HISTORIC SEASCAPE CHARACTERISATION (HSC)

EAST YORKSHIRE TO NORFOLK

SECTION THREE: NATIONAL AND REGIONAL PERSPECTIVE CHARACTER TYPE TEXTS

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REPORT STRUCTURE

This Project Report for 'Historic Seascape Characterisation (HSC): East Yorkshire to Norfolk' (EH Project 6228) is divided into three sections for ease of use.

Section 1 outlines the project's method implementation. Section 2 outlines an applications review and case studies. Section 3 contains the Character Type text descriptions from both National and Regional perspectives: digital versions of those texts are also linked to the project GIS. This Project Area encompasses two sets of Regional perspectives (East Anglia Region and East Yorkshire to The Wash Region). These are contained together in one volume, alongside one set of National Perspective of the Character Descriptions.

This document comprises Section 3 of this Project Report: National Perspective Character Descriptions and Regional Perspective Character Descriptions for East Anglia and East Yorkshire to The Wash.

The 'Historic Seascape Characterisation (HSC): East Yorkshire to Norfolk' (EH Project 6228) extends across two Regions: 'East Anglia' and 'East Yorkshire to The Wash'. Understanding of regions and their boundaries are matters of perception and inevitably vary considerably. The rationale behind the regional divide reflected in these texts follows a decision inherited by this project from Oxford Archaeology's 'Historic Seascape Characterisation (HSC): Newport to Clacton (EH Project 5735)'. Although the East Anglia Region was only partially covered by Oxford Archaeology's project area, the region as a whole had to be defined by that project to give parameters to its Character Type text-drafting. Following the advice and local knowledge of its Project Officer, the western limit of the East Anglia Region along coastal land was taken as extending to and including, King's Lynn. West of King's Lynn, coastal land around The Wash, together with The Wash itself, are taken as part of the East Yorkshire to the Wash Region. Beyond these regions' coastal limits on land and the inter-tidal zone, their mutual boundary across the Inshore and Offshore Regions is not intended to be viewed as a hard one. The perception of regional boundaries is far more marked on coastal land, becoming highly diffuse across the Inshore and Offshore Regions where activities such as fishing undertaken by those from neighbouring or more distant differing coastal regions may overlap considerably. Accordingly, beyond coastal land, HSC's regional 'boundaries' are 'fuzzy' and broad, not intended to be seen as narrow linear divides between exclusive territories. Thus, the draft East Anglia Regional Perspective texts compiled by Oxford Archaeology have been enhanced to more fully represent aspects of the area from Newport to King's Lynn characterised by this 'Historic Seascape Characterisation (HSC): East Yorkshire to Norfolk' (EH Project 6228). The East Yorkshire to The Wash Region presented in this document for 'Historic Seascape Characterisation (HSC): East Yorkshire to Norfolk' (EH Project 6228) spans the area west from King's Lynn and north to Withernsea.

As explained in the Section 1 report (3.1), the 'East Yorkshire to Norfolk' project (EH Project 6228) was divided into 2 separate areas that were being characterised. Project Area 1 was the northernmost part of the English Offshore region off the east coast which lies between the Anglo-Scottish boundary defined in the Civil Jurisdiction (Offshore Activities) Order 1987 1 (2) and the northern boundary of the English Offshore region as defined in the Marine and Coastal Access Act 2009 Section 322. Project Area 2: the coastal land and English Inshore and Offshore regions off England's east coast between the areas already covered by two completed national HSC projects: the northern of those had a coastal extent

from the Anglo-Scottish border near Berwick to Withernsea, East Riding of Yorkshire (Merritt & Dellino-Musgrave 2009); the southern extended from Newport near Great Yarmouth, Norfolk, to Jaywick near Clacton, Essex (Oxford Archaeology 2011). The Character Types in the northernmost project area (Project Area 1) were deemed not to have generated any aspects which would merit revision of the existing National Perspective texts or the North East England Regional Perspective texts.

The National Perspective Character Descriptions is presented first in this document, followed by East Anglia Regional Perspective Character Descriptions, and then East Yorkshire to The Wash Regional Perspective Character Descriptions. The Character Descriptions are presented alphabetically by Broad Character, and then by Character Type, and not by their numerical headings (2^{nd} order sub-headings and 3^{rd} order sub-headings respectively). For example, Coastal Infrastructure (5) and *Flood and erosion defence* (5.1).

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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COASTAL INFRASTRUCTURE

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 setting, design and build may be more heavily influenced by 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 inter-tidal zone, as with lines of spaced revetments. The 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 human-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 was administered under the Coast Protection Act 1949 but is now replaced by Marine Licence (unless exempted activity) under the Marine and Coastal Access Act 2009. 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. The EA is the authority responsible for implementing and managing flood defence schemes in England. 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) exists 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 on-going National Mapping Programme (NMP) and the Rapid Coastal Zone Assessment Surveys (RCZAS) have been 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 Fen area within the East Yorkshire to The Wash Region, especially 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 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 that they have maintained, contribute strongly to local distinctiveness.

There are also conflicts between SMP coastal protection policy/resources and the perceived interests of some coastal communities. For example, the debates at Happisburgh, in the East Anglia Region (http://www.bgs.ac.uk/landslides/happisburgh.html). 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 20th 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 change is also be driven by cliff instability caused by subaerial processes (e.g. saturation and collapse due to rainfall). However, coastal change 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/environ/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). Historic Seascape Characterisation (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, 2010; 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

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 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 macrofossils 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 e*t 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

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 19th 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 the constructions of railways initiated the development of coastal resorts on farmland and around pre-existing hamlets. 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 inter-tidal 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 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 remoter 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

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 inter-tidal 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 inter-tidal zone from the landward coastal margin; the extent of the foreshore is defined by the perception of inter-tidal 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 inter-tidal 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). Inter-tidal 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 a*l 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.

Inter-tidal areas often formed convenient routes of travel for people and/or animals and early evidence for this has been found in several inter-tidal 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 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. For example, the wreck of the Amsterdam beached in 1749 by a crew mutiny is located on the foreshore near Hastings (a site designated as a historic shipwreck under the Protection of Wrecks Act 1973 see: http://www.english-heritage.org.uk/discover/maritime/map/amsterdam/). 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.

Inter-tidal 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 inter-tidal 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 inter-tidal 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, inter-tidal and landward perspectives that combine uniquely along the coast.

Rarity And Vulnerability

Relatively little-disturbed inter-tidal 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 inter-tidal 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. Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) are EU nature conservation designations and are collectively know, in a maritime context, as European Marine Sites and will have published Conservation Objectives (see http://www.naturalengland.gov.uk/ourwork/marine/mpa/ems/default.aspx).

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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

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 rapidly 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 (Parfitt *et al.* 2005).

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 breeds. 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, inter-tidal, 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 is 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

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 outstripped 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 gravely sand. The preservation of archaeological remains in these contexts could be considered as high although in gravely 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 a*l 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 aggregates 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 warning. 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

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 inter-tidal 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 inter-tidal 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, inter-tidal 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 inter-tidal zones from Neolithic and Bronze Age in England (e.g. Wootton Quarr and Langstone Harbour) stressing the historic character of these submerged landscapes. Flemming (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 Yorkshire to The Wash and the East Anglia regions. 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 focussing 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 (cf. Parfitt 2005). 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 (Gaffney *et al.* 2007). 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 inter-tidal 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 northwest 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: ENCLOSED LAND

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 The Wash area, 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 The Wash area, large tracts of reclaimed land are 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 (Williamson 2006, 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 (Williamson 2006, 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 inter-tidal habitat. Due to sea level rise, that inter-tidal habitat is constrained on one side by the sea and on the other by sea walls. Managed realignment allows the inter-tidal 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. Along the eastern coast 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 inter-tidal 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

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, as well as from The Wash. 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 valuable inputs to these future trends.

