable commercial species such as plaice, sole, bass, herring and mackerel (LDA Design, 2010). Shellfish dredging is common off the Sussex coast, and native oysters are dredged in the west of the district. Principal lobster and crab fisheries occur off Selsey and Eastbourne, and lobsters have provided an improving income for the majority of potters during the summer (Walmslet and Pawwon, 2006). Scallop dredging is also important to the region's fisheries industry, with Shoreham and Newhaven landing over 85% of the total volume caught (Cappell and Nimmo, 2007).

Shoals of cuttlefish and squid appear close inshore in summer and are caught in trawls, fixed and drift nets and pots. Both species are of particular importance to the trawler fleet, especially during periods when quota regulations severely limit the quantity of white fish landed (Walmslet and Pawwon, 2006). Cuttlefish landings have increased greatly since the 1980s. It is thought that this is due to a combination of an increase in its market value (Dunn 1999) and a lack of restrictions compared with other commercial species (Royer et al,

2006, Clark 2007). Other non-quota stocks targeted by trawlers include black bream, bass and red mullet (Walmslet & Pawwon, 2006).

Bait digging takes place on the intertidal zones of the region for example at the Hamble River, and is permitted under licence at Pagham Harbour and the Keyhaven and Pennington Nature Reserve. The Poole Harbour Steering Group has produced a leaflet laying out a code for bait diggers to follow to ensure that the damage to mudflats in wildlife in the area is minimised (www.pooleharbouraqmp.co.uk/pdf/bait_digging.pdf).

Warehousing and storage facilities are important distinctive components of this Character Type. There are daily landings of local boats along much of the Sussex coast with catches sold either directly from fish stalls where they are landed (eg at Eastbourne) or taken to the markets at Rye, Hastings or Brighton (Walmslet & Pawwon, 2006).



Stalls in Hastings selling fresh fish (© Maritime Archaeology Ltd)

VALUES AND PERCEPTIONS

The livelihoods of fishing communities are intimately tied to the productivity of the seas, and there are deep cultural attachments associated with fishing. Brighton continues to hold its Annual Mackerel Fair and the "Blessing of the Nets", an annual event held as a reminder of the historic roots of Brighton as a small fishing village.

The infrastructure associated with this Character Type can be an important part of the present character of small towns and villages, attracting tourists and day trippers who congregate around seafood stalls at many of the coastal destinations of the region. At Hastings there are stalls selling fresh fish amongst the historic net sheds, and in Selsey stalls along the sea-wall sell locally caught fish and shellfish, including crab, whelks and cockles.

Offshore fishing is remote from the coast and only visible on clear days. As it does not so widely connect with the local tourist economy it is viewed as a more strictly 'commercial' undertaking without tourist industry spin-offs.

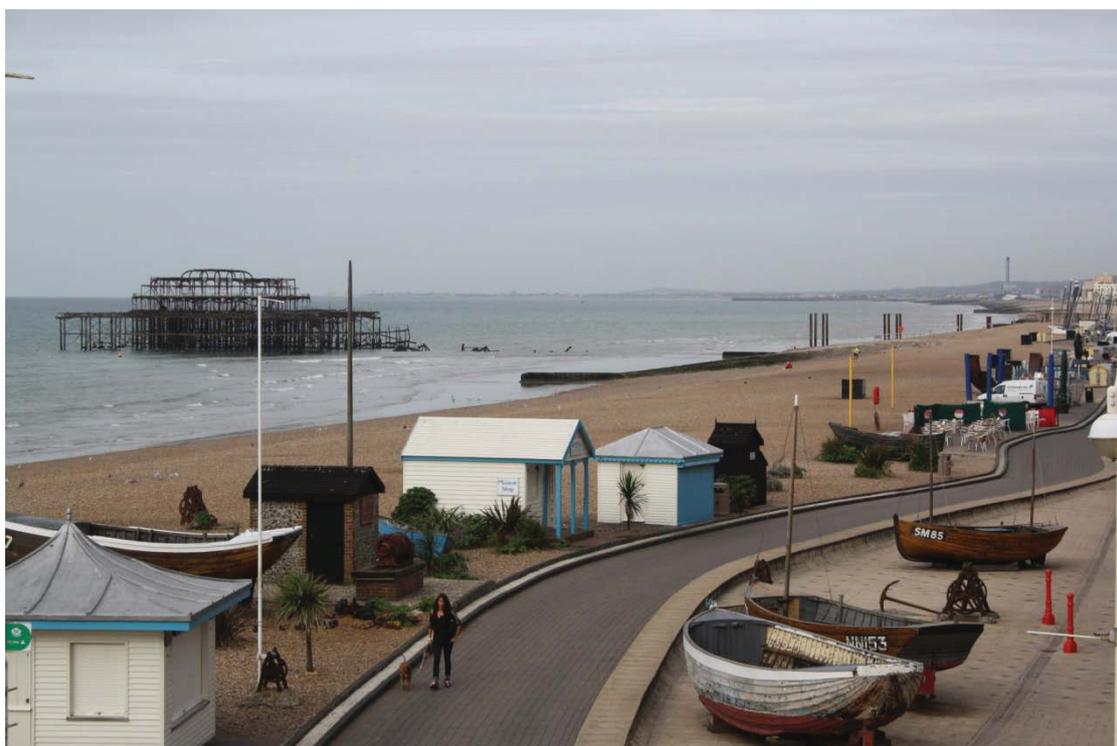
Overall the fishing industry still provides many jobs in the Southern England region and is therefore viewed as a major employer who contributes significantly to the regional economy.

RESEARCH, AMENITY AND EDUCATION

Trawling and dredging off the Southern England coast have recovered material that otherwise would have gone undetected. Initiatives like the British Marine Aggregate Producers Association (BMAPA)-English Heritage (EH) Protocol for Reporting Finds of Archaeological Interest have raised the public and professional profile of submerged archaeology and demonstrated that collaboration between industry and regulators is possible and beneficial (BMAPA & English Heritage 2005).

Issues of over-exploitation of fish stocks are contributing to raise public awareness of sustainability issues surrounding this Character Type. These issues have been highlighted by the Marine Stewardship Council (www.msc.org) and Sea Fish (www.seafish.org). Research is being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

Some towns and villages in the region are very proud of their long links with the fishing industry and have opened museums to celebrate this. Brighton has its own Fishing Quarter which includes stalls selling fresh fish, traditional clinker built boats which have been restored by our the Fishing Quarter workshop, and plays host to the Annual Mackerel Fair and the "Blessing of the Nets". The Brighton Fishing Museum traces the story of the fishing community in the town.



Brighton Fishing Quarter (© Maritime Archaeology Ltd)

Hastings Fishermen's Museum is one of the town's most popular tourist attractions and attracts over 140,000 people every year (www.hastingsfish.co.uk.museum).



The Stade, Hastings, home to the Hastings Fishermen's Museum (© Maritime Archaeology Ltd)

CONDITION AND FORCES FOR CHANGE

Modern fishing methods have greatly reduced many fish stocks putting several species at risk of extinction (www.msc.org). The decline of some species in the region is thought to be a result of pollution. This is particularly so in the case of bass, which has led to the designation of specified bass nursery areas which are located in harbours and fall under fishing restrictions (Hampshire County Council, 2010)

An issue that has been encountered off the Sussex coast is that fishing grounds out to 6 miles offshore have become saturated with nets as fishermen try to maintain catch levels. Conflicts between fixed net and beam trawler crews have intensified as static gear fishermen set nets further offshore in search of improved catches. (Walmslet & Pawwon, 2006)

Better technology, changes in fisheries control and increased economic demand could result in more aquaculture development. In addition, fishing restrictions as a result of the creation of Marine Conservation Zones (MCZs) under the Marine and Coastal Access Act 2009 may affect fishing patterns and activities. MCZs will be subject to management plans which may change types and numbers of boats in these waters and the areas where they work, with potential for corresponding changes to areas affected on the seafloor. Other changes may result from reforms arising from the Common Fisheries Policy review in 2012.

There are a number of factors that could affect the character of deep water offshore fishing areas through effects on fisheries. Apart from the sustainability issues surrounding the fisheries themselves, these include marine pollution, damage to seabed/reef habitats from mobile fishing gear and fishing restrictions resulting from conservation designations (Special Areas of Conservation (SACs) and MCZs). These could also have effects on inshore waters if trawlers move closer inshore to compensate (LDA Design 2010).

Climate change predictions suggest that increased storminess and extreme weather events may affect the UK coast and waters, with average water temperatures forecast to rise. The effect of this may be to alter physical oceanography and ecology, particularly target species distribution, and the usage patterns and types of activities taking place in offshore waters. For example, increased storminess might affect how far and how often small boats are able to move offshore.

Sea dredging and beam trawling may impact upon known seabed obstructions and as yet unknown wrecks. This would take the form of both direct damage to wreck structure contents and setting, and the destabilisation of sites resulting in renewed corrosion and potential decay (Val Baker et al 2007). Initiatives such as the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage have demonstrated that collaboration between regulators, the heritage sector and the aggregates industry is beneficial and necessary to encourage an environmentally friendly extraction and ensure the conservation of the historic environment for present and future generations (see Dellino-Musgrave 2007).

RARITY AND VULNERABILITY

Fishing in the Southern England region has a long and complex history and contributes to a distinctive and important aspect in the history of fisheries in England.

Fishing in the Southern England region is vulnerable to the pressures of climate change, overfishing, changes in fishery control and marine pollution.

Alongside the existing consumer pressure for more sustainable fishing practices, an understanding of historic fishing practices and their impact on their target fish resources may contribute to designing measures to ensure the long-term sustainability of sea fisheries.

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2.3.2 Character Type: Aquaculture

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Fish farming is limited in this region, the exception being parts of Langstone and Chichester Harbours which are designated as a sea bass nursery area and important spawning ground for demersal fish (Hampshire County Council, 2010).

Shellfish farming is the main form of aquaculture undertaken in the Southern England region. Oysters have been laid and dredged at various points along the Hampshire coast, for example at Emsworth, from at least medieval times onwards, and this continues today in the Solent. Other shellfish farmed include mussels and clams, fisheries of which are predominantly found in Poole Harbour.



Emsworth oyster beds (© HWTMA/ Emsworth Maritime & Historical Trust)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Fish farming is limited in this region, the exception being parts of Langstone and Chichester Harbours which are designated as a sea bass nursery area and important spawning ground for demersal fish (Hampshire County Council, 2010).

Oysters have been laid and dredged at various points along the Hampshire coast from medieval times onwards. The fishery at Emsworth was of some value in the fourteenth century and the reputed oyster fishery at Hamble dates from medieval times. Other chief

oyster beds included Hayling Island, Wootton Creek and the Newtown, Beaulieu and Medina rivers (Hewitt, 1912). In 1856, fifty sails were engaged in oyster dredging in Langstone and Chichester Harbours. The season began on 4th September and oysters fetched an average of 1s per 100. The old salterns on Hayling Island were also utilised for oyster ponds in the early modern period, the most renowned ones being Mill Rife, My Lord's Pond, the Sinar and Gutnar Lakes. These local beds in North Hayling were acclaimed as being the largest and best constructed in England in the early 19th century, with huge quantities of Langstone oysters being sent all over the country (Humphrey, undated).

Many oyster fishermen were engaged in the widespread clearing of land on which to store young oysters, so that they might grow and fatten. However, in the 1840s they encountered problems with the new Lord of the Manor who claimed his right to the soil and brought court actions for trespass against the fishermen (Humphrey, undated). A further problem facing the oyster fishermen in the late nineteenth and early twentieth century was that of pollution. The most notorious example of this occurred when council workers in Warblington re-laid a number of sewers and drains, which emptied onto the Emsworth foreshore. One of the eminent Emsworth oyster merchants then constructed a number of ponds in close proximity to the outflow and seeded them with a considerable quantity of young oysters. In 1902 there was a mayoral banquet with one of the courses consisting of the oysters for which Emsworth and Hayling had by then become famous. Unfortunately some of the shellfish had been contaminated by the outflow and several of the diners, including the Dean of Winchester, died of typhoid. The oyster industry in the area collapsed almost overnight (Humphrey, undated).

The industry remained effectively dormant from the 1920s to 1960s but has continued despite setbacks including inadvertent introduction and competition from non-native species such as slipper limpets, and the spread of disease from marine snails in the mid 1970s. However, harbour oysters still command a strong market value in mainland Europe, and today, some of the northwest Hayling beds have been recently restored (Hampshire County Council 2010).

The Solent and its surrounding harbours continue to be one of the few regions in the UK supporting a healthy self-generating native oyster fishery. Both Pacific and native oysters are cultivated within Chichester Harbour and native oysters are also dredged from naturally-occurring beds. Two orders have been granted for oyster beds in Stanswood Bay and Calshot which are administered by fishermen's co-operatives and may be seeded from the wild stock (Walmslet and Pawwon, 2006).



A local oyster industry continues to thrive in Chichester Harbour (© Maritime Archaeology Ltd)

This area is now one of the largest and most productive self-sustaining oyster grounds in Europe and is of international conservation importance (James et al, 2010). Today the oyster fishery is tightly regulated and both public and private fisheries exist within the Solent. Fishery is managed through byelaws setting a closed season from 1 April and 31 October, a maximum dredge length and a ban on night fishing. Regulated fishery vessels much obtain one of 90 available Solent oyster licences issued by the Southern Sea Fisheries District Committee. During the first week of the season approximately 50% of the oysters are marketable and the other 50% are sold as seed (James et al, 2010). Most of the oysters caught before Christmas are exported to the continent although, with the recovery of continental oyster stocks, this market is declining.

Poole Harbour contains important mussel and clam fisheries. An area of over 500 acres is seeded regularly with mussels from Portland and was established in the 1980s when the local oyster fishery was wiped out by *Bonamia* (Pawson et al, 2002). The manila clam was first introduced into the UK in 1992 by Othinell Shell Fisheries who seeded Poole Harbour with juvenile clams (Utting and Spencer 1992). By 1994 it was evidence that successful reproduction has occurred in the harbour and fishermen were exploiting the new intertidal resource at high tide (Jensen et al, 2004). In an effort to ensure the sustainability of this fishery the Southern Sea Fisheries Committee licensed the fishery and introduced an 8-10 week season (October to January) as well as regulations for allowable fishing techniques (James et al, 2010). The harbour also contains a fishery for cockles (Franklin, 1972).



Poole Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

Mussel beds have been identified to the east of the Isle of Wight by Plumb (1996) but the Sussex Sea Fisheries Committee byelaws prevent this from becoming commercial fishery.

VALUES AND PERCEPTIONS

Aquaculture is still deeply engrained in the perception and economy of some communities in the region (for example at Emsworth, and also in Hastings). As such, it is valued for the distinctiveness it affords such areas and as an important element in their local economy.



Fishing boats and equipment in Hastings (© Maritime Archaeology Ltd)

This Character Type has been an important part of the character of some of the harbours of the region for centuries, for example Poole, Langstone and Chichester Harbours.

It continues to provide valuable employment in the region and can also act as an attraction to tourists and visitors to the area.

RESEARCH, AMENITY AND EDUCATION

The Hampshire and Wight Trust for Maritime Archaeology have undertaken a number of research projects in Langstone and Chichester Harbours since the 1990s (www.hwtma.org.uk). These have included the survey of abandoned oyster beds on the Emsworth foreshore. The project recorded the remains of several timber lined beds on the foreshore that were dug to store oysters for the thriving industry there in the 19th and early 20th centuries. Fieldwork included a significant volunteer and outreach component, enabling communities to become involved with, and learn about their local heritage, and culminated in a special display on the oyster industry at the Emsworth Museum that incorporated volunteers' plans and records of the site.



Archaeological investigations at Emsworth (© Hampshire & Wight Trust for Maritime Archaeology)

Further research, being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

CONDITION AND FORCES FOR CHANGE

Pressures on the shellfish farming industry in Southern England include the sea level rise and erosion of low lying features such as the oyster beds (Walmslet and Pawwon, 2006)

Other threats include the recovering continental oyster stocks and poor export prices (Walmslet and Pawwon, 2006). The sustainability of this type of fishery has been questioned by some (Cappell and Nimmo, 2007) and it is believed that one year of poor recruitment could be enough to cause its collapse.

On a more positive note, a demand for seed to restock national oyster fisheries does remain (Pawson et al, 2002).

The industry is also set to undergo regulatory change as, under the Marine and Coastal Access Act 2009; the Sea Fisheries Committees are replaced by Inshore Fishery Conservation Authorities (IFCAs), with a differing membership and differing objectives.

RARITY AND VULNERABILITY

Aquaculture in the Southern England region has a long and complex history and contributes to a distinctive and important aspect in the history of fisheries in England. The industry

continues to thrive within certain harbours and remains a distinctive character type of the region.

Its vulnerability in the region comes mainly from economic pressures on its export trade from increasing continental shellfish stocks and poor export prices.

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2.4 BROAD CHARACTER: PORTS AND DOCKS

2.4.1 Character Type: Ports and docks

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Southern England region contains numerous examples of this Character Type. Small hard, quays and landing places existed all along the Southern England coast in the past, used as means for transferring goods since marine transport was faster, cheaper and more efficient than via road. Examples have been identified in the Hamble area (www.hwtma.org.uk) around the Isle of Wight (including Shalfleet and Newport) and at Mudeford in Dorset. Some quays have now been developed into large recreational complexes eg Gunwharf Quays in Portsmouth.

Southampton is one of the major ports of the country and its facilities include docks, ferry terminals and a car terminal. The modern port was opened in 1843 and since then has grown to become the flagship port operated by Associated British Ports (www.abports.co.uk). It is a principal driver in the regional economy, handling in excess of 42 million tonnes of cargo annually. Other major ports in Southern England include Portsmouth Commercial Port which, although smaller than in its heyday (the postmedieval and early modern periods) still remains a major dockyard; and Newhaven in Sussex. All three locations include terminal buildings and warehousing components. Information on Portsmouth Naval Dockyard is given under the 'Military Facilities' Character Type.

Harbours are numerous and include Poole and Christchurch Harbours in Dorset; the Hampshire neighbours of Portsmouth, Langstone and Chichester Harbours; Shoreham Harbour in Sussex; and Bembridge, Ryde, Binstead and Cowes on the Isle of Wight.



Poole Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Southampton has a long trading history; its first recorded existence as a harbour was the Roman town of Clausentum on the eastern bank of the River Itchen. From the twelfth century onwards, the port developed through the wine trade with Gascony and considerable trade with the Italian City States from the fifteenth century onwards. After a collapse of trade in the sixteenth century, the town's fortunes picked up again with the close of the Napoleonic Wars in the early nineteenth century. The first stone of the modern docks was laid on 1838 and the facility opened in 1843. It was immediately put into heavy use by the P&O Line which had secured the contract for mail to India. In 1895 the Prince of Wales Dry Dock, at the time the largest on earth, opened, and in the same year both the White Star Line (famous for the *Titanic*) and American Line chose to move their transatlantic terminus to Southampton (Wheatley, 1990).



Southampton Docks (© Hampshire & Wight Trust for Maritime Archaeology)

Southampton is now one of the UK's busiest and most important ports, and a principal driver in the regional economy. It is the flagship port operated by Associated British Ports and handles in excess of 42 million tonnes of cargo annually (around seven per cent of the UK's entire seaborne trade). Southampton carries the majority of the country's cruise passengers in its four cruise terminals, and is home port to the country's largest cruise ships (www.abports.co.uk).

Newhaven lies at the mouth of the River Ouse, and although it is now a town of importance because of its continental traffic (Salzman, 2009), the main outlet and port of the Ouse throughout the Middle Ages was at Seaford. Over the centuries the river migrated between Newhaven and Seaford in response to the growth and decay of a shingle spit at its mouth. In the mid-16th century a channel was cut through the spit below Castle Hill, Newhaven, creating access to a sheltered harbour which was better than that at Seaford. In 1847 the London Brighton and South Coast Railway opened the Newhaven harbour railway station. The railway funded the dredging of the channel and other improvements to the harbour between 1850 and 1878, to enable it to be used by cross channel ferries (Pratt, 1921), and in 1863 the LB&SCR and the Chemin de Fer de l'Ouest introduced the Newhaven-Dieppe passenger service (Jordan, 1998) which continues to run today. The harbour was officially recognised as 'The Port of Newhaven' in 1882 (Cassell, 1912) with imports including French farm products and manufactures, timber, granite and slates.

Newhaven harbour was designated as the principal port for the movement of men and material to the European continent during World War I and was designated a 'Special Military Area'. The port and harbour facilities, rail sidings and warehousing were greatly enlarged at this time and electric lighting installed to allow for 24-hour operation.



Newhaven Harbour facilities (© Maritime Archaeology Ltd)

Christchurch Harbour (Dorset) is a natural harbour which has been designated as a Site of Special Scientific Interest (SSSI) comprising the estuary of the Stour and Avon and the Hengistbury Head peninsula. The harbour became a major trading port around 100BC, when exports included copper, gold, silver and iron and luxury goods were imported (Hoodless, 2005), and during Saxon times the harbour became one of the most important in Britain (Stannard, 1999). Numerous recreational activities take place in the harbour today including sailing (it is home to three sailing clubs), rowing, canoeing, windsurfing and kite surfing, with fishing, walking and bird spotting being enjoyed on the Harbour shores.

Three major harbours Langstone, Portsmouth and Chichester, feed into the Solent. These linked harbours are important recreational and conservation areas as well as supporting commercial fishing and shipping. Artefacts from many periods have been discovered eroding from the shores of the islands and from within the mud flats. Some items date back to the late Mesolithic period. By the Iron Age the maritime environment had evolved and salt working took place on the margins of the harbour. A logboat discovered off the north west coast of Long Island in 2003 has been dated to between AD400-640 (www.hwtma.org.uk) and comprises the oldest watercraft remains from the area.

The sheltered nature of Chichester and Langstone harbours means that they have historically been exploited for various uses including oyster farming (from Roman times onwards), wildfowling, sheltered navigation, fish nursery stocks, land reclamation as coastal grazing marsh and localised gravel extraction. Modern military features have been found within Langstone harbour including evidence of a bombing decoy site on one of the islands and a Mulberry Harbour (Hampshire County Council, 2010). More recently, the growing recreational market has driven an increase of marinas and boatyards (Hampshire County Council, 2010).



Chichester Harbour (© Maritime Archaeology Ltd)

These three harbours are also havens for wildlife. Langstone Harbour is an internationally important habitat for a range of water fowl and waders, and is designated as a RAMSAR site (a wetland site with international importance), a SPA (special protection area) and SSSI (site of special scientific interest). Chichester and Langstone harbours are amongst the twenty most important intertidal areas in Britain as a summer and autumn assembly ground for waders. Langstone Harbour and the adjoining and connected harbours of Portsmouth and Chichester form a single, coherent ecosystem which is among the ten most important intertidal areas for waders in Britain (Hampshire County Council, 2010).

Quays or wharfs (structures built along or at an angle from the shore of navigable waters) were necessary components of ports. These structures allowed ships and other vessels to load and discharge cargo and passengers. The historic importance of sea trading is evident from the many wharves both in current or disuse in many areas of Southern England harbours eg Langstone and Chichester where Great Saltern Quay, Kendalls and Brockhampton wharves are still active for the sand and gravel industry (Hampshire County Council, 2010). There are various quays dotted around the Isle of Wight coastline including Newport, Kings and Shalfleet Quays.

Mudford Quay is a working quay in Christchurch Harbour, constructed in the late 1940s. It is frequently used for watersports including windsurfing and sailing, and hosts an RNLi lifeboat station, fresh fish stall and a ferry which takes passengers across to Hengistbury Head and Christchurch.

Gunwharf Quays in Portsmouth was established in the twelfth century when Richard I let out land for development of a dockyard and constructed a dock for royal galleys, known as Richard's Docks. What is now the Camber Dock was the original berthing place for warships in Portsmouth. In those days, the shoreline was 300 yards further back, roughly where the

existing perimeter wall is along Gunwharf Road. The main archaeological interest of the Gunwharf site relates to the defences of Portsmouth dating from 1526 (www.gunwharf-quays.com). Over the centuries, the site of Gunwharf has been incrementally reclaimed from the sea.

Gunwharf Quay was the first main ordnance yard for the Navy, established in the late 17th century. Ships would collect their gunpowder, cannon balls and weapons before leaving Portsmouth Harbour for action at sea. It would have been from Gunwharf that Nelson's Victory would have collected her munitions before the Battle of Trafalgar (www.gunwharf-quays.com). The quay has since housed an infirmary for Royal Marines, a Customs and Excise House and barracks. Today, 'Gunwharf Quays' has been redeveloped as a £200 million mixed-use complex comprising designer outlets, bars & restaurants, a cinema and Bowlplex, as well as offices and berthing space which can take vessels up to 75m in length (www.gunwharf-quays.com).

VALUES AND PERCEPTIONS

Ports are perceived by visitors and locals in different, and even contradictory, ways, for example as highly competitive commercial entities, transport hubs, centres for service industries, areas resonant with their towns' and cities' historic and economic development, or more simply as recreational places: pleasant places to be. They also often have cargo-handling equipment such as cranes and forklifts which can be seen as unsightly or, conversely, as iconic features from past activity preserved within redeveloped shopping areas.

Ports have historically been significant employers in the Southern England region, and remain so today. For example the Port of Southampton remains a major employer in the city, being the busiest cruise terminal and second largest container port in the UK. The redevelopment of areas into recreational facilities (eg Gunwharf Quays in Portsmouth) has increased regional employment as well as the local economy.

The resurgence of cruise holidays and the berthing of the liners in ports such as Southampton have had a positive effect on public perception of this Character Type with many people associating cruises with the 'glory days' of the first transatlantic ocean liners. The launching of these ships is often a community event, for example many local people went to see the launch of Cunard's newest and largest ship, the Queen Elizabeth, in Southampton in October 2010. Community engagement with the naval origins and ongoing naval associations of the region's major ports also comes to the fore in the many thousands of visitors drawn to 'Navy Days' at the Portsmouth Historic Dockyard each year (www.navydaysuk.co.uk).

The character of the three harbours of Portsmouth, Langstone and Chichester is very varied, and therefore perceived differently by the public. Portsmouth Harbour has a heavily developed shoreline with the dock-yards and associated industrial development dominating the landscape. At the other extreme the undeveloped shoreline of Chichester Harbour provides a tranquil respite from the nearby developed areas (Cox 1997).



Portsmouth Harbour, Naval Dockyard and Historic Dockyard (© Hampshire & Wight Trust for Maritime Archaeology)

RESEARCH, AMENITY AND EDUCATION

Research into the region's harbours has been prolific, for example, the Hampshire and Wight Trust for Maritime Archaeology has been involved in the investigation of Portsmouth, Chichester and Langstone Harbours since the early 1990s. Many projects have included a significant volunteer and outreach component, enabling communities to become involved with, and learn about their local heritage (www.hwtma.org.uk).



Archaeological investigations at Langstone Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

Although many of the port locations may be inaccessible to the public, the harbours contain an amenity value which is linked to recreational and leisure activities such as sailing and wildlife watching (Langstone Harbour being designated as a RAMSAR site, an SPA, SAC and SSSI). There is much potential for educational and outreach activities such as visits to harbours, local history courses in schools, and learning about the environmental and ecological aspects of the locations. These sites are also often a source of inspiration to historians and writers.

The significance of the maritime heritage of many port cities is now being recognised. A current example is the building of the new Sea City museum in Southampton due to open in 2012 which will feature two permanent exhibitions focussing on Southampton's Titanic story and the city's role as a maritime gateway to the world

CONDITION AND FORCES FOR CHANGE

There are many ports that are thriving in the region. They possess long, complex and dynamic histories that have been built up through many centuries. Some of them eg Southampton are still growing, with new terminals and storage facilities being constructed each year.

Other locations which are no longer being used for their original purposes have been redeveloped eg Gunwharf Quays, which is now a large retail and recreation facility, reflecting the attractiveness and premium attached to historic coastal locations as prime development locations.

RARITY AND VULNERABILITY

The ports, docks and harbours in the Southern England region have made considerable impacts at national and international levels through their commercial trade links and transatlantic cruise businesses.

The pressures for change on this Character Type can be seen clearly on areas whose active port facilities have become redundant and have been transformed into prestigious commercial and recreational centres or marinas.

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2.5 BROAD CHARACTER: COASTAL INFRASTRUCTURE

2.5.1 Character Type: Flood and erosion defence

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Sea and flood defences are expressed in different forms at almost all the coastal settlements and other vulnerable areas along the coast of Southern England.

Sea and flood defences in the region are characteristic for protecting agricultural land and coastal settlements such as Selsey where the coastline has been receding for hundreds of years, and settlements surrounding those rivers which are prone to flooding.

Wooden groynes are common on both sandy and shingle beaches, in particular at the main tourist resorts where they serve to retain the beach, though they have been claimed as the cause of sediment starvation further along the direction of longshore drift.



Wooden groynes at Felpham (© Maritime Archaeology Ltd)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Coastal defences frequently occur on beaches associated with residential areas. Experts have estimated that since the mid-1980s Swanage beach has narrowed by 20m. In 2005 a £2 million project aimed at protecting the beach's sea wall from erosion was given the go-ahead. The plan involves replacing aged groynes with new timber groynes along the sand and raising the level of the beach to protect the wall. It was approved as being the most cost-effective long term solution to shoring up the Swanage coastline. (news.bbc.co.uk/1/hi/england/dorset/4194414.stm)

Further east along the coast at Christchurch Harbour many types of sea defence are present. On the coast outside the harbour there are 50 groynes and 4km of sea wall which protect about £100 million of property. Seaward of the formal defences, there are c.4km of beaches, most with high amenity value and, on the defences themselves, a heavy concentration of tourist attractions, such as beach huts, cafes, sailing and bathing stations. This illustrates the economic rationale for sea defences.

Groynes installed in the 1960s along the New Forest coastal plain have helped protect the area against erosion from the easterly longshore drift (Hampshire County Council, 2010). Barton-on-Sea in Hampshire is suffering from coastal recession rates averaging 1m per year. The area is heavily settled with developments perched precariously near to the erosion zone: a 1850m long frontage of continuous residential development is at risk in the next few decades, with an estimated 15 properties to be 'probably lost in the next 20 years' (www.nfdc.gov.uk).

Since the mid 20th century, beach replenishment and redistribution has taken place annually around Hayling Island which has a naturally dynamic coastline. This is managed by sea defences from groynes in the south to sea walls in the east and west. (Hampshire County Council 2010).

Certain settlements within the Southern England region are extremely vulnerable, and severely affected by coastal erosion. This is ever-present in the town of Selsey in West Sussex where the coastline has been receding for hundreds of years. In addition to the erosion at Selsey, there are many lost villages and settlements all along the Sussex coast, such as Barpham south of Angmering, Kingston Church, parts of old Middleton-on Sea and Climping (www.westsussex.info/selsey-flood-defences.shtml). The most frequently used coastal protection in the area is wooden groynes, which are supplemented by sea walls and other concrete defences to protect the back shore. According to the Environment Agency, Selsey is the most vulnerable settlement in Southern England and would be the first to suffer as a result of rising sea levels and increased storms arising from climatic change.



Wooden groynes and concrete sea defences at Climping, Sussex (© Maritime Archaeology Ltd)

The beaches of many seaside resorts (particularly along the East and West Sussex coasts) are protected by groynes. For example, at Worthing beach erosion and long-shore drift have long been dealt with by the maintenance of wooden groynes built out from the top of the beach. In recent years rock armour, in the form of huge boulders of granite (from Norway) and limestone (from the Mendips) have been added, to reduce the likelihood of erosion undercutting the coastal road in various places. Similar groynes and rock armour can be seen at Bognor Regis, Eastbourne, Littlehampton and St. Leonards.



Concrete and wooden sea defences at St Leonards (© Maritime Archaeology Ltd)

The Pevensey Bay Sea Defence scheme is the first sea defence project anywhere in the world to be funded as a Public Private Partnership (PPP/PFI) (www.pevensey-bay.co.uk/). Its sea defences are 9 km long. In 2000 there were over 150 timber groynes along the frontage, many of which were in a relatively poor state of repair. As they fail, groynes are being removed so that ultimately only ten or so will remain. The sea defences provide protection from the permanent flooding of a 50 square km area including Pevensey Bay, Normans Bay, Langley, Westham and parts of Pevensey itself. Within this area there are more than 10,000 properties, important recreational and commercial complexes, transport links (main road and railway), wetlands of international importance and two important nature reserves (Hooe Flats and Pevensey Levels). Should there be a serious breach of the sea defences then all these areas could be flooded.

In 2008, Halcrow consultants undertook a Regional Flood Risk Appraisal of South East England on behalf of the then South East Regional Assembly. Areas of high flood risk in the region include South Hampshire and Shoreham Harbour. This appraisal will be used to inform development and flood defence policy (Halcrow 2008).

In February 2010 it was announced that three flood zones in the New Forest were to benefit from a £700,000 Environment Agency project designed to protect properties near the Danes Stream, Bartley Water and Lymington River (www.bournemouthcho.co.uk).

VALUES AND PERCEPTIONS

Sea and flood defences are generally seen as essential for the preservation of settlements along the Southern England coast. The protection of property by preventing erosion and also by providing flood protection conserves economic value and provides local residents with reassurance (DEFRA, 2010). Coastal defences may also maintain or increase local tourist trade by conserving or enhancing amenity values (DEFRA, 2010).



Sea defences at Felpham (© Maritime Archaeology Ltd)

There are conflicting pressures from local residents and visitors who are in favour of sea defences as they perceive them as saving their coastline and settlements, and pressure from conservationists who say that coastal defences and their maintenance can have significant collateral effects on habitats, including loss, reduction and replacement (DEFRA, 2010).

Sea level changes or changes in coastal processes as a result of climate change may also result in coastal squeeze. This is the process by which intertidal areas, which would normally move inland in response to changed coastal processes such as sea-level rise, are prevented from doing so as a result of immovable or maintained man-made infrastructure (seawalls, embankments, roads etc). Thus intertidal areas (e.g. beaches, saltmarsh, mudflats) are lost or reduced in extent, and ultimately may lead to the complete loss of a beach (Pilkey and Dixon, 1996). Coastal defences may also lead to accelerated erosion of

the inter-tidal area in front of the defences (Cooper and Pontee, 2006). Given the intensive use of these beaches for the local economy and recreation this will be an important consideration for future Shoreline Management Plans. Any reduction in beach area may add to conflict between uses or intensify to overcrowding issues.

Beach replenishment may also have implications for the historic environment. During a replenishment project on the beaches of Poole Bay several large pieces of wood were washed ashore. It has been suggested that some of these could have come from wrecked vessels (www.poolebay.net/PhaseI/archaeology.htm). Historic environment considerations, at all scales from small individual sites to the typical character of areas, are key factors in Shoreline Management Plan Review and are covered by an English Heritage Guidance Note: www.helm.org.uk/upload/pdf/Shoreline-Management-Plan-Review.pdf.

Beach replenishment has been seen as supporting employment, including associated industries such as marine aggregate dredging and environmental consultancy and advice. Material can be deposited from vessels by 'rainbowing' or using a pipeline to pump material on to the shore. These methods reduce transport and traffic issues. Alternatively, material may be trucked on to the shore and may require mechanical spreading. One drawback may be that by mitigating and/or preventing erosion, replenishment schemes may encourage coastal development with associated environmental impacts (DEFRA, 2010).

RESEARCH, AMENITY AND EDUCATION

Sea and flood defences have been used in England for many centuries and are an integral part of the historic environment. Some of the early coastal defence systems are the focus of much historical and archaeological interest (Fulford et al 1997).

These defences provide a stimulating and relevant focus for cross-curricular educational topics, offering excellent case studies looking at relationships between the environment, landscape, coastal change and sustainability. Case study resources related to flood defence schemes are freely available online, for example from Met Office Education (www.metoffice.gov.uk/education) and the Geographical Association (www.geography.org.uk).

The components of this Character Type could be further explored as aspects contributing strongly to regional distinctiveness, with potential for developing wider education and raising public awareness of the region's links with the sea. Regional educational studies may also usefully focus on the complex issues surrounding coastal erosion at settlements within the region such as Selsey which affect the whole community.

Specific historic features can also be affected by development works as well as by the indirect impact of the defences. Consequently, when developing future sea defences, such features are necessary considerations as well as the effects the defences are likely to have on aesthetics and historic character. Fuller discussion of this aspect can be found in the English Heritage Guidance note on Shoreline Management Plan Review and the historic environment: www.helm.org.uk/upload/pdf/Shoreline-Management-Plan-Review.pdf.

CONDITION AND FORCES FOR CHANGE

The main forces for change in the region are the dynamic relationship of the sea with man's coastal activities. This is intensified by the effects of climate change, especially flooding and

coastal erosion from sea level rise, and the potential increase in intensity, severity and frequency of coastal storms and heavy rainfall (DEFRA 2006).

The investment within this sector in England and Wales has doubled over the past ten years due to the vulnerability of the coast to potential flooding and coastal erosion associated with climate change (DEFRA 2010).

The responsibility for flood and coastal erosion risk management lies with Department of the Environment, Food and Rural Affairs (DEFRA) who provides funding through grants to the Environment Agency and local authorities. The Pitt Review (carried out in 2009 following devastating flooding a few years earlier) resulted in a series of recommendations for improving the way flood risk is managed in England. Defra is now taking forward the findings of the review to improve flood defences, and prevent unnecessary building in areas of high flood risk. The [Flood and Water Management Act \(2010\)](http://www2.defra.gov.uk/environment/flooding/legislation) ([ww2.defra.gov.uk/environment/flooding/legislation](http://www2.defra.gov.uk/environment/flooding/legislation)) aims to improve the way flood risk is managed, with the first parts implemented in September 2010. In November 2010 Defra launched a consultation on '[Future Funding of Flood and Coastal Erosion Risk Management in England](#)'. The consultation formed part of a wider consultation on a [National Flood and Coastal Erosion Risk Management Strategy for England](#) being conducted by the Environment Agency. Updates on legislation, policies and consultations can be found at www2.defra.gov.uk/environment/flooding/

RARITY AND VULNERABILITY

Investments in coastal defence have doubled over the past ten years due to concerns over climate change impacts on the coast (DEFRA 2010). Projections are that spending on coastal defences will need to double by 2080 (DEFRA 2010). The need for coastal defences is dependent on the stability of beaches and the impacts of flooding and coastal erosion on human activities along the coast. Climate change, predicted to lead to a rise in sea levels, possible increased storminess and changes to wave conditions (MCCIP 2008), may alter erosion rates, the incidence and severity of flooding events, and increased steepening of intertidal profiles, resulting in increased demand for coastal defences (DEFRA, 2010), though inevitably these will be more clearly targeted to sustainable management within available resources.

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2.6 BROAD CHARACTER: COMMUNICATIONS

2.6.1 Character Type: Transport

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Southern England region is well served with transport infrastructure including motorways, main roads, railways and airports.

There is one canal in the Southern England coastal region, the Chichester Ship Canal. This opened in 1823 and enabled coastal ships to reach Chichester from its harbour. It carried trade until 1906 and was totally abandoned in 1928. It is now being restored by the Chichester Ship Canal Trust and is a popular recreational and tourist destination in the region.

Three main rail companies currently operate in the region - South West Trains, Southern and, to a lesser extent, First Great Western.

Two motorways converge on the region – the M3 from London to Southampton, where it joins the M27 which runs to Portsmouth in the east and to the New Forest in the west. Further west of the region (for example along coastal Dorset) there is no motorway presence, although the two motorways mentioned do facilitate access from London and the south coast conurbations to the number of 'A' roads running close to the coast. Despite this, some of the coastal villages are quite remote from major routes (eg Swanage on the Isle of Purbeck). There is also no motorway presence in the coastal zone to the east of the region, but main roads include the A259 which runs close to the coast from Hastings to Langstone, and the faster A27 which runs parallel to this, but slightly further inland.

Two international airfields serve the region, Southampton Airport and Bournemouth International Airport.

The railways, roads and airports of southern England have opened up the area to the people who live there as well as to tourists. They have increased the ability for people to commute further afield for jobs, have made the coast more accessible with people having access to goods and services, and have increased local economies through tourism.



Brighton Railway Station (© English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Chichester Ship Canal was originally constructed as part of the Portsmouth and Arundel Canal, and was opened in 1823. It carried trade (for example bringing in building materials and coal, and taking away manure) until 1906, and fell derelict soon after. In the late 1970s the Portsmouth & Arundel Canal Society was formed (later changing their name to the Chichester Canal Society and more recently to Chichester Ship Canal Trust) with the aim of restoring the canal (www.chichestercanal.org.uk).