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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

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 stationery 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 midwinter 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 *c*13,000 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 (Fagan 2006, 246).

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 concern 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

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.

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. Pipe entrenching is the process in the oil and gas industry most likely to disturb prehistoric archaeological deposits, although dredging for marine aggregates is much more invasive. Commercial site investigation and sediment coring could provide beneficial new archaeological data (Flemming 2002). 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; Gribble and Leather 2011). 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; Flemming 2002; Gribble and Leather 2011). 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

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 focussed 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 focussed 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). Over the last twenty years the growth and development of the offshore 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. 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 'gullets', 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 has a varied geology, with 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, copperas 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 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 coastal access requirements define in 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

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 Broighter 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 Bonze 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

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 Bamburgh 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-focussed 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. Two forts were also constructed in the Humber, Bull Sands fort and Haile Sands fort. Although planned in 1914, they were not built until 1919, and were used during WWII.

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 and 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

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 a 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 Orfordness 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

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=3870038andCFTOKEN=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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

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 that 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 and 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.

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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

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, focussing 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 recognise 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 biodioversity 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 Records of the Historic Environment (NRHE). 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: PORTS AND DOCKS

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 inter-tidal 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 and 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' competitivity.

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 are '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 been 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: RECREATION

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 focussing 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 the 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. As divers (and dive clubs) can travel from anywhere in the UK to visit, explore or discover new sites and that archaeological expertise is also similarly dispersed, this creates opportunities for extensive knowledge exchange. 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: SETTLEMENT

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 of 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 later 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 later 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: UNIMPROVED GRAZING

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 (Williamson 2006, 174). This subsequently allows the development of the characteristic underscrub vegetation dominated by heather (Williamson 2006, 174). 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 (Williamson 2006, 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 unintensive 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.

It's 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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NATIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: WOODLAND

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-focussed 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.countryscape.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 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

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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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COASTAL INFRASTRUCTURE

CHARACTER TYPE: FLOOD AND EROSION DEFENCE

Introduction: Defining/Distinguishing Attributes

The coastline within the East Anglia Region is particularly susceptible to coastal erosion and flooding. The soft rocks and deposits which make up the coastline are easily eroded by wave action. In addition East Anglia has particularly muted topography and is 'sinking' as a result of isostatic effects following the last glaciation. As such on-going sea level rise, increased storminess and wave heights can lead to widespread flooding. Flood defences have been constructed in the region since the medieval period to drain and reclaim marshland. Flood and erosion defences are therefore important to the region and a subject of on-going contention with debates over policy and the needs to adapt to the effects of climate change.

Figure 2. Sea defences at Cromer.

Much of the East Anglian coast is protected by some form of erosion or flood defences. In some areas these are hard, most notably almost the entire coastline of Essex is protected by sea walls, as well as along parts of Suffolk and Norfolk. Fixed defences include concrete seawalls which are found all along the coast from the north of the region in Norfolk (Happisburgh, Caister-on-Sea, Great Yarmouth, Gorleston, Hoptonon-Sea), throughout the Suffolk coast (Corton, Lowestoft, Kessingland, Southwold, Aldeburgh, Walberswick) and into Essex (Frinton-on-Sea, Jaywick). In other places defences are in the form of maintained

shingle banks. However, there are still large stretches of the coastline which are unmanaged and undefended including many of the clay cliffs (DEFRA 2002).

Sea walls are also found in the estuaries, most notably the Blyth, Deben and Orwell (the latter from Shotley point to Colton Creek on the south bank, Fagbury Point to Trimley on the north). Over 200 km of sea walls was recorded in the Suffolk NMP project alone (Hegarty and Newsome 2005). These features have been further reinforced with sheet piling and rock armouring (e.g. Lowestoft, Corton, Kessingland, Jaywick) a rock berm (California to Caister) and timber revetments (Kessingland to Benacre, Hopton-on-Sea). In some areas such as Gorleston to Hopton only timber revetments were constructed, while others possess embankments (Benacre 'cross wall', Suffolk Yacht Marina and Levington Creek in the Orwell and around the Walton end of Hamford Water). Along the Norfolk coast historic sea walls are located along the coastline at Cley Next the Sea, Blakeney, Morston, Stiffkey, Wells Next the Sea, Burnham, Hunstanton, and Snettisham. These were generally constructed as embankments, perpendicular to the prevailing wave action, although there was also a specific intent to construct better harbouring facilities along navigable creeks and estuaries in some places, such as Burnham Overy Staithe and Wells Next the Sea.

Many of the beaches are further protected by breakwaters and series of groynes, extending into the sea. These are particularly found in areas of large tourist activity such as Great Yarmouth and the Norfolk coastal resorts, Lowestoft, Southwold, Aldeburgh and Clacton, as well as along the south Norfolk coastline up to Cromer. A series of four offshore reefs are situated at Caister, performing the same job. One of the largest series of recent sea defences can be found at Jaywick Sands including fishtail and offshore breakwaters with rock armouring, reinforced with sand. These stand in front of the existing concrete sea wall. One of the more unusual forms of flood and erosion defences in this area exists in Walton Backwaters. Here in 1988 a barrage breakwater of sunken Thames barges was put in place, backfilled and reinforced with 20,000 m² of mud from Harwich dredging to protect the saltmarsh and seawall behind.

In other locations along the coastline unmodified topographic features act as effective flood and erosion defences including the sand dunes at the northern part of the area around California and Great Yarmouth (the 'Denes') and from Southwold to Walberswick, with the marshes as a buffer. Between Thorpeness and the north of Aldeburgh a single beach barrier protects low lying marsh behind. Stretches such as Dunwich and Covehithe have no defences at all. Many of the hard sea defences were originally built in the Victorian period with a further phase of construction following the 1953 catastrophic floods. Many of these defences are reaching the end of their lifespan and their on-going maintenance and renewal is likely to be costly. Given this fact coupled with the predicted sea level rise, future management will have to include abandoning some areas to the sea and breaching former sea defences, as efforts shift to working with natural processes rather than against them. Such decisions will be guided by flood and coastal defence policies and will lead to an influx of sea water over large areas, but will allow more effective management and investment to protect key populated or wildlife sites.

Historical Processes; Components, Features And Variability

Due to its topography and position East Anglia has always had to consider flood and erosion defences. In area buffering on to the Fens has many sea walls and drainage channels that were constructed as early as the Roman period (Countryside Agency 1999, 16). Historically the East Anglian coastline has suffered greatly from erosion, with much movement of sediment. This is best exemplified by Dunwich in Suffolk, once a thriving medieval port. Land was recorded as being lost to the sea here as early as the Domesday Book but much

more dramatic erosion occurred during the 14th century. In 1300 St Leonard's Church was recorded as being washed away, by 1350 more than 400 houses, shops and windmills had been destroyed. By the 17th century, most of the town had disappeared, leaving only a small village (Williamson 2006, 115). Maps show that the coastline here has eroded by nearly quarter of a mile since 1587 (Williamson 2005, 129). Dunwich remains the largest settlement in England to have been destroyed by coastal erosion (Williamson 2006, 115).