The first mainline railway in southern England was the London and Southampton Railway (renamed LSWR in 1838), which completed its line in May 1840. This was quickly followed by the London and Brighton Railway (September 1841) which served the port of Newhaven and several popular holiday resorts on the south coast.



**Clayton Tunnel, West Sussex. Built in 1841 for the London and Brighton Railway
(© English Heritage)**

After WWI the government decided on a compulsory amalgamation of the railways into four large groups through the 1921 Railways Act, known as the Grouping. The south coast railways were amalgamated to form the Southern Railway in 1923. In addition to its railway operations, the Southern Railway inherited several important port and harbour facilities along the south coast, including Southampton and Newhaven, and ran services to the harbour at Portsmouth.



**Newhaven Port which has been well served by the railway since the nineteenth century
(© Maritime Archaeology Ltd)**

Holiday makers using the lines to the Channel ports and the West Country were replaced with troops during WWII, in response to the threat of a German invasion on the south coast. When the threat of invasion receded, the area served by the Southern Railway became the marshalling area for troops preparing to invade Normandy under 'Operation Overlord', and the railway played its part by providing a link in the logistics chain. This came at a cost, however, as the Southern Railway's strategic role around London and the Channel ports meant that it was subjected to heavy bombing.

The company was nationalised along with the rest of the railway network in 1948 and incorporated into British Railways. British Rail was privatised in 1997. Ownership of the track and infrastructure passed to Railtrack, later becoming Network Rail; passenger operations were franchised to individual private-sector operators. The region is now (2011) served by South West Trains, Southern and First Great Western.

The Southern England region is served by two major motorways. The M3 from London runs to Southampton where it joins the M27 which runs to east to Portsmouth and west to the New Forest in the West. There are no motorways in the coastal zone to the east of the region, but main roads include the A259 which runs close to the coast from Hastings to Langstone, and the faster A27 which runs parallel to this, but slightly further inland. These are main routes to the South Coast, enabling holidaymakers to reach seaside destinations quickly, and allowing residents of coastal towns to reach other areas of the country with ease. The coastal settlements in Dorset, to the west of the region, do not have easy access to a motorway: although a number of 'A' roads run through the county, some of the coastal villages, such as Swanage on the Isle of Purbeck, are quite remote from major routes



Swanage on Isle of Purbeck (in distance) in coastal Dorset

(© Maritime Archaeology Ltd)

Both motorways and the 'A' roads can become very busy in the summer months, with traffic jams of many miles occurring due to the large numbers of tourists trying to reach the coastal towns and villages for day trips and longer holidays.

Southampton operated a flying boat service between 1919 and 1958 carrying passengers and mail. The first services ran only as far as Bournemouth, Portsmouth and the Isle of Wight, but in the 1920s flights operated to northern France, and from 1937 Imperial Airways began services to Africa, the USA, Australia, Japan, Singapore and Hong Kong (www.disused-stations.org.uk/s/southampton_flying_boat_terminal/index.shtml). The flights ended with competition from land-based jets in 1958.



Flying boat pier, Southampton (© English Heritage)

Two international airfields now serve the region, Southampton Airport and Bournemouth International Airport. Southampton Municipal Airport, owned by Southampton Corporation, opened in 1932. It became a training area for the Royal Navy in WWII but began operating again as a municipal airport in 1945 with a regular service to the Channel Islands. (www.southampton-airport-guide.co.uk). Many improvements were made to the airport during the 1960s and 1970s including a new runway and air traffic control tower. In 1984 Airports UK Ltd was appointed to manage the operational activities and made further improvements. The financial future of the airport was secured when BAA plc purchased the site in 1990 and announced that they would be investing £27 million in developing it. The 'New Southampton Airport' was opened in the 1994. Today Southampton is one of Europe's most modern regional airports with over 1 million passengers each year flying to 33 different destinations (www.southampton-airport-guide.co.uk), opening up the South Coast region to a vast number of international travellers.

Bournemouth Airport originally opened as a Royal Air Force (RAF) air base (RAF Hurn) and accommodated many RAF units between 1941 and 1944 when it was handed over to the Ministry of Civil Aviation. Hurn was the main terminal for international airline flights into the

UK until 1949 when Heathrow was opened and airline operators moved there. (www.airportguides.co.uk/guides/bournemouth/history.html). In 1969 the airport was bought by Bournemouth Corporation and Dorset County Council who ran the airport in partnership until 1995 when it was sold to National Express. Today, it is known as Bournemouth International Airport and serves the south coast with an increasing number of charter flights as well as a number of UK and European scheduled destinations (www.airportguides.co.uk/guides/bournemouth/history.html). In addition to commercial flights, Bournemouth Airport carries cargo (including flowers from the Channel Islands and Royal Mail flights) and operates a fleet of Falcon jets for service with the RAF and Royal Navy. The airport is also home to three flying schools training private and commercial pilots (www.bournemouthairport.com).

VALUES AND PERCEPTIONS

Canals are a lasting imprint on the present-day landscape of a 19th century period of prosperity and success. At the same time, they are an integral part of the present social and cultural landscape, with a range of current uses, including leisure. Recreation uses of the Chichester Ship Canal include canal trips, rowboat hire, canoeing, angling, towpath walks, painting and bird watching. This quiet area is highly valued by residents and visitors to the region.

The South Coast's railways, roads and airports have opened up the area for the people who live there as well as to tourists. They have made the coast more accessible with people having access to goods and services as well as increasing local economies through tourism.



The region's railways, roads and airports have increased access to the South Coast and its holiday destinations such as Brighton (© Maritime Archaeology Ltd)

However, all these means of transport have generated mixed feelings with local residents with increased noise, pollution, traffic jams and a negative impact on the landscape with

junction improvements and motorway extensions such as the M3 extension through Twyford Down in 1994.

RESEARCH, AMENITY AND EDUCATION

Generally, research has focused on canals from an 'industrial' and 'historical' point of view. Further research integrating maritime perspectives will contribute to a greater understanding of canals and their effects on developing early industrial period landscapes, contextualised regionally, nationally and internationally. Today, many canals such as the Chichester Ship Canal are largely used for leisure purposes. As such, education and outreach initiatives which bring together leisure activities whilst also exploring the insights of the 'industrial heritage' of canals would be highly beneficial in terms of educating and raising public awareness. This could also be the starting point of promoting and seeking further economic benefits.

The Southern Railway's memory lives on at several preserved railways in the south of England, including the Watercress Line and Swanage Railway. There are several societies that specialise in the Southern Railway, including the Southern Railways Group and the Southern Electric Group.

Further research on early development of the region's long distance routeways would be valuable at national, regional and local levels, by looking at the developing relationships through time between coastal populations, trade, transport and topography.

Transport routes fulfil a variety of roles in respect of land/seascape. They are facilitators, providing the means and locations for many people's perception and appreciation of the historic landscape/seascape. They also have considerable character effects on the landscape/seascape, directly and indirectly through, for example, the establishment of new coastal settlements and trade. However, they also possess a range of interesting features which are an expression of people's past activities. Bridges, viaducts, stations, roadside services, out-of-town shopping centres, big-shed warehousing and distribution centres and other infrastructure are also aspects which contribute to their landscape/seascape. A high proportion of the market supporting this infrastructure is generated by the huge numbers of people living in, or travelling to access, the region on account of their appreciation of its coastal qualities.

Due to the intrusive nature of the work involved in the construction of new communication routes, this can have major effects of the existing historic environment in coastal and foreshore areas can be. In addition, construction may also have indirect effects as a result of alterations to existing patterns of drainage, water flow in rivers, or tidal currents, thus creating the possibility of removal or exposure of historic assets through erosion (Fulford et al 1997). These are issues, including landscape impact issues, which should be noted as part of the Environmental Impact Assessment (EIA) requirements in advance of such developments.

This Character Type could be further explored through the way it enables people to access the wider historic landscape/seascape (e.g. canal, railway and road features). In addition, the disused canals and railway lines offer routes for public access and enjoyment.

CONDITION AND FORCES FOR CHANGE

The Chichester Ship Canal is a typical example of how an abandoned working canal is now being utilised for recreational purposes.

The region's railways are heavily used during the summer months by holidaymakers and day trippers travelling to the coast. They are also used extensively by commuters, particularly for travelling to London. This has caused significant overcrowding on the morning and evening rush hour trains. Some railway operators eg Southern are increasing capacity in the hope of easing the overcrowding.

Construction of communication routes at or near the coast frequently involves major engineering projects since coastal areas are generally unstable environments. Such new route-building responds to several factors which include increased traffic to the coast, changing configuration of the coastline, rising sea-levels, or coastal defence initiatives, amongst others. The direct impact of these projects on the landscape/seascape needs to be assessed according to UK Government and EC requirements (e.g. Environmental Impact Assessments), but they are also often highly contested, setting regional and national infrastructure pressures against those seeking landscape conservation, as in the debates over the possible future re-routing of the A35 behind the Golden Cap estate in the west Dorset coastal hinterland.

RARITY AND VULNERABILITY

Today, the scale of change has affected the size and frequency of key nodal transport points. It has also affected the differing frequencies of expression of past and present transport infrastructure along the coast as well as the low, easily overlooked (and therefore vulnerable) profile of much early transport related character.

Pressures to improve transport infrastructure and conflicting public responses to them will continue to affect the expressions of this Character Type.

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2.6.2 Character Type: Telecommunications

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type covers telecommunications infrastructure across coastal land, inter-tidal and marine zones. This includes historic telegraph stations and their associated cabling, and civic listening devices. Modern cables also transfer mass media such as the internet and telephone systems

There are two principal submarine cables routes through the region:

- 1) UK-France 3 runs from Brighton to Dieppe, Upper Normandy in France. It came into service in 1989 and is maintained by BT, C&W and France Telecom.
- 2) CIRCE South runs from Pevensey Bay to Cayeux-sur-Mer in France. It came into service in 1999 and is maintained by Viatel.

There are also cables which are no longer in commercial use, some of which may be employed for research purposes (DTI, 2007).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The first submarine communications cables in the nineteenth century carried telegraphy (written communication) traffic. Subsequent generations of cables were utilised first to carry telephony (voice communication) traffic and later for data communications traffic. Modern cables use optical fibre technology (developed in the 1980s) to carry telephone traffic as well as Internet and private data traffic (http://en.wikipedia.org/wiki/Submarine_communication_cable).

There has been a considerable increase in global electronic data transmission since the final years of the 20th century, brought about by the unprecedented popularity of the Internet and the development of e-commerce. As a consequence, the number of cables linking England with mainland Europe has grown considerably.

VALUES AND PERCEPTIONS

Due to the character of submarine telecommunications cables, their presence in the marine environment is likely to be known only to those who were involved in laying them, and to people involved in communications infrastructure. Although highly dependent on them, the wider public are likely to know little about their location. However, their importance on public and private life cannot be underestimated due to the impact they have made for millions of internet and phone users.

RESEARCH, AMENITY AND EDUCATION

The work that is undertaken during the laying and maintenance of cables offers an opportunity to further investigate preceding phases of the historic environment, which in turn informs and enhances our ability to characterise the human imprints on the landscape/seascape. Palaeoenvironmental evidence has been unearthed during such works, uncovering deposits rich in pollen taxa and microfossils that can further inform our knowledge of the evolution of marine transgressions and previous character in the landscape/seascape.

The laying of submarine telecommunication cables has provided the means to allow internet and phone access for private companies and the general public, and has made accessible a wide variety of online educational and amenity tools.

The need for submarine telecommunication cables and the logistics, practicalities and issues associated with their installation and maintenance can provide an interesting cross-curricular educational case study.

CONDITION AND FORCES FOR CHANGE

Overall, the submarine telecommunication cables in the region join the historic environment as modern impositions onto other Character Types.

Such cables are designed to be highly robust, but damage can and does occur which requires their replacement periodically. Rapidly increasing volumes of cable-borne traffic and technological development in cable capacity also prompts the laying of new cables.

Offshore development arising from preliminary survey work, laying and maintenance of cables, and removal of disused cables can have a significant impact on the character of the landscape/seascape. Preparatory investigations may involve intrusive survey of the sea bed, disturbing and exposing archaeological deposits, but also providing detailed knowledge of seabed conditions. The laying of the cables involves burying them where they cross the foreshore and in shallow waters, which can potentially disturb the historic environment. In deeper waters, submersible ploughs running on tracks or skis and towed by surface vessels are used for trenching, laying cable, and subsequent inspections. Consequently, the use of such machinery would have significant impact on the historic character of the region (see Fulford et al 1997).

RARITY AND VULNERABILITY

The laying of telecommunications cables is likely to increase, although the development of wireless technology may eventually lead to the redundancy of many of these cable routes.

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2.7 BROAD CHARACTER: MILITARY

2.7.1 Character Type: Military defence and fortification

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Military coastal defences can be found all along the Southern England coast, although there is a tendency to find them concentrated around the main ports (Portsmouth being an example) due to their perceived vulnerability to foreign attack over many centuries.

A small number of examples of prehistoric fortifications are found within the region including the Iron Age hillforts of Devils Dyke and Thundersbarrow and the Bronze Age settlement at Highdown camp and encampment near Seaford.

Portchester Castle was originally a late Roman fortification though the castle was added to in phases during the Saxon and Medieval periods, and also in the seventeenth century.

The remains of medieval fortifications can be seen at Calshot, Hurst and Southsea Castles in Hampshire, Edburton Castle in West Sussex and at Hastings. These were all sited in coastal locations and designed to deter or prevent attack from seaward.

Post-medieval fortifications were similarly sited in coastal locations. Examples in the region are Branksea Castle, Hurst Castle and Castle Goring.

Early Modern fortifications are abundant in the region in the form of Palmerston Forts including, amongst others, Fort Brockhurst, Fort Elson, Fort Nelson, Fort Purbrook, and Fort Rowner) and Martello Towers along the East Sussex coast including Newhaven Fort and Eastbourne Redoubt. A number of Sea Forts were also constructed during this period.



Fort Brockhurst (© English Heritage)

Remnants of WWII fortifications can be seen stretching across the Southern England coastline. These include the line of tank traps which overlook Hordle Beach in the New Forest, gun emplacements along Southampton Water, and pillboxes which are scattered

along the whole coastal area. During WWII, troops were billeted at the sixteenth century Hurst Castle, and the MOD still uses the two Victorian wings there.



Pillbox along Dorset coastline (© Maritime Archaeology Ltd)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Southern England region has always been considered as vulnerable to attack, with mainland Europeans seeing the south-eastern corner of England as the natural gateway to the country (Wheatley, 1990). Fortifications and anti-invasion defences have therefore been constructed along the coastline accordingly.

Remains of prehistoric fortifications within the region including the Iron Age hillforts of Devils Dyke and Thundersbarrow and the Bronze Age settlement at Highdown camp, and encampment near Seaford.

In the early years of Roman influence in England, the construction and location of coastal installations was related to supply routes, the transportation of goods and the harbouring and maintenance of the small Roman naval fleet rather than solely for defence (see de la Bedoyere 2006; Laycock 2008). Portchester Castle is a well preserved example of a late Roman fortification on the Southern England coast. It is thought to have been built in the late third century AD as part of the defensive system of 'Saxon Shore Forts', probably operating in conjunction with a fleet, to defend the coasts of the eastern Channel and East Anglia from sea-borne raiders from mainland Europe. Originally a Roman fortification, the castle was added to in phases during the Saxon and Medieval periods, and also in the seventeenth century. Although initially constructed for defence purposes, it has been used for many different purposes in its 1700-year history (www.portchestercastle.co.uk).

The remains of medieval fortifications can be seen at Calshot, Hurst and Southsea Castles in Hampshire, Edburton Castle in West Sussex and at Hastings, East Sussex. These were all designed to deter or prevent attack from seaward. Impressive sea defences surrounding Portsmouth Harbour include the Round Tower of Henry V from which a chain boom used to be stretched across the harbour to a tower on the opposite bank, in order to prevent invasion. Since the Norman period, Portsmouth has been a prime focus of naval power, and it was in 1194 that Richard I took the decision to create a naval and military base there from which he could attack France (Wheatley, 1990). King John later decided to station all his war galleys there and in 1212 instructed the City's mayor to build a high, strong wall around the dock 'so that we may avoid damage to our vessels and their appurtenances' (Wheatley, 1990). In Medieval times Hastings was one of the most powerful towns of the federation known as the Cinque Ports, linked with Dover, Hythe, Romney and Sandwich which provided most of the ships and men needed to defence the coast from attacks by the French (Wheatley, 1990).



Calshot Castle (© English Heritage)

The early post medieval period saw the emergence of England as a nation state, with a consequent placing of defences to reflect national strategic considerations. Against the background of gradual change in the landscape, major conflicting events were taking place. A number of castles were constructed in the region during Henry VIII's reign as part of his south coast defences. These include Branksea Castle, built on Branksea Island as a military fort to defend Poole; Hurst Castle at the end of a long shingle barrier beach at the west end of the Solent to guard the approaches to Portsmouth; and Southsea Castle from which three sea forts are visible, and is now a museum.



Hurst Castle (© Hampshire & Wight Trust for Maritime Archaeology)

The early 19th century saw the effect of the Napoleonic wars (1803-1814), and England remained at war throughout this time. Having lost most of its colonial empire in the preceding decades, French efforts were focused mainly in Europe. Consequently, Napoleon Bonaparte saw an invasion of England as the key to supreme control over Europe. In response, England decided that a new coastal defence strategy was needed, to include a chain of forts to be built along the coast. The towers were simple and robust, being based on the design of a fort at Mortella in Corsica which stood up to heavy bombardment from a British force. Napoleon's invasion never materialised and the towers had little military significance until 1940 when some were used as observation posts. Originally 103 Martello towers stretched from Seaford in Sussex to Aldeburgh in Suffolk. 45 still stand; many are in ruins but some have been restored as museums such as Seaford and the Wish Tower in Eastbourne.

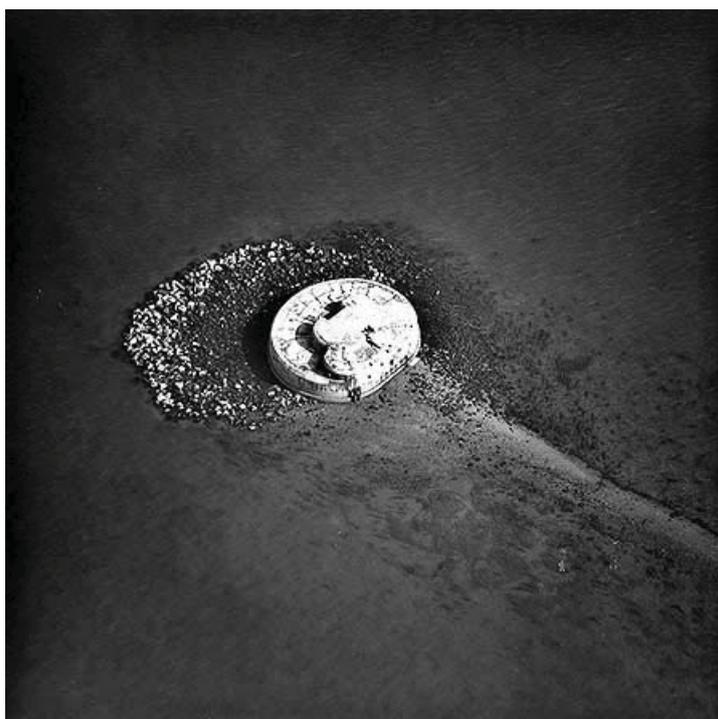


Martello Tower, Seaford, now a museum (© Maritime Archaeology Ltd)

Fort Cumberland, as it appears today, was built between 1785 and 1810 in the far eastern edge of Portsmouth at Eastney Point on the site of an earlier fort. It was designed to defend the entrance to Langstone Harbour and was built in a star plan bastioned style (it was the last of this type of fort to be built in the UK). It is now home to English Heritage offices, also hosting heritage outreach activities on National Archaeology Days.