Other settlements in the area met similar fates including Covehithe, Easton Bavents and Aldeburgh. A map of 1591 shows three streets in Aldeburgh lying parallel to the beach; by 1787 only one street remained and the market place and moot hall which had been in the centre of the town were in their current position on the seafront. Much of the historic town of Walton has also been lost to the sea including a Roman shore fort. Southwold was originally located within a bay (Sole Bay) but is now a slight promontory (see also Settlement).

The embankment and drainage of the coastal marshes from the medieval period onwards has altered the appearance of much of the west and north Norfolk coast (Albone *et al.* 2007). One of the earliest sea defences within Norfolk is the Roman Bank, which runs between Clenchwarton and West Lynn. This is thought to be largely late Saxon and medieval in date, although Roman and middle Saxon finds have been recovered from the earthwork (NRHE 2187). This sea defence, and others like it, appear to have been piecemeal constructions, perhaps started in the Roman period running between earlier used saltings, through to the medieval period.

The incorporation of salterns into early sea banks initiated a process that resulted in several kilometres of land being reclaimed and initiating the appearance of the Fens that define the western edge of the East Anglia region, forming the outline of The Wash as it is recognised today. The presence or absence of sea defences to counter processes of coastal erosion was, and remains, influenced by economies and technological capabilities. For example the harbour at Dunwich silted up in the 14th century making trade difficult, leading to its demise and eventual disappearance. Southwold on the other hand remained accessible and could afford defences (Williamson 2005, 129), and so survived. The reclamation of land around Burnham in the 13th century may have been part of sea defence works initiated by the friary at Burnham Norton. However, this resulted in moving the harbouring point in the 16th – 17th centuries to Burnham Overy Staithe (Albone *et al.* 2007, 107).

Construction of flood and erosion defences was intricately related to land reclamation which occurred principally from the post medieval period onwards (see 'Reclaimed Land' text). During this period defences was constructed, and a widespread concern was implemented to save marginal grazing land from flooding, or to extend the land area close to the coast. For example, the Blyth estuary training walls were first constructed in the 18th century and have simply been extended since. Victorian sea defences, including the 'Tamarisk Wall' (which held until 1953) were also constructed at the Naze in order to try and save the cliffs area from further erosion. It is these marginal areas where EA coastal defence policies may lead to their abandonment through withdrawal of funding. These features can be difficult to trace as sea walls as they were constantly repaired and maintained and their current position or position on maps may not be their originally constructed locations. Many have borrowed pits alongside the inside of the bank where more material has been excavated, (Hegarty and Newsome 2005, 86). In some cases, attempts at management have failed and massive expanses of tidal flats and reed beds exist over former farmland with the remnants of failed banks evident in the mud (Good and Plouviez 2007, 41).

During World War II the East Anglian coastline was mined and access was restricted, resulting in some sea defences falling into disrepair. In some areas some sea defences were

deliberately breached as an anti-invasion feature, such as the deliberate flooding of a large area of drained marshland at Walberswick (Williamson 2005, 147). Vast changes to flood and erosion defences eventually had to be made after the North Sea flood of 1953 destroyed any remaining sea defences (http://en.wikipedia.org/wiki/North_Sea_flood_of_1953). This occurred on the night of 31st January and has been described as the worst peacetime disaster the UK has seen (http://www.open2.net/naturalhistory/1953.html). It was caused by a combination of high spring tide, an intense low pressure heading down the North Sea and hurricane force winds. A huge wave was pushed south creating a high tide up to 2.5 m higher than usual. In 1953 there were no flood warning systems and a poor communications network, as a result of which 307 people lost their lives in Britain and 30,000 homes were evacuated. In the Netherlands 1835 people were killed, with a further 230 lost at sea (http://en.wikipedia.org). It took nine months to drain the water and make repairs. In Jaywick, where the housing was particularly poor 35 people were killed during the storm and 600 people made homeless, leading to the construction of massive sea defences. However the shingle beach was all but washed away by successive storms battering against the sea wall, leading to a series of beach replenishments and construction of breakwaters since the 1980s (Strachan 1998). These have recently been completed as outlined above.

Values And Perceptions

Flood and erosion defences are considered by many coastal communities to be essential. A number of organisations and groups have been set up to try and improve the coastal defences. Examples include Coastal Concern Action Group (CC AG), campaigning to save Happisburgh and the Naze protection Society who work with local and central authorities to find a way to prevent further cliff erosion. Recently the historical value of sea defences has also been recognised in terms of informing our understanding of past efforts to hold the sea at bay, and of land reclamation (see English Heritage 2011). In some cases the structures themselves have become monumentalised as features of historic interest such as the Tamarisk wall at the Naze and remains of failed sea walls found within the marshes.

Occasionally sea defences are seen as inappropriate to their surrounding landscape meaning vulnerable stretches of coast can remain at risk. However, the problems in East Anglia are generally considered to be too severe for this to prevent construction of defences. In some cases the structures can be viewed with interest, such as the barge barrage in Walton backwaters. Groynes and breakwaters are a common sight along the East Anglian beaches today, and not only have a role in reducing long-shore drift, but are also perceived as part of the recreational landscape.

As has been predicted, sea level rise and higher storm surges will increase the risk of coastal erosion and flooding. And while traditionally coastal protection schemes have defended the coastline with ‘hold the line’ policies and ‘hard’ defences such as walls and groynes, new policy favours the policy of ‘managed realignment’. ‘Managed realignment’ involves the breaching of hard defences when they reach the end of their lives and allowing the coastline to move inland. The main objective is to create more inter-tidal habitats to provide a range of benefits, including buffering wave energy and reducing hard defence costs. This policy relates to several EU Directives, such as the Water Framework Directive (WFD), which require the loss of inter-tidal habitats to be compensated for by creating new ones. These habitats could decline due to ‘coastal squeeze’ between rising sea levels and sea defences or roads, and unregulated land-use change. Coastal squeeze increases the wave energy reaching sea walls and causes maintenance costs to rise. Use of ‘managed realignment’ techniques to create these benefits is still however, an experimental technique with uncertain outcomes and

timetables for delivery and decisions on its use require case by case economic, cultural and environmental considerations.

Research, Amenity And Education

There is potential for research into the region's flood and erosion defences on a number of levels. There is certainly scope to study the evolution of sea defences, particularly using the data compiled by the RCZAS and NMP, but also the work carried out by English Heritage connected with their heritage assets (English Heritage 2011). This forms part of the wider research issue of human's relationship with the sea and education in terms of respect for the sea. The development of defensive structures is also be useful in understanding the formation of the past landscape. Often, when worked on and replaced, the excavation of sea defences can reveal a much earlier land surface subsequently covered by accreted material.

Condition And Forces For Change

The condition of flood and erosion defences along the coastline and estuaries varies dramatically. Some places have seen recent development in defences which have improved their effectiveness and contributed strongly to landscape changes in their area. (e.g. Jaywick). Newer schemes are very often more aesthetically pleasing than the concrete walls they tend to replace or mask. In contrast many of the concrete walls or timber structures are in poor states of repair depending on when they were built and whether they are still used, requiring replacement or reinforcement. The main force of change for this character type is climate change. The on-going effects of the last glaciations are still being felt here in terms of sea level rise and land subsidence. This is exacerbated by a global increase in temperature which is also expected to lead to increased storminess and accelerated sea level rise. All of this will put extra pressure on the coastline and existing defensive structures. For example, the Naze cliffs that were eroded at a rate of up to 0.88m/yr between 1874 and 1973, have been increasing in their rate of erosion to 1.45 m/yr between 1973 - 1988 (D'Olier 2002).