Another significant group of Forts in the region are known as 'Palmerston Forts'. They were built in the 1860s on the orders of Lord Palmerston (then Prime Minister), following concerns about the strength of the French Navy, and were built to defend areas of specific strategic importance along the coast, in particular those surrounding military bases. The forts were also known as Palmerston's Follies as, by the time they were completed the threat (if it had ever really existed) had passed. They were the most costly and extensive system of fixed defences undertaken in Britain in peacetime. Examples from the Southern England region include the line of forts on Portsdown Hill, built to protect Portsmouth Harbour. These include Fort Purbrook, Fort Widley, Fort Southwick and Fort Nelson. The Gosport Advanced Line of forts protected Gosport from the West, and was made up of Fort Rowner Fort Elson, Fort Brockhurst, Fort Rowner, Fort Grange and Fort Gomer. Other Palmerston Forts in the region include Fort Victoria and Fort Albert on the Isle of Wight.

Four sea forts, Spitbank, Horse Sands, No Man's Land and St. Helen's Fort are located in the Solent between Portsmouth and the Isle of Wight and were built after the 1859 Royal Commission of the country's defences



St. Helen's Fort in the Solent

By the 20th century, the impact of warfare in England was considerable. During WW1 the Defence of the Realm Act 1914 enabled vast tracts of land to be requisitioned for the installation of defensive systems of fortifications and associated support facilities, including camps, airfields, munitions production, and storage, although many of these coastal defences and camps were temporary and have left little traces (Hampshire County Council, 2010). Many earlier fortifications that remained structurally sound were reused as defences during this time. These include Calshot Castle which provided Channel defence (as well as a training base for pilots). At the northern end of Langstone Harbour are the remains of a WWI anti-invasion redoubt. It was built on the site of a proposed Palmerston fortification - Langstone Redoubt - and was well placed to guard Langstone Harbour. It is very significant in that it is the only surviving WWI defence left on Portsdown (www.portsdown-tunnels.org.uk/invasion_defences/langstone_redoubt.htm)

The British anti-invasion preparations of the Second World War entailed a large-scale division of military and civilian mobilisation in response to the threat of invasion by German armed forces in 1940 and 1941. The rapid construction of field fortifications transformed much of the United Kingdom, especially Southern England, into a prepared battlefield. Short of heavy weapons and equipment, the British had to make the best use of whatever was available and earlier fortifications were reused, for example troops were billeted at the sixteenth century Hurst Castle (the MOD still uses the two Victorian wings there).

Any German invasion of Britain would have to involve the landing of troops and equipment somewhere on the coast, and the most vulnerable areas were the south and east coasts of England. Here, Emergency Coastal Batteries were constructed to protect ports and likely landing places. They were fitted with whatever guns were available, which mainly came from naval vessels scrapped since the end of the First World War. Records of the remaining

features from Britain's anti-invasion preparations can be found in the archive of the Council for British Archaeology's Defence of Britain Project: www.britarch.ac.uk/cba/projects/DoB. WWII defences were later dismantled and 1956 saw the formal end of the military coastal defence policy in England. However, some abandoned structures can still be seen in today's landscape. These include the line of tank traps which overlook Hordle Beach in the New Forest, gun emplacements and anti-aircraft battery along Southampton Water and the Solent coast, and pillboxes, often with extensive associated trenching and other fieldworks, which were constructed to overlook beaches and to house machine guns are scattered along the whole coastal area.



Anti-tank device, Bakers Island (© Hampshire & Wight Trust for Maritime Archaeology)

VALUES AND PERCEPTIONS

Attitudes to this Character Type are evolving. In addition to the long-appreciated heritage value of most medieval and earlier fortifications, post-medieval military defences are increasingly being perceived as part of the overall historic legacy of the landscape too. More specifically, in the case of WWII, they are seen as historically significant in terms of their place in the front line of the fight for freedom as their construction and use gradually slips from living memory.

Many defences have now been converted into museums which are informing the public about the specific fortifications as well as the general defence of Britain in history. Examples include many of the Palmerston Forts (eg the Martello Tower at Seaford, Fort Victoria on the Isle of Wight). Other examples such as Fort Albert on the Isle of Wight have been converted into residential developments.

RESEARCH, AMENITY AND EDUCATION

In general, there is scarce interest in research of this Character Type from a maritime archaeological perspective. For example, the built environment (e.g. castles and other fortifications) has often been well-researched in itself but often in isolation from its maritime setting and the maritime defensive strategies to which its built structures were responses (e.g. Johnson 2002). However, there is a wide and on-going research interest in 20th century military defences. For example, WWI and WWII military remains have been one of the most active areas of research for special interest groups in recent years and have been the subject of major national research programmes such as the CBA's Defence of Britain Project mentioned above.

Castles and other fortifications along the English coast act as a point of attraction for tourism and educational initiatives. Examples include Fort Victoria on Isle of Wight, a Palmerston Fort now containing a number of attractions including the Underwater Archaeology Centre, and surrounded by a 50 acre country park. Many others have been turned into museums or opened up to the public eg Portchester Castle, Hurst Castle, many of the Palmerston Forts on Portsdown Hill and the Martello Tower at Seaford to name a few.

Local history projects have been developed in the Southern England region which are helping researchers as well as local residents and visitors to the region to understand the maritime heritage of their areas. One example is the Maritime Memories project developed by the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org) which included an intergenerational oral history programme, with younger members of the community interviewing older generations about their island maritime memories, a local heritage day where community members were encouraged to bring their old photos of the fort for a photographic archive to be compiled and displayed, and interviews with many of the people who had previously served at the Fort.

A number of WWI and WWII remains are found underwater and are generally understudied, a contributing factor being that some of them could be considered as dangerous due to the potential presence of munitions. These submerged remains often have amenity value due to their popularity with sports divers. Educational value could be further explored through interactive web-interfaces.

A result of an increased public interest in surviving military remains was the Defence of Britain Project (DOB) (1995-2002), which ran under the auspices of the Council for British Archaeology. The purpose of the project was to record the 20th century militarised landscape of the UK, and to inform the responsible heritage agencies at both local and national level with a view to the future preservation of surviving structures (www.britarch.ac.uk/cba/projects/dob).

In England, there are military vessels (including aircraft) which are protected as war graves under the Protection of Military Remains Act 1986. The primary reason for designation as a 'war grave' is to preserve the site as the last resting place of UK servicemen (or other nationals). However, the Act does not require the loss of the vessel to have occurred during war.

CONDITION AND FORCES FOR CHANGE

Many examples of this Character Type have been transformed into museums or are open to the public as tourist attractions. These are usually owned or curated by larger organisations such as English Heritage or by smaller charitable trusts who attempt to keep them in a good state of repair. Others which have no such guardianship are often left to decay and are now ruined. The remains of WWII pillboxes and gun emplacements which are scattered along the beaches of the region are suffering the effects of time, erosion and vandalism. Pressures to remove concrete WWII fortifications as unsightly have lessened as attitudes to their historic role have changed, but such threats may still remain from some landowners and managers.

Additionally, erosion and saltmarsh reclamation in later periods may have affected the survival of this Character Type.

RARITY AND VULNERABILITY

In terms of vulnerability, raising awareness of the significance and uniqueness of coastal military remains in England will make them more valued as a resource for present and future generations: an integral part of the cultural legibility embedded in the landscape. The vulnerability of this Character Type in the landscape arises from onshore and offshore industrial development as well as coastal erosion processes. However, this could be identified, avoided and/or mitigated through the Environmental Impact Assessment (EIA) process, enabling an assessment of the possible impact (positive or negative) that a proposed project may have on the environment. EIA considers natural, historical, social and economic aspects, including impacts on landscape.

The Defence of Britain Project (DOB) highlights that there are still significant examples that survive in good condition, and that it is important to preserve them for their historic and unique importance as well as for their educational potential (www.britarch.ac.uk/cba/projects/dob). Many defence structures that have good public access could be enhanced by appropriately positioned information boards, and incorporated into 'heritage walks', so that their place in history can be understood more comprehensively. The effectiveness of this would be greatly enhanced if aligned with implementation of the provisions to create England's coastal access route under the Marine and Coastal Access Act 2009.

There is now a growing business in 'heritage tours' looking at WWII military sites. They are currently confined to places associated with the British and North American air forces, but important points of the defended landscape such as groups of pillboxes, anti-tank obstacles and coastal forts would also be valuable additions to itineraries (Foot 2000).

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2.7.2 Character Type: Military facility

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type covers a broad range of areas and sites intimately connected with military activity but ancillary to the locations of defensive or offensive activity themselves. For example, it includes training areas and establishments, barracks, and repair and maintenance areas

Military facilities are mainly found in the central area of the Southern England coastal region, with few examples on the extremities (eg eastern Dorset and East Sussex). The examples that are in evidence are varied and cover a broad range of areas and sites.

Barracks are found on the Isle of Wight, with disused examples at Littlehampton (West Sussex) and Seaford (East Sussex).

Firing ranges (land) can be found at Newtown on the Isle of Wight, with a former example at Shoreham-by-Sea (West Sussex).

The two military airfields found within the region are now disused. They are Thorney Island and HMS Daedalus (Royal Navy air station).

Military bases are found around Poole Harbour (Royal Marines Poole training base, Admiralty Research Establishment), throughout coastal Hampshire (eg Browdown Training Camp, HMS Collingwood, Marchwood Military Port, MOD Research Establishment on Portsdown Hill), and West Thorney Island (West Sussex). There are a number of now disused batteries on the Isle of Wight. The main naval dockyard in the region is at Portsmouth.



Poole Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

Ordnance dumping areas, used for the disposal of spent or redundant military weaponry are found off the coast of Dorset, Hampshire and the Isle of Wight and include mines and explosive dumping areas.

Military practice areas cover much of the offshore area south of the Isle of Wight and Dorset. These include submarine exercise areas.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

During WWI, the Defence of the Realm Act enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. Half a million people were stationed in England as a home defence force, and coastal defences were greatly extended. Much of the training of the army took place across the English Channel, or on battle fronts. Some troops practised the construction of fieldworks for trench warfare, which left distinctive features on the landscape which can still be found today.

At the outbreak of WWII, under the Defence Regulations, the power to requisition and make use of land was given to service and civil departments. In 1944, at the peak period of the militarisation of the landscape in England, around 11½ million acres (4.6 million hectares) was under some form of military control.

Barracks are found on the Isle of Wight eg Sandown Barracks and Northwood Barracks. Barracks were also formerly at) at Littlehampton (West Sussex) and Seaford (East Sussex). These have now been converted into civilian residential developments.

A firing range (on land) can be found at Newtown on the Isle of Wight with a former example at Shoreham-by-Sea (West Sussex), which was set up as an army training camp and was in use between 1914-1918.

The two military airfields found within the region are now disused. They are at Thorney Island and Lee on Solent (*HMS Daedalus*) Royal Naval Air Station. Thorney Island juts into Chichester Harbour, and was opened as a military airfield in 1938. By 1944 there was permanent accommodation for 3636 male and 508 female personnel. In the Battle of Britain it was used by fighter aircraft of 236 Squadron of 11 Group, Royal Air Force: the most heavily engaged Group in the battle. Its later wartime role was as an operational airfield for Royal Air Force Coastal Command. During WWII the island was protected by both military defences and a sea wall. There was a dummy airfield (bombing decoy) at West Wittering to draw enemy fire away from the airfield on the Island. Flying ceased in 1975, the site became a naval base and from at least 1985 a barracks for the Royal Artillery (Baker Barracks). The airfield now lies within an Area of Outstanding Natural beauty (AONB) (www.pastscape.org.uk).



Chichester Harbour looking across to Thorney Island (© Maritime Archaeology Ltd)

Royal Naval Air Station Lee-on-Solent (*HMS Daedalus*) was one of the primary shore airfields of the Fleet Air Arm. It was first established as a seaplane base during the First World War, and later became the main training establishment and administrative centre of the Fleet Air Arm. In March 2006 the site was split, with ownership of the central area including the runways transferred to the Maritime and Coastguard Agency (MCA) who have continued to use it as a base for their air-sea rescue helicopters. Hampshire Constabulary's fixed wing aircraft have also continued to use the airfield. The outlying areas, including the former accommodation and technical area and surrounding land, hangars, and dispersals, were transferred to the South East England Development Agency (SEEDA).

There are numerous military bases in the Southern England region. Surrounding Poole Harbour are the Royal Marines Poole training base and Admiralty Research Establishment. Other bases are located in Hampshire and include Browdown Training Camp (mainly used by the Army Cadet Force, Combined Cadet Force, Army Training Corps and the Territorial Army), HMS Collingwood which hosts the Maritime Warfare Centre, Marchwood Military Port,

and the MOD Research Establishment on Portsmouth Hill.



Old Needles Battery, Isle of Wight
(© Hampshire & Wight Trust for Maritime Archaeology)

Her Majesty's Naval Base (HMNB) Portsmouth is one of three operating bases in the UK for the Royal Navy. The base is the oldest in the Royal Navy, and has been a vital part of its history and the defence of the England and, later, the United Kingdom for centuries. It was in 1194 that Richard I took the decision to create a naval and military base there from which he could attack France (Wheatley, 1990). It is home to the oldest surviving dry dock in the world, as well as being the base port for two thirds of the Royal Navy's surface fleet including two aircraft carriers. The base also houses a number of commercial shore activities including shipbuilding and ship repair, naval logistics, accommodation and messing and personnel support functions. Within the overall area of the Naval Base is the Portsmouth Historic Dockyard, where members of the public can visit major maritime attractions such as the Mary Rose, HMS Victory and HMS Warrior.



Portsmouth Naval Base (© Hampshire & Wight Trust for Maritime Archaeology)

Ordnance dumping areas, used for the disposal of spent or redundant military weaponry are found off the coast of Dorset and Hampshire and include mines and explosive dumping areas.

Offshore, there are several designated Military Practice and Exercise Areas (PEXAs) within the region which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises. These include RAF practice areas, and submarine exercise areas.

VALUES AND PERCEPTIONS

This Character Type presents controlled specific areas which may dominate the landscape physically (through warning signs and security devices like fences) as well as psychologically and, by the presence of military vehicles and their occasional noise, through the senses too. This is also true of the coastal training from the region's military facilities, as with the Royal Marine exercises within Poole Harbour where safety issues are an obvious concern in this busy stretch of water. The use of hazardous materials at many military facilities means that possible contamination of land and sediments also remains an issue at many such sites even when decommissioned (LDA Design 2010).

Many of the areas owned and used by the military have restricted public access due to safety and security reasons but some military ranges do permit public access when not being used for military exercises and are popular attractions. For examples, Portsmouth Naval Base holds an annual Navy Day (www.navydaysuk.co.uk) which allows access to areas not normally open to the public.

RESEARCH, AMENITY AND EDUCATION

Most military bases have restricted access to the general public and usually only authorised personnel may enter them. Safety requirements mean that public access to the coast within ranges is not permitted for much of the year (Dorset Coast Forum, undated) although this limited public access, and reduced agricultural activity within the ranges has had some wildlife benefits through reduced disturbance. Some marine danger areas restrict recreational boating and fishing during weekdays outside the main holiday periods, and during 6 weekends each year which are used for Territorial Army training (Dorset Coast Forum, undated).

As defence installations, active modern components are generally kept secret or confidential. However, military features from earlier periods have received considerable attention from military historians. Military installations and their history are part of the nation's local, regional, national and international historic environment and strongly influence cultural perceptions of landscape and seascape. The inherently competitive nature of warfare and the rapid technological advances that can result, means that features change rapidly in this particular sphere of human activity. Therefore, there is scope for further detailed and comprehensive archaeological research complementing both land and maritime perspectives. While operational, there will be little or no potential for amenity use but once decommissioned, military sites have considerable potential, being both dramatic and, to most, unfamiliar at the same time.

In terms of formal education, this character type is particularly appropriate in the context of the Secondary National Curriculum for history, providing local, regional and national foci for studies of British, European and World History.

Some military facilities have been converted in museums, for example, the Naval Dockyard at Portsmouth which now also hosts the Historic Dockyard. This allows members of the public to visit important maritime attractions such as the Mary Rose, HMS Victory and HMS Warrior, and also contains the National Museum of the Royal Navy and Action Stations, an interactive museum which allows the public to experience many of the aspects of life in the Royal Navy.

CONDITION AND FORCES FOR CHANGE

The modern components of this Character Type in the Southern England region which are still in use are well maintained. However, defence cuts announced in 2010 by the government saw the decommissioning of some of the current components such as the Ark Royal

The existence of military practice areas in the region is dependent on the location of military bases. For example offshore naval exercise areas in the region have substantially decreased since closure of Portland naval base (just west of the Hastings to Purbeck project area) and the relocation of the Navy's sea training unit. Surface exercises by warships are now much reduced and has been mainly transferred to waters off Devon and Cornwall. Submarine exercises are rare off the Dorset coast, but do continue off the Isle of Wight and Hampshire coasts.

The effects of military activity on the landscape/seascape in the region are linked to the level of use. Direct effects are a product of construction and operations, such as the use of

tracked vehicles, trench digging and explosions. Artillery and bombing ranges also have clear physical effects on the inter-tidal and sub-tidal zones, but understanding the net effects of military bases on the landscape is not straightforward: much has been made in recent years of the ecological benefits resulting from the restrictions on development and reduced visitor pressure that commonly result from military use.

A particular issue identified by the Ministry of Defence (MoD) is the disposal of litter, rubble, spoil, and military equipment. The excavation of pits to dispose rubbish could be considered as an intrusive activity which may impact adversely on the historic environment (Fulford 1999). There are also issues with seabed litter from munitions and potentially so from underwater noise (LDA Design, 2010).

The Royal Marines use of fast boats within busy waters in Poole Harbour is an issue which may require a change from present activity. The lead responsibility for managing the harbour lies with Poole Harbour Commissioners. Whilst the MoD are not subject to harbour authority powers of direction, good liaison with the managers of the harbour remains the most effective means of avoiding possible conflicts. Outside of the harbour RM Poole give rise to limited impacts in the areas where they operate. The MoD considers that the most significant impact is from loading and unloading of vehicles from landing craft (Dorset Coast Forum, undated).

RARITY AND VULNERABILITY

This Character Type contributes strongly to landscape character due to its scale and has considerable research and amenity potential which becomes live once installations are decommissioned.

The number of military installations has reduced considerably as they have become more centralised. Offshore naval exercise areas in the west of the region have also substantially decreased since closure of the Portland naval base and relocation of the Navy's sea training unit.

Closure of naval bases and other military establishments remains subject to further Government defence reviews.

From a maritime perspective, very little is currently known about the physical signatures of this Character Type in the marine zone.

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2.8 BROAD CHARACTER: SETTLEMENT

2.8.1 Character Type: Settlement

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The coastal area of the Southern England region is densely populated. It includes a variety of coastal settlement types including major cities such as Southampton and Portsmouth, tourist resorts such as Brighton, Worthing, Eastbourne and Bognor Regis and smaller fishing towns and villages including Lymington, Bosham and Emsworth amongst others.



Bosham village (© Maritime Archaeology Ltd)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Southern England region has a long history of human settlement. The earliest human remains from the British Isles have been recovered from Boxgrove on the West Sussex Coastal Plain and have been dated to c500,000 BC. Environmental evidence has indicated a wet grassland and shrub habitat on the site which would have provided an open area of good grazing (matt.pope.users.btopenworld.com/boxgrove/boxhome.htm)

At Southampton remains dating from the Pleistocene period have also been found, as well as artefacts dating from the Mesolithic, Neolithic through to the Iron Age (www.southampton.gov.uk). Clausentum, the Roman settlement of Southampton was founded soon after the invasion of AD 43 and became an important port. Trading links increased from the middle Saxon period (c.700-850) with finds of pottery, glass, coins, stone and metalwork pointing to connections with Scandinavia, France, the Low Countries and the Rhineland. After the Norman Conquest the town developed into one of the most important ports in medieval England (www.southampton.gov.uk). Wealthy merchants continued to live in the town, and during the late 17th and 18th centuries Southampton enjoyed brief popularity as a spa resort for the upper classes. The modern port of Southampton was founded in 1838, and by the end of the 19th century and into the early 20th, the great liners had made Southampton their home. The town was recognised as the "Gateway to the Empire", and one of the busiest ports in the country (www.southampton.gov.uk). Despite heavy bombing during WWII, Southampton still retains many of its old buildings, including the sixteenth century Tudor House, the Norman Bargate and the towers and extensive lengths of the medieval town walls. Southampton continues to be an international seaport and home to the Atlantic liners of the Cunard Company. The new Sea City Museum, to open in 2012, will feature two permanent exhibitions focussing on Southampton's 'Titanic story' and the city's role as a maritime gateway to the world.