This is being combated where possible by changes in policy and schemes to improve coastal defence. This is best exemplified by the Shoreline Management Plans (SMP) implemented by DEFRA and the Environment Agency (EA). These consider the current state of the shoreline, predicted changes and possible solutions. The first SMPs were undertaken in the mid-1990s, with a second round underway in the later 2000s. These are supported by an evidence base from projects such as Futurecoast, a system for predicting coastal behaviour. The government has also allocated £11 million to local authorities with innovative ideas for coastal change. Four of the 15 coastal change pathfinder authorities chosen are in the East Anglian region.

Rarity And Vulnerability

Flood and erosion defences are clearly quite common through necessity in this region. However, some of the historic examples of sea defences which may provide information about our current landscape are under threat from ploughing as intensive arable cultivation has expanded onto many areas of reclaimed land previously used as pasture (Hegarty and Newsome 2005, 87). In addition many of land areas protected by clay embankments from flooding have become ecological habitats in their own right, becoming areas of natural grassland. Much of the coastal land *not* protected by the current defences also display rare and vulnerable features, including the Naze Pleistocene Red Crag cliffs, an SSSI as a result of the land and sea fossils exposed within the cliff face (http://www.naturalengland.org.uk/ourwork/conservation/geodiversity/englands/sites/local_ID31.aspx). To the north eroding cliffs have revealed the earliest occupation of hominins in the UK and in northern Europe as a whole.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

CHARACTER TYPE: TELECOMMUNICATIONS

Introduction: Defining/Distinguishing Attributes

A number of submarine telecommunications cables run through the East Anglian marine area, partly as a result of the proximity of this coastline to the European continent. Most connect the UK with the Netherlands, although other routes operate.

The majority of the cables make landfall on the East Anglian coast, principally Suffolk. The Suffolk coastline has two main areas of landfall; near Lowestoft and in the vicinity of Thorpeness and Aldeburgh. Cables connecting at Lowestoft include NORSEA COM 1 which connects the UK to Norway at Kårstø. Anglo-Dutch cables include PANGEA SOUTH, CIRCENORTHand ULYSSES 2 which make landfall at Alkmaar, Zandvoort and Ijmudien respectively. To the south CONCERTO1 NORTH and SOUTH extend from near Thorpeness to Zandvoort in the Netherlands and Zeebruge in Belguim and FARLAND NORTH connects Aldeburgh with Domburg in the Netherlands. A single trans-Atlantic cable (AC-1) also traverses the area before heading into Katwijk in the Netherlands. In addition, there is a single cable (NETHERLANDS 14) that connects Winterton in Norfolk to the Netherlands.

A number of disused cables are still in place including the STRATOS cable from Sheringham, UK-GERMANY 5 from Winterton, REMBRANDT1 from Lowestoft to the Netherlands, HERMES NORTH from Aldeburgh to Zandvoort and UK-NETHERLANDS 12 from Aldeburgh.

Historical Processes; Components, Features And Variability

The East Anglian region saw the laying of one of the first submarine telecommunications cables. This was extended from Orfordness to The Hague in the Netherlands in 1853 and was laid by the Monarch, a paddle steamer specially fitted for the work, assisted by HMS Adder on loan from the Admiralty. The cable was operated by the Electric and International Telegraph Co. and like all early cables carried telegraphy (written communication) traffic. A further three cables were laid across the route between1853 and 1855 measuring between 118 and 123 nm long. These initial cables were constructed of copper and covered by gutta percha latex, taped and covered with yarn before being armoured with iron wires. The cables were connected to telegraph equipment held at Orfordness lighthouse.

Over the subsequent decades several more telecommunications cables were laid in the region, from Dunwich to Zandvoort in 1858, Lowestoft to Zandvoort in 1862, Lowestoft to Germany in 1866 and Benacre to Zandvoort in 1884 and 1900. Submarine telegraph cables were inherited by the General Post Office (GPO) when private telegraph companied were privatised in 1870 and leased to the Submarine Telegraph Company (www.atlantic-cable.com).

Subsequent generations of submarine communication cables carried telephony (verbal communication). Further cables were installed in the 20th century from Aldeburgh to Domburg in 1926, 1937, 1972 and 1989, from Lowestoft to Schevingen in 1954 and from Winterton to Esbjerg and Borkum in 1963.

Most recently the cables have carried data communications traffic, enhanced by the development of fibre optic cables in the 1980s. All modern cables use this technology (http://en.wikipedia.org/wiki/Submarine_communications_cable). Modern cables have been

installed in the region from the 1990s onwards with PANGEA the latest in 2000. Recently cables have been buried beneath the seabed in order to protect them from external threats.

Values And Perceptions
Submarine telecommunications cables are mostly undetected in the marine environment. However they are a highly reliable form of transferring information and are critical to our present-day life. They can be perceived as obstacles to certain sea users such as fishermen and dredgers. Awareness charts are now produced.

Research, Amenity And Education
Submarine telecommunications cables are an essential amenity, connecting England and the UK as a whole to the European continent and beyond. With the advent of the wide scale use of the World Wide Web much of the population has become dependent on access to the internet for both work and domestic purposes. This is facilitated by the presence of the generally invisible cables. The proximity of East Anglia to the continent makes this a crucial region for placing cables.

There are a number of amateur enthusiasts who log the history of marine telecommunications although this is still a relatively obscure sphere of research. There is potential for a larger scale study.

The laying of cables facilitates research as it provides opportunity for investigation of the seafloor and subsea floor prior to trenching for burial of cables. This would mainly be in the form of desk based assessment and geophysical survey, however the works themselves may unearth previously unknown deposits or remains.

Condition And Forces For Change
Increased demand for communications in our modern day life has led to the placement of numerous telecommunications cables in the marine zone. These have to be replaced and maintained regularly with the progress of technology.

The laying of cables and the associated disturbance of the seabed can disturb the existing historic environment and can be viewed as impositions of the landscape/seascape. However, their presence has become a part of the seascape in this area over many years.

Rarity And Vulnerability
Telecommunications cables are not rare features in the seascape of the East Anglian region, although further development of technology may ultimately lead to their replacement. This is particularly pertinent given the rise of wireless telecommunication.

Submarine telecommunications cables have been vulnerable to various processes over their history. Most significantly cables can be broken by trawling and anchoring of boats at sea. They can also be affected by natural occurrences such as earthquakes and undersea avalanches, as well as animal activity including shark bites. As a result cables are now buried in the seabed, although some of these activities, such as trawling can penetrate their cover.

Websites
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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

CHARACTER TYPE: TRANSPORT

Introduction: Defining/Distinguishing Attributes

Transport clearly plays a vital role in the economy and everyday life of the region. The road network is a vital form of communication for local people, but it also brings tourists and other forms of economic benefit. However, road access can be poor along the coastline and is not particularly well developed across much of East Anglia. Poor road access has limited development in some areas, most notably along the Suffolk coast (Countryside Agency 1999, 60). There are few roads in The Broads area: these cling to the valley sides, linking settlements on the valley edges and are very rare in the marshy valleys (Countryside Agency 1999, 48). The sense of isolation created by the less well developed parts of the road network is, however, valued by some, as contributing to the areas local distinctiveness. Some important works of civil engineering have, however, been constructed in the region. Examples of this are the Orwell Bridge, which was built in 1982, and which was one of the largest concrete structures in Europe at the time of its construction; it also marks the boundary between Ipswich and parkland on the banks of the Orwell (Countryside Agency1999, 58).

Figure 3. Sheringham train station.