The modern docks at Southampton
(© Hampshire & Wight Trust for Maritime Archaeology)

Portsmouth has served as a major naval port for many centuries. It was granted a charter by Richard I in 1194, and established as a naval dockyard during reign of Henry VII. Portsmouth is home to many famous ships, including *HMS Warrior* and Lord Nelson's flagship *HMS Victory*. Although smaller than in its heyday, the naval base remains a major dockyard and base for the Royal Navy and Royal Marine Commandos. There is also a

thriving commercial ferryport serving destinations on the continent for freight and passenger traffic.



Portsmouth Harbour, Naval Dockyard and Historic Dockyard (© Hampshire & Wight Trust for Maritime Archaeology)

Across the region as a whole, the rapid growth of the coastal population started in the mid nineteenth century with the development of resort towns, and has continued until the present day with the influx of migrants from many parts of the UK seeking retirement homes (Isle of Wight Centre for the Coastal Environment, 2006).

The region contains a number of coastal towns that developed into popular holiday destinations from the 18th-20th centuries. After an economic decline affecting many of the region's seaside resorts in the later 20th century, several are experiencing regeneration in various roles in the early years of the 21st century. Brighton emerged as a fashionable health resort during the 18th century. Growth of the town was further encouraged by the patronage of the Prince Regent (later King George IV) after his first visit in 1783 (Carder, 1990). He spent much of his leisure time in the town and constructed the Royal Pavilion during the early part of his Regency. The arrival of the railway in 1841 brought Brighton within the reach of day-trippers from London, and the Victorian era saw the building of many major attractions including the Grand Hotel (1864), the West Pier (1866) and the Palace Pier (1899). More recently, gentrification of much of Brighton has seen a return of a modern equivalent of the fashionable image which characterised its growth in the Regency period (Carder, 1990).



Traditional town house in Brighton (© Maritime Archaeology Ltd)



New development at Brighton Marina (© Maritime Archaeology Ltd)

Other coastal towns include Worthing, Bognor Regis and Eastbourne. Worthing is the biggest resort in West Sussex with five miles of seafront and a working pier. It became a resort towards end of the 18th century and was frequented by visitors who wanted an alternative, quieter, holiday destination to Brighton. Bognor Regis was also founded as a resort in the late eighteenth century and made famous by royal visits. In the mid-later 20th century it was also home to a large Butlins holiday camp. As a resort it stretches for more than 7 miles and incorporates surrounding villages from Pagham through to Middleton-on-Sea. Queen Victoria referred little Bognor' whilst her grandson King George V gave it the title 'Regis' in 1928 after recovering there from a serious illness. Eastbourne remained a small settlement until the 19th century when its four hamlets gradually merged to form a town (Wright, 1902). Assisted by the arrival of the railway in 1849, Eastbourne became a prime Victorian seaside resort and remains so today. In the 1990s, the town's growth accelerated rapidly as a new plan was launched to develop the area known as the Crumbles, a shingle bank on the coast to the east of the town centre. This area, now known as Sovereign Harbour, contains a marina, shops, and several thousand houses, along with luxury flats and apartments, and was formerly home to many rare plants, causing much controversy when the development was first proposed.



Eastbourne (© Maritime Archaeology Ltd)

In historical terms, Hastings can claim fame through its historical association with the Norman Conquest and its role as one of the medieval Cinque Ports. Hastings was, for centuries, an important fishing port; although much reduced, it still has the largest beach-based fishing fleet in England.



Hastings (© Maritime Archaeology Ltd)

Bucklers Hard, part of the Beaulieu estate, is a shipbuilding village that was originally planned by the 2nd Duke of Montagu as a base, 'Montagu Town', for the import of sugar from the islands of St Vincent and St Lucia in the West Indies. In the event, the French seized the islands and the village became a shipbuilding community. The village consists of two lines of cottages leading down to the beach where, from 1698 to 1827, wooden-walled ships were built. For almost a century, wood was under the control of the family and descendants of the master builder Henry Adams. Among the ships they supervised were *HMS Euryalus* and *HMS Agamemnon* for Nelson's fleet.

The South Coast is also known for its yachting centres such as Lymington which has three marinas. It is famous for its sailing history, and in recent years has been home to numerous world regattas.

VALUES AND PERCEPTIONS

Coastal settlements are where most people in the coastal region live and base their visits. As such, they are where most develop their coastal perceptions. Those perceptions of coastal settlements in Southern England vary with the size and character of the individual city, town or village. Some see the larger port cities as places of economic growth that support many local jobs and provide local income, contrasting with 'more tranquil' smaller fishing villages (which also provide some local employment) and the coastal resorts as areas of entertainment and holiday destinations.

Coastal settlements are largely not populated by people who make their living directly from the sea. The later 20th century saw an influx of migrants from many parts of the UK seeking retirement homes and (more recently) employment opportunities (Isle of Wight Centre for

the Coastal Environment, 2006). Newly developed marina areas of coastal towns (eg at Southampton and Brighton) have provided a new type of living next to the coast. These can be very expensive and seen as overt expressions of luxury living as Sandbanks, a small peninsula crossing the mouth of Poole Harbour which is well-known for the highly-regarded Sandbanks Beach and its very high property values; Sandbanks has, by area, the fourth highest land value in the world (BBC news website, April 2005).

From their early days as tourist resorts in the 19th century, certain coastal settlements such as Eastbourne, and Worthing continue to be perceived as holiday destinations. With the economic recession and tightening of belts since 2008, British seaside holidays have seen some resurgence. In the summer months the resident population in these towns almost doubles due to the influx of tourists.

The West Sussex coast is almost continuously developed and forms part of what has been called the South Coast Conurbation (Isle of Wight Centre for the Coastal Environment, 2006). Growth, initially centred on the old-established cities of Southampton and Portsmouth, has converted the littoral zone of the northeast Solent into one of the most urbanised sections of the British coast (Isle of Wight Centre for the Coastal Environment, 2006).

RESEARCH, AMENITY AND EDUCATION

Many of the coastal towns and villages of the region are important elements of the tourist industry, containing many historical features (e.g. churches, castles and bridges) which attract and are displayed to visitors.

There is, however, considerable further potential for outreach and public awareness initiatives embracing the historic character that lends distinctiveness to the region's coastal towns. This can engage with the towns' inhabitants, particularly children, increasing peoples' awareness of the historical contexts of their own homes as well as raising the understanding of the tourists. In the case of port cities such as Southampton tourists include the large number of people embarking from the cruise ships or those visiting for the day from the continent (via many ferry services along the south coast).

Many coastal settlements already have maritime museums eg at Seaford and Hastings, and the importance of raising public understanding of the region's extensive maritime heritage has been recognised by Southampton City Council in the development of the new Sea City Museum (to open in 2012). It is estimated to be costing £15million and is planned to be a centrepiece of the new Cultural Quarter of the city. The Museum will feature two permanent exhibitions focussing on Southampton's Titanic story and the city's role as a maritime gateway to the world. It will also showcase the city's impressive archaeological and maritime collections.

There is also considerable scope for awareness-raising about the issues of coastal erosion as experienced by settlements within the region such as Selsey, placing these issues in their historical context.

CONDITION AND FORCES FOR CHANGE

The settlements of the region have come under attack from many forces (cultural and natural) over the years.

The major cities of the Southern England coastal region were some of the main targets during and after the Battle of Britain, the air campaign waged by the German Air Force (Luftwaffe) against the United Kingdom during the summer and autumn of 1940. Portsmouth's status as a major naval base and civilian port were key factors in the Luftwaffe's decision to bomb it extensively, with many houses and the Guildhall destroyed. While most of the city has since been rebuilt, developers still occasionally find unexploded bombs. Southampton was also heavily bombed.

The character of coastal towns is constantly evolving to meet new demands, as with the construction of new housing, often as estates, along with central and out-of-town shopping areas.

Certain settlements within the region are vulnerable to, and severely affected by coastal erosion. It is ever-present in Selsey, West Sussex, where the coastline has been receding for hundreds of years. Beyond Selsey, there are many lost villages and settlements all along the Sussex coast, including Barpham south of Angmering; Kingston Church; parts of old Middleton-on Sea and Clymping (www.westsussex.info/selsey-flood-defences.shtml).

RARITY AND VULNERABILITY

Towns and villages are key components of the landscape and seascape, with a considerable time-depth of human activity which has contributed hugely to the distinctive appearance and character of the Southern England coastline.

The region's cultural and natural environment is overall highly protected by local, national and international designations (Isle of Wight Centre for the Coastal Environment 2006).

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2.9 BROAD CHARACTER: RECREATION

2.9.1 Character Type: Recreation

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Tourism is an important source of income and employment in the Southern England region, even being the main industry and economic mainstay of some counties such as Dorset.

There are many long established seaside resorts in the region such as Brighton, Bournemouth, Eastbourne and Worthing. These provide traditional seaside entertainment as well as more modern activities at many new leisure complexes.



Pier, promenade and gardens at Eastbourne (© Maritime Archaeology Ltd)

As well as the holiday resorts, the region's coastline attracts many visitors (local and tourists) involved in recreational activities. Such activities in the region include walking, sunbathing, and golfing. Popular water sport activities involve sea bathing, sailing, surfing, diving, leisure fishing, angling, water and jet-skiing.

Wildlife watching is also a popular pastime in the region which has a number of Nature Reserves surrounding harbours such as Pagham and Chichester as well as a designated Heritage Coast in which lies the Seven Sisters Country Park.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Southern England region has been renowned for its seaside resorts for over a century. One of the most well known resorts is Brighton in East Sussex. The town came to prominence during the 1740s and 1750s when Dr Richard Russell began prescribing its

seawater for health benefits (Russell, 1755; Russell, 1760; Gray, 2006). By 1780 the development of Georgian terraces had started and what was once a fishing village became a fashionable resort. The growth of the town was further encouraged by the patronage of the Prince Regent (later King George IV) after his first visit in 1783 (Carder 1990). He spent much of his leisure time in the town and constructed the Royal Pavilion during the early part of his Regency. The arrival of the railway in 1841 brought Brighton within the reach of day-trippers from London and the Victorian era saw the building of many major attractions including the Grand Hotel (1864), the West Pier (1866) and the Palace Pier (1899). Brighton remains a popular resort today and continues to develop, for example the new marina which is Europe's largest man-made yacht harbour, with moorings for more than 2000 boats, residential development and leisure facilities (www.brightonmarina.co.uk).



Brighton Royal Pavilion (© English Heritage)



Brighton Marina (© Maritime Archaeology Ltd)

Worthing is the biggest resort in West Sussex with fine gardens, five miles of seafront and a working pier. It became a resort towards end of the eighteenth century and was frequented by visitors who wanted an alternative, quieter, holiday destination to Brighton.

Bognor Regis is a classic seaside town, founded as a resort in the late eighteenth century and made famous by royal visits and the large Butlin's holiday camp. As a resort it stretches for more than 7 miles and incorporates surrounding villages from Pagham through to Middleton-on-Sea. Queen Victoria referred to it as her 'dear little Bognor' whilst her grandson King George V gave it the title 'Regis' in 1928 after recovering there from a serious illness.

Other seaside resorts in the region include towns such as Bournemouth, Eastbourne and Littlehampton, as well as many smaller villages scattered along the coastline. These resorts incorporate many of the components of this Character Type such as piers, promenades, golf courses and leisure beaches, aquariums, entertainment and amusements. In the later twentieth century British seaside resorts declined in popularity. This was due to improvements in air travel, the development of package holidays, and higher expectation of holiday makers (who chose to visit what they saw as more 'exotic' locations. British seaside towns suffered with increasing economic and social problems, and a lack of investment (Melbourne, undated). In response to this, individual resorts sought to reinvent themselves and project a sense of their unique character to attract more visitors. The recession since 2008 and an economic tightening of belts have also helped, and British seaside holidays have recently seen resurgence.



Eastbourne seafront (© Maritime Archaeology Ltd)

There are a large number of parks and gardens in the region, as well as extensive nature reserves. The chines (coastal ravines) on the Isle of Wight and near Bournemouth are famous in the area for walking and other recreational activities. Each of the chines near Bournemouth has a public garden and marked paths leading to the beach, with the Lower Gardens and Central Gardens providing a lush green contrast to the beach. Exbury Gardens in the New Forest is a 250 acre garden which contains more than 1000 species of rhododendron.

Nature reserves include Durlston Country Park in Dorset whose notable feature is the sea-bird colonies along the cliffs, Studland Heath National Nature Reserve, Christchurch Harbour, Paghham Harbour (a nature reserve covering more than 1000 acres and designated a SSSI (Site of Special Scientific Interest), a SPI (Special Protection Area) and a Ramsar site), Seaford Head Nature Reserve and the Seven Sisters Country Park which forms part of the Sussex Heritage Coast.



Pagham Harbour Nature Reserve (© Maritime Archaeology Ltd)

The Southern England region is a nationally significant area for leisure fishing. It takes place all along the coastline from piers, marinas and harbour walls as well as beaches (James et al, 2010). Small privately owned craft also take anglers offshore eg from Mudeford Quay to fish for species including mackerel, bass, plaice, sole and conger-eel.

Watersports are popular in the region and include recreational diving on the many wrecks of the area, water-skiing (eg off Hayling Island) and leisure sailing (the village of Hamble in Hampshire being one of the most active centres of yachting activity in Britain),



Leisure fishing and sailing on Southampton Water (© Hampshire & Wight Trust for Maritime Archaeology)

Holiday and theme parks are a fairly modern creation and are located near some of the main tourist resorts of the region. The most famous is Butlin's in Bognor Regis, opened in 1960. Tuckton near Christchurch is a 21 acre leisure park offers large range of amusements including a four acre 'Model Great Britain' with 200 replicas of some of the country's greatest buildings. Blackgang Chine on the Isle of Wight was supposedly named after a local band of smugglers. It opened as an amusement park in 1843, and is now a large Fantasy Theme Park which includes a maze, models of IOW houses, an Indian camp, and a series of model dinosaurs (www.blackgangchine.com)

The development of landscape heritage conservation measures in the later 20th century was applied to specifically coastal landscape too. A 'Heritage Coast' designation was initiated in 1972 to highlight the special scenic and environmental value of some stretches of coastline when development proposals are under consideration. Parts of the Sussex coastline are designated as Heritage Coast, such as that surrounding the Seven Sisters Country Park.

The newly established (2010) South Downs National Park (www.southdowns.gov.uk) and the New Forest National Park (www.newforestnpa.gov.uk) both extend to the coast in the Southern England. They offer many recreational opportunities for residents and visitors ranging from wildlife watching to walking, horse riding, cycling and watersports.

The National Trust's Nepture Coastline Campaign was set up in 1965 to save coastal locations from development and to promote public access to these areas (www.nationaltrust.org.uk/main/w-chl/w-countryside_environment/w-coastline.htm). The Trust's 'Shifting Shores' report (2005) and pamphlet highlight the importance of raising awareness of coastal issues and impacts and the critical involvement of the public in helping

to manage coastal change.

The 20th century saw the rapid development of the heritage industry. Heritage attractions in the region include Bucklers Hard a former shipbuilding village which is currently being restored to its eighteenth century appearance, and Beaulieu Palace House, the home of Lord Montagu which is home to the National Motor Museum (with more than 200 historic vehicles) and on whose land are the remains of Beaulieu Abbey which the Montagu family bought from Henry VIII on its dissolution in 1538.

VALUES AND PERCEPTIONS

The coast along Southern England provides a wide variety of recreational opportunities from bustling seaside resorts such as Brighton and Bournemouth to the quieter nature reserves of the Seven Sisters Country Park and Pagham Harbour Nature Reserve. These cater for different audiences and are appreciated by many. Individual sporting activities such as diving, water-skiing and leisure fishing are also appreciated along the coastline.

The value of coastal recreation and water related activities has a number of positive outcomes, including health benefits, social inclusion and quality of life, environmental protection and economic benefits (Church 2008). For example, recreational activities such as swimming, rowing, canoeing, dinghy sailing and other activities that require sustained physical exertion are highly beneficial to achieve a healthy lifestyle.

This Character Type causes pronounced conflicting feelings. Some people dislike recreation sites because they are seen as blots on the landscape as well as the physical manifestations of the annual invasion of tourists bringing cars and noise to the region. In contrast, other people perceive recreation sites as representing a mainstay of the region's economy and offering long term security.

Within this Character Type, the development of recreational facilities (eg new marina developments, caravan parks, expansion of seaside resorts) often leads to pressures on earlier features in the region and highlight the needs to manage such change with care. For example, the creation of golf courses and caravan parks involve dismantling of existing landscape features and the creation of new ones. Furthermore, constraints on development initiatives in the region are beginning to exert control on the locations and forms of recreation complexes.

RESEARCH, AMENITY AND EDUCATION

Tourism has had a profound impact on the region's recent economy, infrastructure and social structure. Further research on this Character Type might focus on understanding the history of tourism at a regional level, understanding the local and regional historic environment to better inform future developments and developing tools to enable the prediction of tourism impacts with established mitigation measures. Although this Character Type is enjoyed in many differing ways an amenity for large numbers of people, the high densities of visitors and associated development, noise and visual impacts in certain areas are also seen by some as reducing the amenity value of the region's coastline.

Many of the seaside resorts have museums dedicated to the local heritage of the area eg Brighton Fishing Museum which traces the story of the fishing community in the town. Hastings Fishermen's Museum is one of the town's most popular tourist attractions and

attracts over 140,000 people every year (www.brightonfishingmuseum.org.uk/). Education centres have also been set up in many of the Nature Reserves at eg Chichester Harbour and the Seven Sisters Country Park.



The Stade, Hastings, home to the Fishermen's Museum (© Maritime Archaeology Ltd)

Further work on the unique elements of individual resorts and the coastal landscape could lead to an increase in their tourism potential.

CONDITION AND FORCES FOR CHANGE

With the recession since 2008 and an economic tightening of belts, British seaside holidays have seen resurgence and tourism has risen again in Southern England. Together with individual activities such as diving, leisure fishing and other watersports that people pay to take part in, this represents an increased source of income and employment for the region.

Some of the recreation facilities along Southern England coast are designated Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPAs), RAMSAR sites and Heritage Coast and are therefore offered some protection. Other areas are regulated by eg harbour authorities and local council authorities.

The seaside resorts of the region continue to expand and develop, for example the new marina at Brighton which is Europe's largest man-made yacht harbour, with moorings for more than 2000 boats, residential development and leisure facilities (www.brightonmarina.co.uk).

Often, the construction of caravan and holiday/theme parks in the region removes earlier historical features on the regional landscape/seascape. Golf courses may retain some

fragments of field systems or ancient woodlands in their landscaping, although these features are often fragmented.

There are also issues concerning the increasing number of tourists to the area. For example, Hengistbury Head is visited by more than 1 million people a year, posing an increasing threat to land, wildlife and archaeological sites. As a result, visitors are now being restricted to certain routes.

RARITY AND VULNERABILITY

The decline in popularity of British holiday resorts in the later twentieth century resulted in many seaside towns suffering increasing economic and social problems. However, there has recently been resurgence in British seaside holidays, in part due to the recent recession, and such towns have seen increased investment and improvement in their economy, infrastructure and attractiveness to holiday makers.

Public access to the coastline for recreational purposes has been improved by the Marine and Coastal Access Act 2009. The Act clarifies, simplifies and extends access through the creation of a coastal access corridor to which the public has right of access on foot (www.defra.gov.uk/environment/marine/legislation/index.htm).

The National Trust's 'Shifting Shores' report highlights the importance of raising awareness of coastal issues and impacts and the critical involvement of the public in helping to manage coastal change.

Diving clubs that dive on unknown wrecks could potentially provide local archaeologists and historians with a wealth of new and valuable information on these sites. Encouraging collaboration between local divers, archaeologists and historians would provide opportunities to continue developing general public awareness.

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2.10 BROAD CHARACTER: CULTURAL TOPOGRAPHY

2.10.1 Character Type: Palaeolandscape component (land)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The potential for survival of palaeolandscape components in marine topography and deposits in England is immense. Processes such as climate change and the fluctuation of sea levels over the last two million years have contributed to the deposition of sand and gravels in river systems that are no submerged (BMAPA 2000, ODPM 2005). Through these processes, large areas of the present sea floor were periodically exposed as dry land. As such, they formed part of the human habitat, leaving potential for associated impacts and archaeological evidence. It is with that regard that we consider the historic character of palaeolandscape surviving within the present seascape.

In the Southern England region, the Solent and West Sussex rivers contain some of the world's most important early Palaeolithic cultural contexts. Sediments of the Solent and its tributaries indicate that south coast river systems were corridors for human migration and favoured habitats for early human populations (Momber 2004, Wenban-Smith 2002, Wessex Archaeology 2007a), with the earliest hominid fossils from the British Isles being recovered from a Pleistocene raised beach at Boxgrove, West Sussex (www.ucl.ac.uk/boxgrove). The platform on which these deposits rest extends into the English Channel and would have

been exposed during phases of low sea-level connecting England with the European mainland (Dix et al 2004).

According to Fulford et al (1997) 'interest in the potential of underwater landscapes around England was stimulated in part by an audit of the English coastline in 1997 which recorded coastal prehistoric peat deposits that were seen to follow ancient river systems extending offshore'. These include the rich source of Mesolithic material from the Solent area such as Bouldnor Cliff (Momber et al, in progress) and the confirmed examples of prehistoric sites in the South Coast intertidal zones from the Neolithic and Bronze Age which include Wootton Quarr on the Isle of Wight and Langstone Harbour in Hampshire.



Neolithic trackways recorded at Wootton Quarr, Isle of Wight

(© Hampshire & Wight Trust for Maritime Archaeology)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Features and variability of this Character Type are difficult to assess since investigations are only in their infancy. However, research undertaken in the Southern England region indicates a concentration of peat deposits along the coast and offshore areas of the Western Solent and palaeochannels in the English Channel.

The pattern of rivers, tributary junctions, deltas, braids, and over-deepened channels which is seen now on the English Channel floor has been influenced by successive retreats and re-advances of the sea level over the fluvial and deltaic features (Maritime Archaeology Ltd, 2007). During the early prehistoric period, between approx. 700,000 and 8,000 years ago, sea level varied greatly. As a result of climatic change and a cycle of cold and warm periods, sea level rose and fell as large amounts of water were alternatively locked away in and released from ice sheets. Consequently, during various times in the Late Quaternary sea level was much lower than today and during these periods the North Sea and the English Channel became land surfaces. At times, Britain was no longer an island but became a northern peninsula of continental Europe. During these periods this landscape became habitable to human populations (Wessex Archaeology, 2007a).

Identified remains in the Southern England region include Middle Palaeolithic inter-glacial deposits which have been recorded at Stone, Hampshire (Brown et al 1975) and Selsey, West Sussex (West and Sparks 1960), and intertidal peat and tree remains at Russell's Lake and Baker's Rithe (Langstone Harbour, Hampshire) (Allen and Gardiner (2000)). The

significant loss of mudflats from the coast in the western Solent (between Hurst Castle and Pitts Deep) over the past 200 years has been exposing a buried prehistoric land surface and peat deposits which can be compared to the upper peats off the north coast of the Isle of Wight.



Langstone Harbour intertidal zone (© Hampshire & Wight Trust for Maritime Archaeology)

Palaeochannels provide an important archaeological resource for understanding prehistory. Through the study of submerged landscapes and palaeochannels it is possible to obtain archaeological material which has remained largely in situ and so improve our understanding of how the landscape was utilised (James et al, 2010). The Palaeosolent is of particular interest in the study of Palaeolithic Britain with many handaxes being recovered from its gravel terraces (James et al, 2010). The origins of the Solent can be traced back into the Pleistocene where river systems abraded a path from Dorset, running east to pass north of the Isle of Wight. Numerous academics have discussed the evolution of the 'Solent' river, interpreting the distribution of fluvial gravels recorded across the Hampshire Basin. The Solent waterway was formed sometime after 3500 BC, shifting from estuarine to fully marine conditions (Scaife 2000; Tomalin 2000). The Palaeoarun is another example of an ancient river of archaeological interest. Study of these data and similar riverine systems has helped inform understanding of the landscape, and the processes which led to the formation of the English Channel (Gupta et al, 2007).

In a recent English Heritage study aimed at assessing the size and spread of significant palaeoenvironmental and archaeological potential existing in intertidal and offshore organic deposits (Hazell, 2008), an even spread of sites containing such deposits was identified along the Southern England coast. The majority of sites included in Hazell's study are intertidal peat and forest exposures, and are typically formed through the creation of waterlogged conditions associated with changes in relative sea level (as discussed by Heyworth (1986) and Bell (1997)). These include exposed Holocene intertidal deposits along the north-east coast of the Isle of Wight such as at Wootton Quarr (Hillam 1994, Loader et al, 1997) where modern erosion has revealed a plethora of archaeological material dating

back to the Mesolithic (Allen et al., 2000), and the fully-submerged Mesolithic peat platform and cliff face off Bouldnor Cliff, on the north-west coast of the Isle of Wight (Momber 2004).



Diving fieldwork at Bouldnor Cliff (© Hampshire & Wight Trust for Maritime Archaeology)

To date, the Mesolithic site at Bouldnor Cliff is the only stratified prehistoric occupation site identified in UK waters. Investigations of Bouldnor Cliff have been ongoing intermittently since the 1980s, with the results being presented in a number of interim publications as new information has come to light (Tomalin 2000, Momber 2000, Momber 2004, Momber 2006, Momber *et al.* 2009). Among the varied occupation debris, timber believed to be the remains of a log boat has provided a secure radiocarbon date of 6370-6060 cal BC. Despite only a small fraction of the site having been explored, the remains point to a site of industrial activity (Momber, in progress (b)).



**Worked and channelled timber from Bouldnor Cliff
(© Hampshire & Wight Trust for Maritime Archaeology)**

Peat deposits dating between 12,650 to 7000 BP exist in the sheltered waters of the Solent. Here, material spanning the lower Palaeolithic to Neolithic has been recovered from the sea floor by oyster fishermen. These finds emanated from fluvial deposits associated with Pleistocene periglacial river systems and from below peat laid down during the Flandrian Transgression (MA Ltd, 2007). On the River Test in Southampton, a series of seven trackways have become exposed in the lower reaches of an inter-tidal peat deposit as the silts have eroded from above them. Typologically, they compare to the Neolithic trackways from the Somerset Levels (Coles *et al.* 1973). These sites are known because they have become uncovered and visible. Many similar prehistoric landscape features remain preserved within the foreshores of the drowned ria systems within the Wight area. Wherever such sites exist, the possibility of finding further contexts containing in-situ Neolithic archaeological material is high (MA Ltd, 2007). Additionally, there are submerged prehistoric landscapes and associated palaeoenvironmental material dating to the Neolithic and Bronze Age both off the Isle of Wight coast and off the New Forest, running for kilometres along the coast (HWTMA 2006, 2008). Today, these provide baseline information about the time-depth of those now submerged landscapes.



Trackways in the River Test (© Hampshire & Wight Trust for Maritime Archaeology)

VALUES AND PERCEPTIONS

The archaeological community has started to recognise that maritime archaeology is not only concerned with shipwrecks but also prehistoric submerged landscapes. The archaeological potential that exists on the continental shelves has been recognised in the UK, especially through the Aggregates Levy Sustainability Fund (ALSF) (see <http://ads.ahds.ac.uk/project/alsf/>), due to the recent expansion of industrial concerns onto the shelf. It is therefore important, from both academic and cultural resource management perspectives, to locate and investigate this archaeological resource which otherwise will be irretrievably lost.

There are also increasing efforts to disseminate understanding of submerged landscapes and raise awareness among the wider public. An example is the successful Education and Outreach programme run by the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org.uk) which raises public awareness about prehistoric deposits in the Solent

by involving volunteers in the processing of remains from Bouldnor Cliff and putting on public exhibitions.

A further opportunity to stimulate public understanding and perceptions of our coastal and marine palaeolandscapes comes from information provision along the coastal access route to be established under the Marine and Coastal Access Act 2009.

RESEARCH, AMENITY AND EDUCATION

Research methods used to identify and analyse prehistoric deposits include a combination of geophysical and geotechnical survey methods. The Arun Valley project used high-resolution marine geophysical technologies, sedimentology and seismic sequence stratigraphy to evaluate the landscape context and archaeological potential of submerged and buried fluvial systems in the English Channel. (Gupta et al, 2004) The reconstruction of the submerged and buried landscapes of the Arun will aid the management of submerged archaeological resources in both these and similar river systems e.g., Outer Thames estuary. Furthermore, this research project offers the following opportunities:

- Provide a landscape context for Palaeolithic submerged landsurfaces which has potential application to understanding the pattern of human colonisation of Britain.
- Improve predictive capability of archaeological resources within offshore sediments.
- Develop strategies for archaeological resource management.
- Extend professional archaeological capacity in the archaeological analysis of marine geophysics.

The Palaeosolent is thought to be of particular interest when studying encroaching sea levels and changes in coastal morphology (James et al, 2010). Fluctuations in sea level would have forced early humans to relocate and adapt to a changing climate. With modern society facing similar changes to our environment it is worth trying to understand how our ancestors may have coped as the world changed around them (James et al, 2010).

The potential for sites such as Bouldnor Cliff and their associated deposits to add to archaeological and palaeo-environmental knowledge represent a major contribution to the archaeological discipline as a whole. They also present a range of opportunities to develop understanding of marine preservation potential, the effect of natural and human threats to submerged prehistoric material and the development of investigative techniques and approaches (Momber et al, in progress).



Diving fieldwork at Bouldnor Cliff (© Hampshire & Wight Trust for Maritime Archaeology)

Other research is being carried out by a team at the marine research consultancy ABPmer, who are currently working on a project to deliver GIS datalayers of UK submerged palaeoenvironments to aid the development of a management indicator framework. The overall aim of the project is to support marine spatial planning in UK offshore environments with regard to historic environments, and is funded by the MALSF.

This Character Type is physically inaccessible to the wider public and remains the sphere of academics and diving specialists. However, dissemination programmes and initiatives are currently being developed which aim to raise public awareness on the existence and uniqueness of these submerged landscapes. These include the Hampshire & Wight Trust for Maritime Archaeology (HWTMA) which is raising public awareness about prehistoric deposits in the Solent by involving volunteers in the processing of samples and material from Bouldnor Cliff, using hands-on educational techniques in the Maritime Bus, and by putting on public exhibitions, for example 'Surviving the Stone Age' exhibition held in 2009 (www.hwtma.org.uk/exhibitions). Outreach work is also carried out by the Dorset Coast Forum (www.dorsetforyou.com).

In terms of formal education, palaeolandscapes provide excellent case studies for cross-curricular work looking at environmental change and how it affects populations over time.

CONDITION AND FORCES FOR CHANGE

The potential survival of palaeolandscape components is very much dependent on processes accompanying burial, erosion and ongoing coastal/marine geomorphological processes.

The components are under intensive developmental pressure from a range of threats including mineral extraction and the direct impact of construction. Specific threats range from the laying of pipelines to, more recently, the development of wind farms, the wider

issues of mineral extraction and the extensive, generalised, impact of fishing and commercial trawling (Dix et al 2004).

The sands and gravels targeted by marine aggregate dredging have the potential to contain evidence of palaeolandscapes. The dredging scars seen in the sub-bottom profiler data next to the Palaeoarun, as identified in the South Coast REC, highlight the fact that as the aggregate areas are exploited they pose a threat to deposits of archaeological interest, as well as providing an opportunity for archaeologists to access these submerged sites and acquire archaeological data that would not otherwise be recorded (James et al, 2010).

As new areas are targeted for marine aggregate extraction in the area, archaeologists will be able to assess the threats to deeper parts of palaeochannels which would have been inundated at earlier stages. This will further enhance our knowledge of how the now submerged landscape and character of the study area has changed over time (James et al, 2010).

The cumulative knowledge that such activities are producing through research to inform Environmental Impact Assessments (EIAs) will enable a deeper understanding of this Character Type before it is lost forever, not only due to human action but also natural erosion processes.

RARITY AND VULNERABILITY

Submerged Palaeolithic and Mesolithic landscape components such as Bouldnor Cliff (see Momber 2004) and the Arun Palaeochannel in the Southern England region are rare discoveries. As such, these deposits are regarded as of national, and even international, importance. Wherever possible, these deposits should be left undisturbed due to the fragility of peat deposits and associated faunal remains (and potential human occupation evidence such as structures).

Neolithic and Bronze Age submerged landscape tracts are also relatively uncommon although examples have been found in areas such as the Solent as well as in tidal rivers and estuaries such as Wootton Quarr on the Isle of Wight. Prehistoric landscape components in the intertidal zone are generally exposed to eroding processes. Therefore, it is important to emphasise the high priority need to monitoring eroding tracts of prehistoric landscape such as those at Wootton Quarr and Langstone Harbour.

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2.10.2 Character Type: Cultural topography (landward)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type refers to those aspects of cultural topography whose physical expressions are predominantly landward of Mean High Water. It relates to areas whose characters are not intensively managed, and includes the following Sub-types:

- Cliff
- Dunes
- Lake, pond
- Reservoir
- Watercourse
- Wetland
- Lagoon

There are several stretches of coastal cliff along the Southern England shore, all offering recreation in the form of country walks. Examples include Swanage, Bournemouth, stretches along the New Forest coast, Peacehaven, and Beachy Head, the highest chalk sea cliff in Britain which rises to 162m (530ft) above sea level.



Beachy Head, East Sussex (© Maritime Archaeology Ltd)

Sand dunes are found on the Isle of Wight at Bembridge, but occur more frequently in the east of the region. The most extensive and well developed occur at the mouths of harbours, for example at the entrance to Chichester Harbour (Cox 1997). They can also be found at Pagham Harbour, Bracklesham Bay, Shoreham Harbour, Littlehampton, Bognor Regis and Camber Sands.

Lakes and ponds are scattered throughout the region. Some are natural whilst others are formed from disused clay pits or disused gravel quarries.

Reservoirs are not common in the region, but can be found scattered throughout it. Examples include Canford Cliffs in Dorset and Fawley and Marchwood in Hampshire, both of which are in the vicinity of Fawley Power Station.

Watercourses exist in the region in the form of rivers, the major ones being Beaulieu River, Southampton Water, the Rivers Hamble, Itchen, Arun and Adur.

Wetlands occur in the form of various marshes throughout the region, as well as watermeadows along the Dorset rivers of Piddle, Avon, Sherford, and Stour. The surviving extent and distribution of wetlands in the region has been affected by human activity, in particular reclamation for industrial expansion eg along Southampton Water,

Few lagoons exist in the region, examples being Widewater Lagoon and Pagham Lagoon in West Sussex.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Cliff tops have been utilised since prehistoric times as areas of summer grazing, sources of fuel, military lookouts and navigational aids. These uses continued through the medieval and post-medieval periods and into the first decades of the 20th century.

The maritime cliffs of Hampshire are formed from very soft rock which is constantly eroding and represents an important source of sediment to the adjacent coastal habitats. The softness of the cliff tops also provides an important habitat for maritime plants and invertebrates (Hampshire County Council, 2010).



Eroding cliff at Barton-on-Sea, Hampshire (© Hampshire & Wight Trust for Maritime Archaeology)

Distinctive cliffs are useful daymarks for sailors eg the recognisable Seven Sisters and Beachy Head in Sussex, and the Needles, a row of three distinctive stacks of chalk that rise out of the sea off the western extremity of the Isle of Wight, close to Alum Bay. These cliffs and formations have associated lighthouses, increasing their significance as maritime navigational aids.

Some of the cliffs provide valuable building stone, for example the limestone of Portland (Portland Stone) and Purbeck (Purbeck 'marble') which have been quarried since Roman times. This stone has been used in the building of the region's cathedrals such as Chichester and was also transported further by ship or barge to be used in buildings further afield eg St. Paul's Cathedral.

The most extensive and well developed sand dunes of the region occur at the mouths of harbours, for example at Chichester Harbour, Pagham Harbour, Shoreham Harbour, Littlehampton, Bognor Regis and Camber Sands. Due to their location on the edges of sandy beaches in the region, dunes have attracted holiday makers for centuries, and during the second half of the 20th century, caravan and chalet parks as well as golf courses have been established on them. Abandoned military structures can also be found within the dune systems in the region.



Dunes at Littlehampton seafront (© Maritime Archaeology Ltd)

Natural and artificial lakes and ponds are scattered throughout the region. Examples of artificial lakes/ponds include a disused clay pit on the surround of Poole Harbour in Dorset and disused gravel quarries in Hampshire.

Reservoirs are fairly rare in the region, but examples can be found near Canford Cliffs in Dorset as well as in Fawley and Marchwood in Hampshire. The latter are both in the vicinity of Fawley Power Station, and are used to supply it with the large amount of water it requires.

Watercourses exist in the region in the form of rivers such as the Beaulieu River, Southampton Water, the Rivers Hamble, Itchen, Arun and Adur, and the Cuckmere Estuary in Sussex. These have been used for food, water, transport and protection for millennia, as well as being utilised to facilitate industry and settlements. The latter can, however, have detrimental effects on freshwater supplies, such as sewage contamination. Rivers continue to be popular for recreational purposes such as boating and angling.



Cuckmere Estuary (© Maritime Archaeology Ltd)

Wetlands such as marshes are seen throughout the region, and can be used for grazing. Watermeadows (areas of grassland subject to controlled irrigation to increase agricultural productivity) are found along the Piddle, Avon, Sherford, and Stour rivers in Dorset as well as further inland in Hampshire. They were mainly in use from the 16th to 20th centuries as grazing land but are now largely disused, although they are often considered important wetland wildlife habitats. The surviving extent and distribution of wetlands in the region has been affected by human activity, in particular reclamation for industrial expansion eg along Southampton Water.

Few lagoons exist in the region. One example is Widewater Lagoon in Lancing, which has special status as a unique Saline Lagoon, and is one of the areas subject to an Action Plan by the Sussex Biodiversity Partnership (www.lancing-nature.bn15.net/widewater/lagoon1.html). Pagham Lagoon used to be the outlet to Pagham Harbour in the late 1800s and was formed when the migration of the shingle spits sealed the outfall to the sea. The site is now a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA) and a Ramsar site. (www.sdgc.org.uk).



Pagham Lagoon (© Maritime Archaeology Ltd)

VALUES AND PERCEPTIONS

Many of the components of this Character Type are valued for their recreational opportunities. The cliff paths and the beaches at the base of cliffs attract walkers, holiday makers, and, in the west of the region, fossil hunters. They are often perceived as tranquil areas. High cliffs may be fenced for safety reasons, which for some people affects their appreciation of the unspoilt qualities of the coast as do eroded paths leading from car parks on to the coast paths which are often up steep slopes (LDA Design, 2010).



Cliffs at Eastbourne, used by walkers and holiday makers (© Maritime Archaeology Ltd)

Rivers, ponds, lakes and also reservoirs are valued for recreational watersports including fishing, boating, windsurfing and bathing.

This Character Type is also highly valued ecologically due to its biodiversity, and many of the wetlands and lagoons in the region are designated as Sites of Special Scientific Interest, Special Area of Conservation and Special Protection Area. These also attract tourists and wildlife enthusiasts.

RESEARCH, AMENITY AND EDUCATION

In terms of amenity, cliffs in the Southern England region are frequently visited by walkers and hikers, contributing their part to public perceptions of landscape and seascape. There is potential to enhance the understanding, appreciation and enjoyment of the heritage encountered by these visitors. One example is the Countryside Centre located at the top of Beachy Head which includes the Downland Experience walk, and the Sussex Gallery containing photographs and pictures by local artists (www.beachyhead.org.uk/countryside_centre.html).



Beachy Head, East Sussex, a popular recreational area for walkers (© Maritime Archaeology Ltd)

Dunes are used for recreational purposes mainly due to their association with sandy beaches; they are also utilised for golf courses and holiday camps or caravan sites. There is potential for encouraging the appreciation of the dunes, their flora and some of the historic features that they contain from both amenity and educational perspectives. Dunes can be perceived as having a stimulating wildness which may be disrupted by housing and golf course developments. Public perception seems to have forgotten their relationship with local economies and the dune systems' history which is often linked to the marine environment.

A greater understanding of the dynamic nature of the dune landscape may be facilitated through public interpretation, via on-site boards and displays in museums and visitor centres (Petts & Gerrard 2006).