Relative lack of industrialisation since the industrial revolution has meant that the canal network was relatively under developed. However, canals were built during the late 18th and 19th centuries. These were an important part of the local economy and some served as inspiration for local artists. The railways are relatively well developed considering the rural character of the region, extending out to coastal towns such as Great Yarmouth and Lowestoft, with smaller lines running to settlements such as Wells, Sheringham, Cromer, Mundesley in North Norfolk, and Hunstanton and King's Lynn. These railways connected the public to the UK-wide rail network, creating the opportunity to visit tourist destinations and fishing spots along the coast. These have served to bring goods and trade into the region, and also stimulated the tourist economy during the 19th centuries. Several coastal towns developed as significant places because of the connections facilitated by the route infrastructures that generated tourism. However, the region's railway network suffered disruption with the closure of the branch lines in the 1960s, but has since been revitalised, with a renewed role in transporting goods, and increased passenger numbers. The region was largely bereft of airfields until the Second World War, however, extensive airfield construction during the middle part of the 20th century left a legacy of airfields and related structures, some of which went on to form the basis for civilian airports in the latter half of the 20th century. For example, Norwich international airport was one of these airfields, and which now plays an important role in bringing trade and tourism into the region.

Historical Processes; Components, Features And Variability

The predominant means of transport in this region has, historically, been water based. However, land transport has also been important, particularly for the movement of certain commodities such as livestock, which were easier to move by land (Williamson 2006, 27). Roman military roads, such as the Pye Road cut across the natural topography of the region (Williamson 2006, 27), with Roman settlement in the area being linked by a network of smaller roads and tracks (Williamson 2006, 41).

East Anglia did not experience the degree of intensive canal building during the 18th century that characterised other areas of the country such as the midlands and the north (Williamson 2006, 75). However, several rivers were improved so that ships could navigate further inland. The Waveney was made navigable between Beccles and Bungay in the late 17th century (Williamson 2006, 75). Subsequent improvements included the Stour as far as Sudbury in the early 18th century and during the course of the 18th century the Little Ouse, the Nar, and the Blyth were also improved (Williamson 2006, 75). The Gipping and the Chelmer were improved in the late 18th century. Some canal construction was carried out, however; improvements to the Broadland River system, included the creation of the New Cut between Reedham and Haddiscoe in the 1830s. Also the construction of the North Walsham and Dilham Canal in the 1820s extended the navigable section of the Ant for 8 km to the north (Williamson 2006, 75) Some of these features were painted by contemporary artists, for example, the painting of Flatford Mill by John Constable (Williamson 2006, 75).

The first railway constructed in the region was the London to Cambridge line, built in 1842. Almost all of the major East Anglian towns were on railway lines by the 1850s (Williamson 2006, 76). The opening up of the landscape that this encouraged had a profound effect on the region, with changes to the economy and landscape accompanying the development of the railways (Williamson 2006, 76). These changes included more intensive production of livestock, and the expansion of potato cultivation in the fens, both of which could now be moved to market more easily (Williamson 2006, 76). Railways also led to urban expansion and stimulated the coastal holiday industry and that of the Norfolk Broads (Williamson 2006, 76). By the 1960s much of the railway network had gone out of use as the result of branch-

line closures; however, resurgence in rail travel and freight in the late 20th century ensured the railways continued to be used. The expansion of trade and increased agricultural production from the late 17th century and this encouraged investment in transport infrastructure. In many cases roads were improved through the establishment of turnpike trusts, with toll houses and inns being erected to accommodate travellers (Williamson 2006, 73). In the 18th and 19th centuries the proliferation of improved turnpike roads transformed patterns of movement in the region towards major centres. Movement of people and goods was not so much connected with the local topography and the configuration of drainage basins (Williamson 2006, 27), but with the improved route systems. This process began the breakdown of the region's older distinctiveness, although still present today, to its modern character (Williamson 2006, 27).

Much of the coast was generally farmland and small hamlets next to the sea until the 20th century when seaside recreation became popular. Much of the land was then purchased by wealthy individuals who planned to create coastal resorts, aided by the construction of railways. It can be argued that Clacton, Walton and Frinton owe their existence entirely to the railways (Williamson 2006, 125). While other places and lordships during the 19th century, such as the estate at Holkham, influenced the development of the transportation and railway system so that travel to and from London was made easier. While relatively short-lived, the remnants of several railway stations and tracks are used as recreational and tourist attractions, for example, the steam railway that runs between Sheringham, Weybourne and Holt.

Air transport made little impression on the East Anglian landscape until the Second World War (Williamson 2006, 77). In the mid-1930s there were only four air bases in the region, but by the end of the war there were 107. These features took up large amounts of space and had a significant impact on the landscape, including the destruction of woods and hedgerows (Williamson 2006, 77) Norwich airfield is now a civilian airport (Williamson 2006, 77). Felixstowe was home during the early part of the 20th century to the Seaplane Experimental Station, which was responsible for designing seaplanes and flying boats. In 1924 design work was discontinued and the station was renamed the Marine Aircraft Experimental Establishment, relocating to Helensburgh in Scotland during the Second World War.

Values And Perceptions

The sense of isolation and remoteness engendered by the relatively poor coastal road network is valued by some local communities and some tourists. The impact of transportation infrastructures, mainly railways and roads, has enabled the development of coastal tourist resorts in the region. This tourist resorts and attractions are valued as a cultural resource in the region, and have been the background for works of art and literature which has played a role in defining English identity and the relationship of English people with the rural landscape.

Research, Amenity And Education

The transport links, including road, rail, and airports (and to a limited extent canals) have obvious utility for the local population and are vital to trade and industry. They also serve to bring tourism into the area. An overall study into the role of railways in bringing tourism and industry to the coast would be beneficial. Transport hubs and heritage resources such as transport museums can play an important role in aspects of education such as geography and history.

Condition And Forces For Change

Development pressure within the study area, along with the continued importance of road, rail and air travel for the local economy will continue to transform these elements of this character type.

Rarity And Vulnerability

Steam trains are still running in North Norfolk. Many railway branch lines went out of use in the 1950s and are now vulnerable to neglect and natural processes such as erosion. Canals although fairly common may be subject to neglect, or infilling by natural processes if not kept up through economic activity, or charitable/government grants. Early roads may be at risk from erosion and agriculture.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (INTER-TIDAL)

Introduction: Defining/Distinguishing Attributes

The inter-tidal areas of this region are extensive and varied in nature, comprising significant zones of saltmarsh, sand and mudflats as well as sandy and shingle foreshore. The sheer size of the former elements is in part due to the punctuation of the shoreline in this area by a series of large estuaries; Breydon Water in Norfolk, the Blyth, the Alde/Ore/Butley, the Deben, Orwell and Stour in Suffolk and Hamford Water in Essex. The Wash area that borders the western edge of the region, is a major inter-tidal area, and has affected the region. This is due to the reclamation of land which has increased land productivity that has contributed to the economy of the region.

Figure 4. Sluice outlet and mud flats close to Brancaster.

The open shoreline comprises sandy foreshore to the north and south of the study area, in places in the north this is mixed with shingle. The central area, however, is particularly well known for its shingle foreshores and spits, mainly composed of flint shingle. Suffolk alone contains 859 ha of vegetated shingle. This is mainly due to the presence of Orfordness,

Europe's largest vegetated shingle spit at c 16 km long. Other significant areas of vegetated shingle include Benacre Ness, Landguard Point, Thorpeness Haven and Shingle Street.

Mudflats and sandflats are found in most sheltered areas of the coast, but most significantly in the estuaries, shorelines along North Norfolk at places such as Holkham Sands and Blakeney Point. Mudflats and sandflats are particularly notable in the wide bays of the Stour which contains c. 16.5 square km of inter-tidal flats, generally muddy but becoming sandier downstream. Holbrook Bay alone contains mudflats up to 1.5 km wide. Mudflats and sandflats are also present in Breydon Water, the Blyth, Alde/Ore, Deben and Orwell as well as Hamford Water, and at Brancaster, Wells and Blakeney.

Saltmarshes is found throughout the study area, although the extent of the saltmarsh varies for area to area. For example 1.07 square km of saltmarsh exists along the entire length of the Stour from Parkeston Quay to Manningtree, largely 50-100 m wide but up to 600 m wide in Copperas Bay (DEFRA 2002). In the adjacent Orwell saltmarsh is restricted to four areas; Cranes Hill, Levington Creek, Colton Creek and Pin Mill. There are significant expanses in Hamford Water (c. 800 ha or one third of the total area) and the Alde/Ore estuary (c, 334 ha). Saltmarsh is also present in stretches of Breydon Water, the Blyth, Deben, Stour and Orwell estuaries as well as Orfordness. Along the foreshore of North Norfolk the area between Wells Next the Sea and Blakney is saltmarsh, and it is associated with the Blakeney Point environs. Another area of saltmarsh, further west from Wells Next the Sea, is Thornham Saltings, which is linked with Holme-On-Sea environs.

Historical Processes; Components, Features And Variability

The nature and location of the landscape features included within this character type arise ultimately from the daily action and interaction of natural and human processes, a process that continues into the present day.

The underlying geology is a significant contributory factor to the landscape character of the region. This comprises Eocene rocks, overlain by a London Clay, a sequence of Quaternary sands and gravels, Holocene sands and muds. Much of the sand found on the foreshore today is created through erosion of the Red Crag cliffs (see Cultural Topography (landward)). This process of sediment deposition is the result of a number of factors including weathering and poor drainage, but has been exacerbated in recent years by increasing sea level rise and erosion rates along the coastline. Effects related to the movement of sediment are generally viewed as one outcome from the climate change. But the movement of sediment along the coast, and the increased storm effect at particular places such as Sea Palling have also been heavily influenced by human activity, related to processes such as harbour and inshore/offshore dredging.

The shingle structures of Orfordness and Benacre Ness have been shaped over long periods of time. Orfordness, for example probably began to form after sea level rise started to slow several thousand years ago (see Palaeolandscape component) through the gradual inshore movement of sediment (DEFRA 2002 appendix a). The formation of the spit visibly gained momentum after the 12th century as eroded material was pushed southwards via currents and longshore drift. At the time of its construction (1165-1167) Orford castle was probably built on the end of the spit, overlooking the harbour, but now lays some 2 km inland. Documentary and cartographic evidence suggests the spit may have grown at around 13 km per year between the 12th and 19th centuries (Williamson 2005, 130) reaching its present length by the 1800s. This growth is recorded on the ness by a series of ancient shorelines preserved as shingle ridges with intervening lows (DEFRA 2002 appendix a). Both spits are still actively moving through a combination of erosion and deposition largely related to the estuaries

(DEFRA 2002 appendix a). Benacre Ness is now more mobile, having migrated northwards at an average rate of 22 m per year over the last 200 years (DEFRA 2002 appendix a).

The estuaries and consequently the majority of inter-tidal deposits are also subject to extensive processes of change, all of which are related to the shingle spit formation discussed above. The area around Breydon Water/the Broads. This was originally a large complex consisting of the Hundred, Yare and Waveney Rivers, all with their own estuarine systems surrounding two islands - Flagg to the north and Lothingland to the south (now the locations of Great Yarmouth and Lowestoft respectively). During the Roman and Anglo-Saxon periods these were utilised and defended as harbours until shingle spits began to form across the estuary mouths and all three were diverted into Breydon Water (Malster 2003). Shingle spits are also known to have blocked several medieval harbours in the area (see Ports and Docks).

The offshore barrier between Brancaster and Wells Next the Sea in North Norfolk is a shingle and sand island that originated from a former spit extending from the coast. The spit was subjected to east to west long-shore drift that moved slightly inshore. The areas around the spit are internationally significant areas for bird breeding and contain many rare plant species. The radiocarbon dating of shell indicated that a barrier had formed by the 9th century AD along with saltmarsh.

Saltmarsh and inter-tidal mud/sandflats are found in sheltered tidal zones. Saltmarsh develops on soft sediments which are only inundated by the highest tides allowing the establishment of salt tolerant vegetation (Williamson 2005, 27). As such these features are generally, although not exclusively, found in the estuaries of the region and behind extensive spits, or where human-made flood or erosion defences have created the right environmental conditions for them to form. For example, vast saltmarsh was formed by the diversion of the Alde by Orford Ness.

Development and survival of inter-tidal flats is therefore partially dependent on human management of the estuaries and land use. In the medieval and post medieval periods vast amounts of saltmarsh were converted to grazing land through drainage and large-scale reclamation. In more recent years the construction and maintenance of flood and erosion defences, partially to protect reclaimed land has influenced the development and loss of inter-tidal flats and saltmarsh.

Furthermore, the coastal processes are revealing a number of submerged forests; at Hunstanton, Brancaster, and Cromer Forest Bed and along the Suffolk coast located around Lowestoft (Ransley and Sturt 2013, 37-40). This process is particularly well exemplified by one of the region's best known and iconic archaeological sites, the so-called Seahenge of Holme-on-Sea (Watson 2005). This monument (called after its better known sister Stonehenge) appears to have been originally constructed on a saltmarsh which over the centuries became a freshwater wetland that became an offshore barrier, preventing sea water from getting access to the area around the circle. The monument became covered and preserved in the resulting peat layers until the sea advanced with rising sea levels in later millennia. Eventually the sand began to cover the peat. Through this process, Seahenge eventually found itself from once being inland to being on the beach, where it was revealed by the eroding away of the sand and peat in the late 20th century, four thousand years since its original construction (http://en.wikipedia.org/wiki/Seahenge). The site exemplifies a range of rivalling aspirations and perceptions of the area, both in the past (as with the changing land surfaces) but also, importantly in the present. Its' present-day character is reflected in several competing types. Depending on the community one is considering Seahenge, it could be a tourist attraction, a ritual or sacred site, a local amenity and a portable archaeological artefact.

Currently the Blyth, Alde/Ore and Deben are strongly constrained by cultural factors, such as marine traffic and the development along the edges of the estuaries, all of which impact on the inter-tidal cultural topography. The Alde/Ore is also largely related to the natural development of Orfordness. The spit has gradually forced the mouth of the estuary southwards for more than 12 km, forcing the river to run parallel with the coast and allowing the development of mudflats some way inland (Williamson 2005, 131; 2006, 18). Human exploitation and experience of these areas (more fully discussed in the Values and Perceptions section below) has seen a variety of manifestations in the past and so into the future: areas have been used as grazing, as holiday or recreational destinations and as the setting of a variety of books and plays.

Values And Perceptions

Inter-tidal landscapes in the East Anglian region are highly valued for their ecological biodiversity and many areas have been given protected status as habitats for wildfowl, wading birds and other wildlife (see below). In addition, and partly as a result of this, the inter-tidal features have become a recreational and tourist attraction. This includes a variety of landscape types from the sandy beaches of North Norfolk, Great Yarmouth and Clacton to the wild estuarine landscapes of the Stour and Alde/Ore. The former and latter are particularly popular with walkers and wildlife enthusiasts.