There is a potential for research and documentation within this Character Type. Archaeological sites are often buried under dune systems giving them a high archaeological potential and time-depth. Dunes are likely to contain well preserved and stratified prehistoric and historical remains. The study of the formation of dunes and their link to the marine environment and regional climate history can provide an important contribution to the understanding of past human activities (Petts & Gerrard 2006). Further study of the more recent use of dunes by farming communities would also be beneficial (Val Baker et al 2007).

This Character Type is highly valued from cultural, ecological and recreational perspectives. Improved provision of information, on-site, available at information centres and online, could be further used to convey these aspects more effectively, especially if aligned with the better coastal access provision to result from the marine and Coastal Access Act 2009.

CONDITION AND FORCES FOR CHANGE

This Character Type experiences both natural and human forces for change. These include the gradual erosion by natural forces, residential and recreational development and the effect of increased tourism and visitors to these locations, all of which could damage the potential historical and archaeological remains.

Erosion is occurring at cliff locations throughout the region, for example at Milford and Barton on Sea. The coastline is very popular with walkers which can cause considerable erosion. Increased recreational pressure could also disturb cliff top habitats or breeding bird colonies, especially where these species are sensitive to disturbance (LDA Design, 2010).

Wave action contributes towards the erosion of cliffs around Beachy Head, by undermining the lower cliffs which in turn undermines the upper parts which eventually collapse.

Climate change may increase the intensity or frequency of storms in the future which could result in coastal squeeze. The loss of beaches that may be protecting the cliff base from wave action could lead to accelerated cliff erosion (LDA Design, 2010).

Dune systems are complex and dynamic entities prone to instability and sudden large-scale shifts. This can have significant impacts on the surrounding environment as well as important consequences for recognising, dating, and conserving historic features within these areas (e.g. Petts & Gerrard 2006). The main threats to dunes in the region are:

- Recreation pressures on dunes can cause erosion and a loss of plant communities in certain areas
- Overgrazing by stock can reduce the species diversity of dune grasslands and lead to erosion. Alternatively, a lack of grazing may result in the invasion of scrub species and coarse grasses at the expense of the distinctive dune flora.
- Stabilization at the back of dunes caused by agriculture, golf course management and road construction can prevent the natural landward movement of dunes. If sea levels rise this could result in dune systems being squeezed out and lost.
- Loss of areas of dune to developments, such as roads and golf courses, and because of agricultural improvements.

RARITY AND VULNERABILITY

The erosion of some of these features (as is discussed above) can result in them becoming more dangerous and therefore less accessible to the general public. English Heritage has highlighted a number of considerations involved in managing these areas, including agriculture, coastal defence, tourism, transport, public and private property interests and ecology, as well as the monument itself (<http://www.helm.org.uk/upload/pdf/Shoreline-Management-Plan-Review.pdf>).

Where cliffs are actively receding, regular checks for stability may result in footpaths having to be rerouted further back for safety reasons. In other areas re-routings may be minor and temporary to assist with repairs to erosion and regeneration of grass and vegetation.

Dunes are generally rich in buried prehistoric and historical archaeological remains. These are usually well-preserved since dunes offer a non-acidic environment. They are also specialised habitats supporting internationally important vegetation types and are key

habitats of conservation concern in the UK Biodiversity Action Plan (Cox 97). The sandy beach at Studland is associated with the only significant and extensive sand dunes in Dorset which supports dune heath and dune wetland, a relatively rare habitat in southern central England (LDA Design, 2010).

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2.10.3 Character Type: Cultural topography (inter-tidal)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type refers to those aspects of cultural topography whose physical expressions are predominantly in the inter-tidal zone, and which are not intensively used or managed. It includes the following Sub-types:

- Saltmarsh
- Sandy foreshore
- Rocky foreshore
- Sandflats
- Mudflats

The Southern England coastal region includes extensive examples of sandy, rocky and shingle foreshore. Long stretches of sandy and shingle foreshore are also associated with the renowned tourist destinations of Bournemouth, Brighton and Eastbourne amongst others, though from their active management and use as leisure beaches, their cultural

character has long been dominated by recreation (see text for the 'Recreation' Character Type). Rocky foreshore also surrounds Brighton marina and Hurst Spit in Hampshire.

Saltmarshes and mudflats tend to occur in close proximity to each other and are common throughout the region, particular around harbour areas such as Southampton Water, Chichester and Pagham Harbours as well as Portsmouth Harbour. Mudflats support a plethora of wildlife (Tubbs 1997) and are often designated as Special Areas of Conservation (SAC) or Sites of Specific Scientific Interest (SSSI) reflecting the values society ascribes to their ecological qualities.



Saltmarsh and mudflats at Pagham Harbour (© Maritime Archaeology Ltd)

Saltmarshes tend not to have been used for agricultural purposes but the more sheltered areas were historically important for salt production and frequently provide evidence of such eg the remains of the industrial scale salterns at Lymington, Hampshire which were in production from the medieval period through to the nineteenth century.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

This Character Type contains remains of varied maritime human activities and their long-term relationship with the sea.

Intertidal mudflats and sandflats are generally found in tidal estuaries such as the Medina and Yar estuaries on the Isle of Wight, as well as various mainland harbours (examples include Southampton Water, Poole Harbour and Langstone and Chichester Harbours). Their

anaerobic conditions often result in the preservation of archaeological remains, either buried such as prehistoric land surface, or on the surface of the flats such as quays. Most human activities that have left remains in these areas were connected with the marine environment. There is also potential for the presence of prehistoric remains on land that is now intertidal but which used to be dry ground.



Archaeological investigations at Langstone Harbour (© Hampshire & Wight Trust for Maritime Archaeology)

Where there are mudflats there may also be evidence of fish traps and it also seems likely that the archaeology of coastal fishing resource is greater than currently understood. It seems likely that at certain times of the tide these areas would have been exploited by canoe for the wild fowl (Hampshire County Council 2010). It is also an area which will have archaeological evidence of boats and hulks, lost or abandoned in the intertidal areas. The mudflats surrounding Portsmouth Harbour were historically utilized for the creation of oyster beds, for example at Emsworth and Chichester Harbour (www.hwtma.org.uk).

Saltmarshes develop in the intertidal zone where there is an accumulation of fine sediments. Some degree of shelter is required for this accumulation, so saltmarshes are found in the harbours and estuaries along the coast, with the largest and best developed examples occurring within Chichester Harbour (Cox 1997). The more sheltered areas of saltmarsh are historically important for salt production and frequently provide evidence of such. There is extensive evidence of industrial scale salterns at Lymington and in Langstone and Chichester Harbours. The latter supplied great quantities to the Royal Navy in Portsmouth who required enough salt to preserve meat from 5000 cattle per year (www.greatsaltern.org.uk).



Saltmarshes at Lymington (© Hampshire & Wight Trust for Maritime Archaeology)



Mudflats at Chichester Harbour (© Maritime Archaeology Ltd)

The western shoreline of Southampton Water continues to support a range of marshes and mudflats eg at Calshot and Dibden Bay, although several sections of mudflats and saltmarshes that would have historically been part of Southampton Water have been lost to built development in the form of docks and marinas.

Long stretches of foreshore, particularly sandy foreshore, occur in the region and have been a focus for holidaymakers for over a century eg at Brighton and Eastbourne. These areas are now used and intensively managed as leisure beaches and are discussed under the Recreation Character Type. Shingle foreshore areas are also found at the top of harbour beaches eg the area surrounding Christchurch Harbour.

VALUES AND PERCEPTIONS

Much of the intertidal zone in Southern England, whether or not it is intensively managed, is valued for its numerous and varied recreational opportunities. Where unmanaged, this zone is often subject to relatively low levels of visitors who enjoy its quiet and solitude as a source of relaxation and inspiration. The sense of remoteness and feeling of being open to the elements can dramatically increase in winter.

This Character Type is also valued ecologically for its biodiversity qualities. Mudflats and intertidal harbours are deemed of international importance for the wading bird and waterfowl populations which breed, feed and migrate through the area at different times of year. Intertidal areas also support considerable shell fish production, most significantly oyster beds and spat locations and recreational anglers bait dig the mudflats (Hampshire County Council 2010). Where such activities are of such intensity as to form the dominant cultural character, the areas in question are characterised and discussed under the 'Fishing' Character Type as 'bait digging'.

Many examples are now nature reserves or have been given national or county nature conservation designations. For example Pagham Harbour, the area surrounding Hurst Spit, and Langstone Harbour which has been designated as a Site of Specific Scientific Interest (SSSI), Special Protection Area (SPA), Special Conservation Area (SAC), and a RAMSAR designated area. These areas attract wildlife enthusiasts as well as day tourists interested in rural walks.



Pagham Harbour Nature Reserve (© Maritime Archaeology Ltd)

The wide variety of recreational opportunities can sometimes cause tension between the different users' interests, requiring careful management to resolve potential conflicts before they occur.

There is also increasing commercial pressures on the region's foreshore for recreational craft marinas, pontoons and moorings, houseboats and MOD vessels (Hampshire County Council 2010).

RESEARCH, AMENITY AND EDUCATION

Much of the Southern England region's foreshore is accessible to the public, with many relatively unmanaged beaches provided with nearby facilities such as car park, toilets, footpaths, café and interpretation boards. However, even at low tide, the large expanses of mudflats across the coastal region can remain inaccessible. Recreational water based activities in these areas are often restricted to a few hours either side of high water unless vessels have access to deep water channels beyond (Hampshire County Council, 2010)

Extensive research into the archaeology of the region's foreshore has been undertaken by the Hampshire and Wight Trust for Maritime Archaeology (www.hwtma.org.uk) and others, for example along Southampton Water and the Hamble River foreshores. Much of the fieldwork has included volunteer and community involvement. Foreshore hulks provide an excellent focus for cross-curricular studies with local relevance, being a more visible and accessible element of the maritime archaeology resource.

Many interest groups, such as walkers, artists, writers, and historians, already make use of this Character Type, offering scope to further develop education and outreach initiatives to raise public awareness about the historic character of the foreshore area and its impact on today's landscape/seascape. Opportunities to do this will be greatly enhanced by the provisions to create a right of public access along England's coast in the Marine and Coastal Access Act 2009 (www.defra.gov.uk/environment/marine/legislation/index.htm).

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing ongoing gradual erosion, and in some cases accretion, as natural processes are enhanced in their effects by intensive beach management elsewhere and by the long-term and culturally induced trends of sea level rise. Other cultural forces for change include the increased pressures from recreational activities, the construction of sewerage schemes, flood and erosion defences, and coastal residential development.

Recreational pressures, even on currently less intensively-used foreshores, from the large coastal populations as well as visitors is significant, with damage caused to many sensitive coastal habitats from disturbance and trampling.

Pressures on intertidal saltmarsh and mudflats include physical disturbance, nutrient enrichment, introduction of alien species and coastal squeeze. The reclamation of former salt marshes for grazing was a significant historic process, and reclamation continues to this day, for the development in the form of docks and marinas. Impacts on saltmarsh are particularly significant as it provides a buffer to shoreline erosion by dissipating wave action. This has been seen at the small islands and areas of saltmarsh in upper reaches of the Langstone and Chichester Harbours (Hampshire County Council 2010).

There is continuing pressure to expand tourism and leisure facilities along the coast, and the excavation of marina basins in which to moor recreational sailing craft has resulted in the destruction of further areas of saltmarsh and intertidal mudflat. (Cox 1997)

Marine litter and pollution is also a continuing issue in this Character Type with serious effects on beach and water cleanliness which generate strong public responses. Litter is mainly derived from offshore shipping and fishing activity as well as from terrestrial sources and beach users themselves.

RARITY AND VULNERABILITY

Unmanaged sandy and shingle foreshore beaches are relatively frequent in the Southern England region, with rocky foreshore being rarer. Extensive areas of saltmarsh and mudflats are a common occurrence along the coastline particular around harbour areas.

This Character Type is under pressure from a range of erosion processes, increased intensity of recreational activities, the construction of sewerage schemes, coastal defences, and coastal residential development.

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2.10.4 Character Type: Cultural topography (marine)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Coarse sediment plains
- Fine sediment plains
- Mud plains
- Mixed sediment plains
- Sand banks with sand waves
- Exposed Bedrock

The seafloor sediments of the Southern England marine region are generally thin, and dominated by gravel deposits of generally less than one metre (Hamblin et al., 1992). There are few sandy sediments within this area and those which do exist are generally found in the more sheltered areas such as Poole and Christchurch Bays and the Solent (MA Ltd, 2007). Patches of mud plains and areas of exposed bedrock are also present, together with sand banks with sand waves.

There is great potential for the survival of prehistoric landscape components in the deposits of the region. Sediments of the Solent and its tributaries indicate that south coast river systems were corridors for human migration and favoured habitats for early human populations (Momber 2004, Wenban-Smith 2002, Wessex Archaeology 2007a). The potential of these marine deposits is confirmed by finds from their contemporary expressions on land: the earliest hominin fossils from the British Isles were recovered from a Pleistocene raised beach at Boxgrove, West Sussex (www.ucl.ac.uk/boxgrove).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The dominant character of sea bed (sea-floor and sub seafloor) in the Southern England region is bedrock (James et al, 2010), covered with a thin layer of unconsolidated sediment. The seafloor sediments of the Southern England region are dominated by gravel deposits, which are generally less than one metre thick (Hamblin et al., 1992). The less dominant sandy sediments are generally found in areas such as Poole Bay and Christchurch Bay which

are fairly sheltered (MA Ltd, 2007). Others are found in the east of a sea bed 'valley' formation called the 'Northern Palaeovalley' which continues onto an adjacent sea bed platform bordering the Selsey to West Sussex coast (James et al, 2010) and was formed by river systems at times of glacial maxima when the now-submerged sea bed was exposed as dry land.

Mud plains are extensive in the inner Poole Bay and Christchurch Bay area (in conjunction with the sandy sediments), Chichester Harbour, off the east and north-east of the Isle of Wight and the extreme north-east corner of the Selsey-West Sussex sea bed platform mentioned above. Some of these occurrences are likely to reflect sheltered areas in bays and behind headlands where mud can settle on the sea bed. A number of patches of mud also occur in the palaeochannel foreshadowing the line of the Solent (James et al, 2010).

Large-scale sandbanks and ridges and smaller sand waves have been formed by the reworking of sea-floor sediments by currents that have been generated by tides and sea waves (BGS 2002). The dominance of rock and thin sediment plus the areas of coarse sediment means that the Southern England region has a limited extent of major sandy bedforms although sand streaks, sand patches, sand ribbons and megaripple do occur (James et al, 2010). Examples include the Dolphin Sand and Dolphin Bank in Poole and Christchurch Bay (James et al, 2010), Shingles Bank at the western entrance to the Solent which is attached onshore to the gravel based Hurst Spit, and Horsetail Bank, also at the entrance to the Solent.

The Southern England marine region has high potential for surviving prehistoric archaeological deposits within their contemporary topographic settings, with well-preserved river valleys infilled with sediments, for example the 'Northern Palaeovalley', and palaeochannels extending seaward from the River Arun and along the line of the Solent (MA Ltd, 2007). The region's submerged topography also represents the offshore extension of the Hampshire Basin drainage system which Wymer describes as containing more Palaeolithic sites than anywhere else in the country (Wymer 1999).

VALUES AND PERCEPTIONS

This Character Type has been receiving increased attention by archaeologists due to the potential of well preserved archaeological remains that could contribute to the understanding of past communities' use of the landscape. It is also an area where increasing archaeological and geomorphological landscape and seascape perceptions have been developing in complement, with extensive sea floor mapping in recent years. Its Pleistocene gravel sediments are also viewed, and exploited, as a rich source of marine aggregates for the construction industry. Ecologically, this Character Type is also highly valued for its biodiversity, both by those wishing to conserve it and by those seeking to extract from it by fishing and potting.

This Character Type can be viewed as potentially hazardous by those piloting ships and boats due to the potential of grounding their vessels. However, the indented coastlines produced by this Character Type can provide sheltered, calm conditions for sailors to moor or anchor.

RESEARCH, AMENITY AND EDUCATION

Within this Character Type, some survey, excavation and analysis of the well-preserved archaeological remains has been undertaken, providing valuable information about past human activities. Examples include the 'Submerged Palaeo-Arun River Project' (funded through English Heritage's distribution of ALSF funds) (Gupta et al, 2004) and the investigations at the Mesolithic site of Bouldnor cliff (Momber, 2004). These examples illustrate just some of the range of historic features that can survive within this Character Type and the historic potential of today's landscape/seascape in the Southern England region.



Diving fieldwork at Bouldnor Cliff (© Hampshire & Wight Trust for Maritime Archaeology)

The English Heritage-Aggregates Levy Sustainability Fund (ALSF) 'Enhancing Our Understanding: Navigational Hazards' project used the UK's extensive hydrographic archives, including charts, sailing directions and pilotage notes, and modern seabed geology mapping to identify and map 'Areas of Maritime Archaeological Potential' (AMAP), areas where high potential for shipwreck losses coincide with areas of high preservation potential (Merritt et al 2007). This project provided the foundations for the development of a quantitative system for assessing the archaeological potential for shipwreck material in the marine environment according to different sediment types.

Collaborative projects between industry and the heritage sector through the analysis of further geophysical data along with sediment characteristics and dynamics will help clarify issues regarding archaeological potential and its preservation in the marine environment.

The amenity value and public awareness of this Character Type could be further explored through, for example, interactive CDs and web resources, including those drawing on HSC. There is also ample opportunity, as England's coastal access provision is developed, for educational initiatives through presentations, posters and online resources, to raise public awareness about the inter-relationships between the cultural and natural environment in marine contexts.

CONDITION AND FORCES FOR CHANGE

The historic cultural character of this Character Type in the Southern England region is under pressure from offshore development including wind farms and aggregate extraction. The direct and indirect physical effects of these activities, including the movement of water and sediments, may have an intrusive impact on the archaeological potential of this Character Type. This will be an aspect for consideration in the Environmental Impact Assessment (EIA), relating to any such proposed developments.

Geophysical surveys (and in some cases core sampling and diver inspections) are often a requirement for offshore developments (including wind farms and aggregates extraction). These surveys can also potentially increase the understanding of the historic environment of an area, and enable the creation of detailed palaeoenvironmental and palaeogeographic reconstructions. This information can inform future historic seascape characterisation of the areas concerned as well as feeding into the local and national historic environment records.

RARITY AND VULNERABILITY

Known and documented historic cultural aspects within this Character Type are currently rare, especially where time-depth is recorded (e.g. Bouldnor Cliff submerged landscape, off the Isle of Wight), but this reflects the relatively limited extent of research to date rather than the potential of the Character Type across its huge area.

In terms of vulnerability, this Character Type has always been subject to change from natural environmental processes such as erosion, sea level rise and global warming and cooling: its Pleistocene development is testimony to that. It is also currently under pressure from human activities such as intrusive fishing activities such as trawling and various forms of offshore development such as offshore wind farms and aggregate extraction. These developments will be subject to the marine planning system through the Marine Plans as the Marine and Coastal Access Act 2009 is implemented, and the individual expressions of such developments will be subject to Environmental Impact Assessment (EIA).

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2.11 BROAD CHARACTER: WOODLAND

2.11.1 Character Type: Woodland

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Woodland includes the Sub-types:

- Ancient woodland
- Plantations

Coastal woodlands were often important in providing timber and other materials for boat building and other coastally-focused activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea, aiding position-finding from ships.

Ancient woodlands have been defined by Peterken (1981) as woodlands that have had a continuous history of woodland cover since at least 1600 A.D. The different forms of ancient woodland are discussed by Natural England at www.english-nature.org.uk/pubs/gis/tech_aw.htm .The current distribution of ancient woodland and the different types of woodland in the region is related to its soils, underlying geology and land use history (Cox 1997), with examples being found in the New Forest, Parkhurst on the Isle of Wight, along the upper reaches of the Hamble River and at Old Park Wood near Bosham on the edge of Chichester Harbour.



View of the New Forest from Lyndhurst (© English Heritage)

Further to the east, the more fertile soils of the coastal plain within West Sussex have a long history of agricultural production and support few ancient woodlands.