The inter-tidal areas are also ingrained in the psyche of locals and holiday makers for their literary and cultural values. For example, Hamford Water, consisting of over 2000 hectares of generally inaccessible tidal creeks and islands, saline lagoons, inter-tidal mudflats, sandflats and saltmarsh is well known as the setting for Arthur Ransome's novel 'Secret Water'. This was the eighth book of the popular Swallows and Amazons children's series, published in 1939.

The often bleak and isolated estuarine areas have become the atmospheric backdrop for numerous ghost stories by a variety of authors including MR James (most notably perhaps his haunting `Oh Whistle and I'll come to you, my lad 'based upon an eroding beach in the Region) and Susan Hill's 'The Woman in Black'. Other writers who have made good use of the areas include PD James in a series of murder and suspense stories centred around the bleak beaches and estuaries of the region and Barbara Erskine in her novel 'Hiding from the Light' based upon the 17th century witch trials conducted by local resident Matthew Hopkins.

In recent years the inter-tidal areas of East Anglia have also been specifically perceived as valuable to the archaeological community for their wealth of archaeological remains. These include wooden structures such as fish traps, quays, jetties and hulks, as well as evidence of early prehistoric occupation in the form of stone tools and scattered features. Perhaps the most remarkable of these inter-tidal archaeological sites is Seahenge, a preserved timber circle, once located in an inland saltmarsh and finally left exposed by the incoming tides and eventually spirited away in the teeth of local and pagan opposition.

Research, Amenity And Education

This character type has enormous research value and educational potential. This applies to both the ecological and archaeological aspects. In particular, habitats such as vegetated shingle and inter-tidal flats attract unusual species of flora and fauna and can provide sanctuary for important bird populations. Areas of significance include Scolt Head Island, Blakeney Point, Orfordness and Hamford Water/Walton Backwaters.

In archaeological and historical terms the value of inter-tidal areas has recently been highlighted for a variety of reasons. Firstly the inter-tidal zone is likely to be a 'hotspot' for

the presence of palaeolandscape components. This is particularly applicable to Mesolithic landscapes as availability of protein – as a food source for Mesolithic people - was higher in areas close to the open water and shores at this time. Settlement sites were often adjacent to wetlands and estuaries, perhaps for this reason (Flemming 2002). Therefore, the potential for such sites is high around the shorelines and rivers at each date, especially where shorelines were constant for hundreds or thousands of years (Flemming 2002).

Secondly the waterlogged condition of many inter-tidal deposits such as mudflats and saltmarsh encourages the survival of organic material such as wood, thereby increasing the likelihood of finding structures such as hulks, quays, fishtraps and Monuments, such as Seahenge. Other features likely to be present in the inter-tidal zone include industrial remains such as saltworking sites, oyster cultivation pits and military structures.

Condition And Forces For Change

Inter-tidal character sub-types are often dynamic areas of landscape as a result of their position in a zone which is subject to tidal inundation. There are a series of forces for change associated with these features, both derived from natural and human-made forces.

The net wave energy direction to the coast is from the east and the 'natural' sediment drift for this area of coastline is to the south (DEFRA 2002 appendix a). As such material is eroded from some areas of the open coast and deposited in others. The general direction of sediment (long-shore drift) is to the southeast, although this varies along the East Anglian coast (see http://www.bgs.ac.uk/landslides/happisburgh.html; http://www.geocases1.co.uk/printable/Coastal%20defences%20in%20Norfolk.htm).

For example material is eroded from the cliffs between Lowestoft and Benacre and deposited at Benacre Ness. Erosion rates at Trimingham are high compared to the rest of the region which is removing sediment from the inter-tidal area. The shingle spits are continually moving as a result of these processes, with the southern end of Orfordness varying almost week by week and Benacre Ness slowly moving northwards.

This also has implications for the estuaries which can act as sediment sinks, in addition shingle and sediment can restrict the width of channels and estuary mouths allowing extensive inter-tidal deposits to develop where tides cannot reach. The process of coastal squeeze described above can counteract this, although the situation is often more complicated. For example The Orwell is generally accreting, though saltmarsh erosion is still taking place (Hutchinson Ports (UK) 2003, 118).

The sand barrier at Scolt Head Island was breached in the 1953 tidal surge, but was quickly repaired with human invention and the erection of wood and wire fences to trap moving sand; thus protecting the saltmarsh and coastal areas from the sea. Scolt Head Island has also caught the western movement of sediment partly as a result of the close-to-shore land reclamation from the 17th century around Wells and Blakeney.

More positive forces for change have become significant in recent years as more human-led action has been taken to preserve inter-tidal deposits and prevent erosion. For example, the North Norfolk coast has been closely associated with Shoreline Management Plans (SMPs) to curtail the erosion of the coastline and the inter-tidal area, particularly in those areas along this stretch of coastline that have been designated as important and protected.

Rarity And Vulnerability

Many of the inter-tidal character types in the East Anglia region are recognised as rare or significant. Shingle structures sufficiently stable to support perennial vegetation are a rare

feature in the UK (with approximately 20% of the national resource represented in Suffolk alone, (http://www.nationaltrust.org.uk))and support a diverse and characteristic plant and invertebrate community. Orfordness is the second largest vegetated shingle structure in UK and home to rare undisturbed vegetation communities and nationally important breeding tern populations. It is currently a national nature reserve, owned by the National Trust. Saltmarsh and mudflats can also provide significant habitat for unusual flora and important populations of birds. RSPB nature reserves are located at Aldeburgh, Orford, and Minsmere, and the area is renowned for its numerous butterflies and wild flowers.

This importance is recognised all along the coast by numerous designations. The entire region from Lowestoft to the river Stour is classed as an Area of Outstanding Natural Beauty (AONB), large zones of which are inter-tidal salt marsh and mudflats. This area is also known as the Suffolk Heritage Coast a classification designed to protect coastlines of special scenic and environmental value from undesirable development. There are several SSSIs within the study area, most are recognised for their diversity of habitats with varied plant and animal communities including nationally sparse species. This includes Shingle Street and the Landguard Peninsula due to the number and quality of shingle-dwelling plant species and their importance as a land-fall site for migrating birds. Leiston to Aldeburgh and the Sizewell marshes are SSSIs for their marsh components and diverse plant and animal communities including nationally sparse species.

International designations are also found across the region, most notably within the estuaries as a result of the extensive inter-tidal mudflats and saltmarsh which provide habitats for bird populations and benthic communities. Breydon Water, the Alde-Ore, Deben, Stour and Orwell estuaries as well as Hamford Water all have status as Special Protection Areas (SPA) and RAMSAR sites (internationally significant wetlands). The Alde-Ore-Butley complex is also a Special Area of Conservation (SAC) as a result of its saltmarsh component (37% of the entire resource in the county).

The protected areas also include the Minsmere to Walberswick marshes (SPA/RAMSAR)incorporating the Blyth estuary, The Minsmere levels RSPB nature reserve is home to breeding marsh harriers, one of Britain's rarest birds of prey (Edwards 1991, 94). Westwood marshes are famous for freshwater reed beds used for thatching and cover for birds. The Blyth estuary, heavily constrained in places and large inter-tidal areas in others, supports nationally and sometimes internationally important populations of wintering wildfowl (English Nature 1997).

Hamford Water/Walton backwaters are a particularly special area as a result of its unusual conditions behind a sand spit, different to the adjacent estuaries or open sea. Consequently the area supports unusual assemblages of invertebrates and plants such as hogs fennel and rare rock sea lavender, as well as ragworms and mussels. The area is probably most significant as a refuge for birds, and is designated an SPA due to its populations of Avocet, Golden Plover, Ruff, Little Tern, Dark-bellied Brent Goose, Teal, Black-tailed Godwit, Redshank and Ringed Plover. Two of the larger islands are notable wildlife havens. Horsey Island is the largest, accessible by road at low tide and supports a colony of over 70 harbour seals and grey seals; Skippers Island is a protected bird sanctuary.