Plantations are areas deliberately planted with trees on new sites to supply the demands for wood from industrial and domestic use. Very few plantations date from before 1700 and those from the 18th and 19th centuries were generally of small scale and unintensively managed. This changed with the establishment of the Forestry Commission in 1919 due the difficulties Britain had encountered in meeting wartime demands on timber (www.forestry.gov.uk/forestry/CMON-4UUM6R). Today, the Commission plants over 24 million trees each year and looks after nearly a million hectares of land, including the New Forest and Firestone Copse and Parkhurst Forest on the Isle of Wight.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The surviving ancient woodlands would have been managed and formed important elements of the working landscape for many centuries. Medieval farmers and craftsmen would have exploited them as pasture grounds, sources of fuel, coppice wood and timber.

In southern Hampshire, the predominantly heavy clay soils support some extensive tracts of ancient semi-natural woodland. The New Forest is one of the most famous areas of ancient woodland in the region. It was created as a royal forest in c.1079 for the private hunting of (mainly) deer (www.newforestnpa.gov.uk/li_history). The system of Forest Law was devised which issued stiff penalties to those damaging the forest habitat or poaching game in the Royal Forest. This had significant impacts on those living in and around the forest and who depended on it for their own survival. Forest Law was upheld by Verderers (judges) with Agisters (stockmen) and commoners (land users) managing the land. These terms are still used today and a Verderers Court still meets quarterly in Lyndhurst.

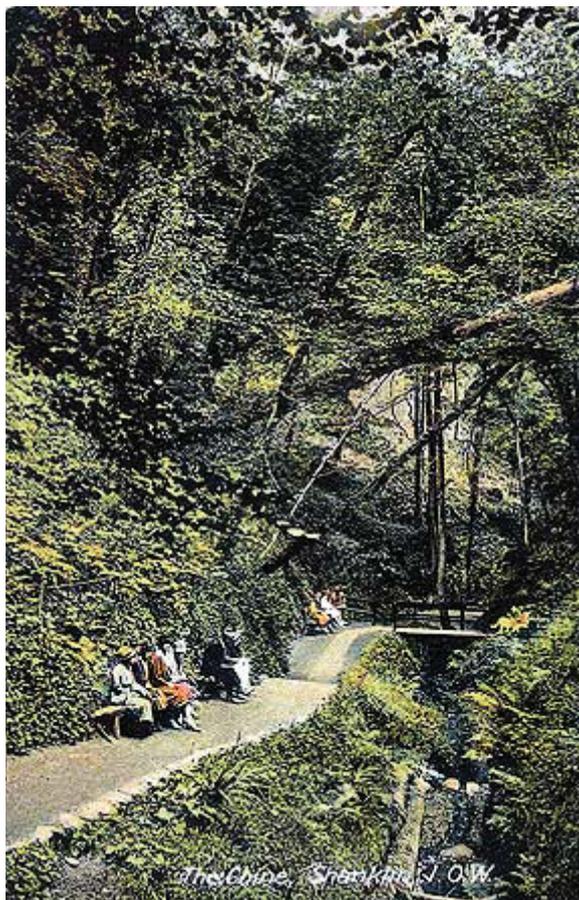
The region's coastal woodland has long served as a resource for supplying coastal boat-builders. In more recent centuries the New Forest became a source of timber for the Royal Navy. Plantations were created in the 18th century for this purpose, and then again in during the First and Second World Wars. The Forestry Commission was established in 1919 due the difficulties Britain had encountered in meeting the wartime demands on timber (www.forestry.gov.uk/forestry/CMON-4UUM6R). During the Second World War the Commission forests produced more than 51 million cubic feet of wood. As the New Forest was one of the most mature forests, it bore the brunt of the felling. Today, the Commission is responsible for nearly a million hectares of land, including (as well as the New Forest) Firestone Copse and Parkhurst Forest on the Isle of Wight.



View of the village of Cadnum in the New Forest (© English Heritage)

Bucklers Hard, part of the Beaulieu estate in the New Forest, is a shipbuilding village that was originally planned by the 2nd Duke of Montagu as a base, 'Montagu Town', for the import of sugar from the islands of St Vincent and St Lucia in the West Indies. In the event, the French seized the islands and the village became a shipbuilding community. The village consists of two lines of cottages leading down to the beach where, from 1698 to 1827, wooden-walled ships were built. For almost a century, wood was under the control of the family and descendants of the master builder Henry Adams. Among the ships they supervised were *HMS Euryalus* and *HMS Agamemnon* for Nelson's fleet.

Ancient woodland on the Isle of Wight includes small areas on the shore of the Solent and the larger area of Parkhurst Forest to the north-west of Newport, Isle of Wight. The site is partly a Site of Special Scientific Interest (SSSI). It consists of ancient woodland, relict heathland and plantation woodland. The woodland is owned and managed by the Forestry Commission.



Woodland at Shanklin Chine, Isle of Wight c1930 (© English Heritage)

Rich deposits of ironstone in Sussex have been exploited from the early Iron Age but made heavy demands on local timber resources. By the Elizabethan period, stands of ancient timber were particularly valued by the Royal Navy who wanted it to build ships. To ease the conflicting demands on timber a law was passed in 1581 to prevent the setting up of any new iron works in some parts of Sussex. Another law sought to preserve trees within 12 miles of the coast to protect the interests of the important Sussex ship building industry (www.westsussex.info/iron-industry.shtml).

VALUES AND PERCEPTIONS

Patterns of coastal woodland provide one of the distinctive landscape components visible from the sea. Those patterns are culturally defined and combine with variation in topography and other cultural features and aspects to give a sense of place and position to mariners and coastal users alike.

Many of the areas of woodland and plantation in the region are accessible to the public. These are visited and valued for a number of reasons, ranging from the leisure opportunities they provide (walking, cycling, watersports on the coastal zone) to the sense of peace and remoteness enjoyed in other areas.

Some areas also have a strong cultural significance as reminders of the maritime and naval connections of the region, for example the boat building village of Bucklers Hard in the New Forest.

RESEARCH, AMENITY AND EDUCATION

Many woodland and plantation areas in the region have public access and are enjoyed by large numbers of people. The Forestry Commission actively promotes public access, providing car parks, way marked routes and interpretation boards.– The New Forest National Park is described as “an outdoor classroom for all ages” containing a unique landscape, abundant wildlife and important cultural heritage. Its website (www.newforestnpa.gov.uk) highlights the key topics and issues facing the Park and contains educational student and teacher areas. Woodlands have considerable potential for creating an educational and outreach package bringing together their recreational, cultural, historical and ecological aspects.



Woodland clearing in Dorset (© English Heritage)

The Woodland Trust hosts events and campaigns to raise awareness of woodlands and provides activities and learning resources on its website (www.woodland-trust.org.uk).

There is an opportunity to research the maritime aspect of coastal woodlands. This could include their role in providing timber and other materials for boat and ship building, investigating the maritime-related activities carried out by local coastal woodland communities, or researching the representation of coastal woodlands on historic charts and in works of art (McInnes, 2008).

CONDITION AND FORCES FOR CHANGE

The restoration of sites with ancient trees requires special care: ancient trees and decaying wood habitats are very sensitive to rapid changes in their microclimate (www.woodland-trust.org.uk). Other factors affecting woodland in the region include sea level rise and an increase in saturated soils and soil salinity which could have a detrimental effect on the woodland and wooded hedgerows which link ancient woodland – a problem particularly associated with stream valley sides and managed coastal realignment areas. Greater storm frequency and intensity could also damage woodland and trees (Hampshire County Council, 2010).

On the positive side, existing trees hedges and woodland are a considerable contributor to landscape and seascape character. The effect of improving provision for access to the coast through the Marine and Coastal Access Act 2009 may have a radical effect on accessibility and therefore the ability to experience this coastal/estuarine Character Type.

RARITY AND VULNERABILITY

This Character Type contributes strongly to the general character of the region's landscape/seascape. As a whole, the survival of ancient woodlands and the historical features within them in Southern England is relatively high and much of it is protected through designations such as SSSI or National Park status. The New Forest National Park Management Plan contains a broad strategic and aspirational approach designed to guide the long-term management of the National Park.

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2.12 BROAD CHARACTER: ENCLOSED LAND

2.12.1 Character Type: Reclaimed land

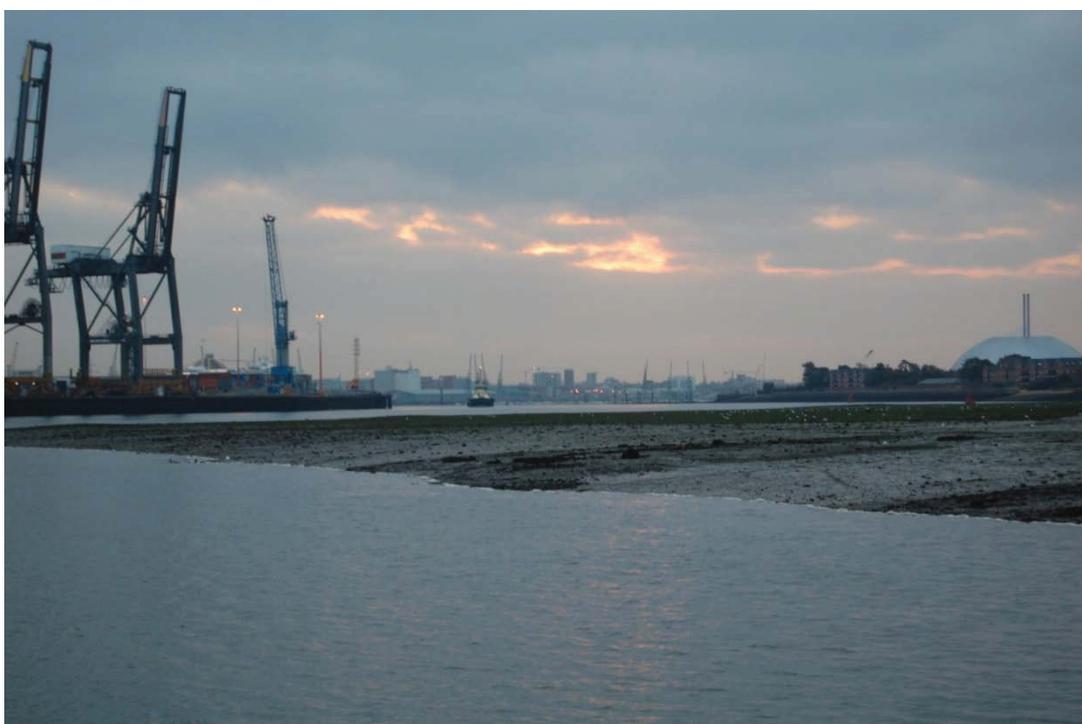
INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type refers to areas of land enclosed, drained and taken in from along the coast for a variety of mostly agricultural purposes. The following Sub-types are included:

- Reclamation from sea
- Reclamation from tidal marsh
- Reclamation from wetland

There are pockets of reclaimed land across the Southern England region. These areas are variously utilized as coastal grazing marsh, golf courses, and wildlife reserves, marina development as well as docks and other industrial activities.

The most extensive areas of reclaimed land in the region are near the main ports and harbours for example Portsmouth Harbour and Southampton Water. The reclamation of land in these areas began in the late eighteenth century (Hampshire County Council 2010) and continues today.



**Southampton Water, an area of reclamation since the late eighteenth century
(© Hampshire & Wight Trust for Maritime Archaeology)**

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Land reclaimed from marsh would have historically been used for grazing, and there is evidence that this occurred from the Neolithic or Bronze Age onwards (Hampshire County Council 2010).

Reclamation was undertaken before the industrial revolution (particularly between AD1600 – 1900) on small scale through embankment of mudflats. The reclaimed areas were associated with grazing and there is also some evidence that some forms of processing took place in this coastal zone (perhaps slaughter and salting meat), for example in Langstone Harbour, Fawley, Hamble and Newtown Salterns (Hampshire County Council 2010).



**Langstone Harbour, an area of reclamation since before the industrial revolution
(© Hampshire & Wight Trust for Maritime Archaeology)**

Reclaimed land in the Hampshire coastal region continues to be dominated by coastal grazing marsh (eg in New Forest area), but is also important for saline lagoons and unimproved grassland often with international habitat designations (Hampshire County Council 2010). Upper saltmarsh, by its geographic location, has been very susceptible to reclamation and pressure from landward development particularly along the Portsmouth and north shores of Langstone (Hampshire County Council 2010).

Much reclaimed land has been developed for modern intensive uses, discussed elsewhere under the other Character Types which now dominate those areas. Such uses include marinas (for example Ocean Village in Southampton), golf courses, landfill and ports and docks.

VALUES AND PERCEPTIONS

The values and perception given to reclaimed land differs across the region, depending on the way that the reclaimed land has been utilized.

The reclaimed land that has not been intensely developed but remains mostly coastal grazing is valued as a highly tranquil environment close to the water and an accessible natural space close to settlements. This is particularly so in the case of the Solent conurbation (Hampshire County Council), where it forms part of the area's 'green infrastructure' and is well used by visitors, local residents and wildlife enthusiasts.

The marina developments, for example Ocean Village in Southampton, are perceived as another form of recreation, as well as increased living space in the City.

In complete contrast the land proposed for reclamation for industrial purposes can be very controversial. Dibden Bay, an area of reclaimed land along Southampton Water is the site of a proposed port expansion by Associated British Ports (ABP). It was argued that this was essential for the continued economic development of the Port of Southampton but the development was vigorously opposed by conservation groups due to Dibden Bay's intertidal marshlands having international significance with Ramsar status. The application for expansion was rejected in April 2005 as it was considered that there were alternative sites for port expansion in southern England which had not yet been fully explored. In July 2009, ABP launched a consultation on a 20-year masterplan for Southampton port which sets out plans for future growth. It states that "In identifying the Dibden reclaim as the only possible location for port expansion, ABP is fully aware of the nature conservation value of the site and the adjoining foreshore... Our demand forecasts indicate that expansion into the Dibden reclaim will become necessary between 2021 and 2027" (www.abports.co.uk)

Areas such as these can be highly contested. When under pressure from development their cause is often taken up by local (and national) conservation groups who lobby the government and run campaigns to raise public awareness of the damaging effects of the development of such land.

RESEARCH, AMENITY AND EDUCATION

Multi-disciplinary projects can offer opportunities to investigate the reclamation of coastal land. This might explore phenomena like the relict field patterns, often defined by networks of drainage ditches, or the early development of sea defences.

CONDITION AND FORCES FOR CHANGE

Reclaimed land is vulnerable to many changes, natural and human. The land can often be subject to storm surges and tidal flooding, although embankments are constructed to provide as much protection from wave action and coastal inundation as possible (see the Character Type text on 'Flood and Erosion Defences').

Reclaimed land is also highly valued as areas prime for development, either residential or industrial. This intense development changes the character (and hence Character Type) of the areas concerned and impacts greatly on the wildlife and ecology.

RARITY AND VULNERABILITY

Reclaimed land is found in pockets across the Southern England region, mostly around the busy ports and harbours where it is most prized. It is often subject to development pressures, both residential and industrial, which may change its character although some areas are protected by conservation designations, such as Special Areas of Conservation (SACs) and Ramsar Sites

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Cox, J, 1997 South Coast Plain and Hampshire Lowlands Natural Area Profile

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<http://www.abports.co.uk>

2.13 BROAD CHARACTER: UNIMPROVED GRAZING

2.13.1 Character Type: Coastal rough ground

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

There are many scattered pockets of coastal rough ground along the Southern England coast. The dominant agricultural use is grazing of livestock, and they are generally unintensively managed. Sometimes this rough ground is held as common land, and in this region is often well-used for recreation purposes. There are few settlements associated with this type, although it has been utilised for military training, both currently and in the past.

Heathland and scrub in the region are often included in nature reserves or wildlife havens such as at the Seven Sisters Country Park and the Studland Heath Nature Reserve. The region also contains internationally important heathland related habitats such as the New Forest in Hampshire with other pockets of heathland surviving at Netley Common and Hamble Common.

Coastal grazing sites can be found near the mouth of Southampton Waters and west of Gosport. Chalk grassland is confined to a relatively small area where the chalk outcrops on Portsdown Hill. This most southerly area of chalk grassland in Hampshire



**Coastal rough ground overlooking the Solent
(© Hampshire & Wight Trust for Maritime Archaeology)**

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The human exploitation of this Character Type has varied in intensity through time. The weak and acid soils seem not to have been preferred for settlement and farming, although there is evidence for exploitation from the Mesolithic period onwards (Hampshire County Council, 2010). Coastal grazing sites continue to be found near the mouth of Southampton Waters and west of Gosport as well as on the chalk outcrops on Portsdown Hill.

This Character Type is typified by large areas of open access land with few lanes and roads. There are very few settlements, the prominent buildings mostly being associated with military training.

Since the late nineteenth century this land type has been targeted by the MOD for training purposes (Hampshire County Council, 2010). Examples in the Southern England region include the Royal Marines Training Base in Poole, Browndown Training Camp in Hampshire and West Thorney Military Airfield.

Maritime safety sites such as coastguard look-outs, daymarks and lighthouses are also often located on such ground. Examples in the Southern England region include the lighthouses on Beachy Head (East Sussex) and coastguard stations such as those at West Wittering and Hayling Island.



Coastal rough ground at Beachy Head (© Maritime Archaeology Ltd)

The late nineteenth and early twentieth centuries also saw the reduction of this Character Type by planting with conifers, changing its character to that of woodland.

Many parts of this Character Type also form havens for wildlife. This includes the New Forest, the Seven Sisters Country Park which forms part of the Sussex Heritage Coast and covers almost 700 acres, and the Studland Heath Nature Reserve, which contains wildlife ranging from wildfowl to lizards



Seven Sisters Country Park (Cuckmere Estuary) (© Maritime Archaeology Ltd)



Pagham Harbour Nature Reserve (© Maritime Archaeology Ltd)

Where this Character Type occurs in New Forest and East Hampshire, there are several disused airfields (Hampshire County Council, 2010).

VALUES AND PERCEPTIONS

This Character type provides significant recreational space and places which attract visitors.

Many of the areas of coastal rough ground are located close to settlements. They are subsequently enjoyed by local residents as well as visitors to the region as quiet and tranquil areas which contrast to the busier urban developments close by.



Coastal rough ground at Pevensey Bay (© Maritime Archaeology Ltd)

RESEARCH, AMENITY AND EDUCATION

The Character Type is often located close to centres of population and is therefore easily accessible to many people, both residents and visitors. Much of these areas have been designated as open access, with most of the roads and lanes are unfenced.

There is enormous scope for education initiatives, focusing on the coastline, the cultural character of the Character Type and the wildlife habitats they contain. For example, the New Forest National Park, which contains internationally important heathland, is described as “an outdoor classroom for all ages” containing an unique landscape, abundant wildlife and important cultural heritage. Its website (www.newforestnpa.gov.uk) highlights the key topics and issues facing the Park and contains educational student and teacher areas. The New Forest Centre (www.newforestcentre.org.uk) is a permanent exhibition that provides information on all aspects of the forest and enables visitors to plan their trip. It also hosts the New Forest Museum. The Studland Heath National Nature Reserve and Seven Sisters Country Park also have their own educational facilities.

CONDITION AND FORCES FOR CHANGE

The Marine and Coastal Access Act 2009 makes provision to improve access, creating a right to walk around England's coast; addressing uncertainty arising from lack of consistency, and securing and clarifying rights of public access to foreshore, beaches and coastal land. This will clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. (<http://www.defra.gov.uk/environment/marine/legislation/index.htm>).

The increase in tourism in the area and the large numbers of visitors to this Character Type means that it is vulnerable to erosion problems. If it is carefully and strategically managed, however, this threat could be minimised.

RARITY AND VULNERABILITY

This Character Type could be considered as relatively rare in the Southern England coastal region. Heathland is no longer a widespread habitat in the region due to its almost total destruction in the Hampshire Basin outside of the New Forest (Cox 1997), and chalk grassland is confined to a relatively small area where the chalk outcrops on Portsdown Hill (Cox 1997).

The values generated by this Character Type have resulted in its extensive coverage by natural environment designations. Much of it is subject to Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), and Special Areas of Conservation (SACs) legislation. Some areas are designated as a Heritage Coast eg the Seven Sisters Country Park forming part of the Sussex Heritage Coast.

PUBLISHED SOURCES

Cox, J, 1997 South Coast Plain and Hampshire Lowlands Natural Area Profile

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