Much of the inter-tidal land in the area is under pressure from various forces of change and is therefore vulnerable. This is ultimately related to on-going sea level rise and erosion along the coastline, as described above, exacerbated by human intervention such as dredging and natural factors like increased storminess. Orfordness, for example, is currently eroding to the extent that the lighthouse, dating from 1792, is expected to be lost within c 5 years.

Holkham National Nature Reserve (NNR) is largest in England, comprising 3,900 ha and including habitats of grazing marsh, saltmarsh, sand dunes and foreshore. Holkham NNR is a part of the North Norfolk SSI and is also a SPA and a part of the AONB and World Biosphere Reserve in the area.

However, the most vulnerable aspect of the landscape is saltmarsh, such as between Wells and Blakeney, or close to Holme Next the Sea. A study by Newcastle University showed that 93 ha of salt marsh was lost from the Essex estuaries in the preceding 27 years, 80 % due to coastal squeeze (2000). The Environment Agency has estimated sea level rise to continue at a rate of 6 mm per year; extrapolation of recorded rates of loss suggest no salt marsh would remain in Hamford water by 2050 (DEFRA 2002). Although this would be accompanied by some in increase in mudflats, this would have a number of ecological implications.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (LANDWARD)

Introduction: Defining/Distinguishing Attributes

Generally the foreshore of the region is backed by cliffs, dunes or shingle ridges. This landward area also contains a series of saline lagoons and wetlands and is punctuated by numerous watercourses.

Cliffs occur all along this stretch of coastline, from Hunstanton in the north, along the southern Norfolk coast at places such as Overstrand, Trimingham and Happisburgh, to California and Scratby, and to the Naze in the south. Sections of cliff vary in length from c 0.5 km to 6 km and are especially prominent in the north and central zones of the region. The cliffs vary in height from c. 2 to14 m and are generally composed of a varied sequence of Norwich Crag formation sediments. Particularly mobile cliffs are located between Overstrand and Mundesley and at Hunstanton, and in the vicinity of Happisburgh.

Figure 5. Trimingham cliffs, sea defences and inter-tidal zone.

Sand dunes are less common, again occurring mainly in the area around Winterton and Great Yarmouth (with two designated SSSIs Great Yarmouth North Denes and Winterton-Horsey dunes). Short sections of narrow dunes exist around Walberswick, Minsmere, Sizewell and

Thorpeness in Suffolk, and across the North Norfolk coast such as at Brancaster, Blakeney Point, Holme, and Old Hunstanton. In particular the Blyth estuary is fronted by a narrow and fragile sand-dune system (the Denes). Sand dunes are also found in the southern part of the region behind Walton Backwaters.

Bodies of water, watercourses and wetlands are ubiquitous within this region, often irrevocably linked to one another and to the North Sea. At the heart of these systems are the rivers and estuaries which extend landward from the sea. In the southern half of the area these include the Stour and Orwell, the Deben, the Ore/Butley complex and the Blyth (see also cultural topography inter-tidal). The Stour and Orwell rivers are relatively straight and busy with commercial and recreational traffic whilst in the Blyth and the Alde boating is limited to the lower reaches as extensive areas of drained marsh encroach on the navigable river (Countryside Agency 1999).

These are linked to separate elements of watery landscape such as the extensive reed beds around Snape on the River Alde and reedbed and swamp around the Butley. Human-made features include Loompit Lake, the artificial fishing lake hard against the northern shore of the Orwell, separated only by an artificial bank and a number of reservoirs in the vicinity of the estuaries such as Alton Water and Delf Pond.

Towards the north of the region lie the Broads, a vast area of inland waterways, much valued both as an area of recreational boating and nature reserve. This area comprises over 200 km of navigable waterways and more smaller watercourses, almost all subject to tidal influence. These are associated with a series of c. 60 'broads' stretches of open water, situated adjacent to the river channels, ranging from tiny isolated lakes to large expanses such as Hickling Broad (5.9 km² of open water), most less than 4 m deep (http://en.wikipedia.org/wiki/The_Broads). The waterways and lakes are surrounded by areas of extensive wetland dominated by reeds, rushes and sedge totalling 303 km².

Another significant area of wetland (2018 ha) exists between Minsmere and Walberswick on the Suffolk coast. This includes elements of brackish – fresh water reedbed, open water, wet woodland and swamp. Much of this now belongs to the RSPB and is run as a nature reserve.

Saline lagoons are an important element of the coastal landscape in the East Anglian region, most notably in North Norfolk and along the Suffolk coast. Saline lagoons are a complex habitat comprising areas of shallow, coastal saline water, wholly or partially separated from the sea by sandbanks, shingle or rock (DEFRA 2002, 13), these can be human-made or formed naturally. In total 188 lagoons covering 133 ha can be found in Suffolk alone. Most notably a series of lagoons exists between Benacre and Easton Bavents and from Orfordness to Shingle Street.

Historical Processes; Components, Features And Variability

The form of landward cultural topography within the region is a product of both natural and manmade processes throughout history. The land is shaped by the underlying geology, chiefly the product of glaciations in what has been described as the 'quintessential region of glacial deposition' (Williamson 2006, 13).

In the coastal area the geology comprises crag deposits, a varied collection of clays, gravels and shelly sands dating to 3.5-1.6 million years ago, resting upon the foundation of the London Clay. The smoothing of existing rock formations by the successive glaciations produced the mainly 'muted' topography we see today (Williamson 2006, 15).

It is these deposits which make up the region's cliffs. For example, the cliffs around Clacton to Holland on Sea are composed of a series of Pleistocene gravels, termed Lower Holland and

Wigborough gravels, sands and laminated estuarine clays, which represent the deposits of a much older course of the Thames (D'Olier 2002). The Pakefield cliffs are composed of Corton formation sand underlain by silty sand of the Cromer Forest bed formation; this Corton formation is overlain by Lowestoft Till in the Kessingland cliffs. Sand dunes are a younger product of weathering and their form depends on location as well as drift geology.

The cliffs and sand dunes change their form dramatically as a result of processes of erosion and deposition along the coastline. In general, erosion is an on-going problem along the East Anglian coast, with historical rates of erosion as high as 8 m per year in Suffolk (DEFRA 2002, appendix a), although rates have been slower in recent years (see below). The erosion of the cliffs is a result of weathering, poor drainage above the predominant London Clay and localised longshore drift. Material washed from the base of the cliffs tends to be deposited to the south, further complicating the processes. Erosion is ultimately a product of natural factors, although human influence on such processes as sea level rise and increased storminess is well documented. The presence or indeed absence of flood or storm defences or cliff support works can also significantly affect the location and scale of erosion.

The results of this erosion of coastal land over the long-term have resulted in a number of 'lost villages' along this stretch of coastline. For example, off the coast at Cromer is the submerged village of Shipden which was washed away during the 14th century (cf. http://web.archive.org/web/20091024064202/http://geocities.com/cromerhistory/medieval.html). In 1888 a boat is supposed to have struck the church tower of St. Peter's Church. Much of Eccles-on-the-Sea was washed away during a violent storm in 1604, and in1895 the church tower slipped onto the beach. Other lost villages along this stretch of coastline include: Clare (near Mundesley), Keswick (near Bacton), Wimpwell (near Happisburgh) and Waxham Parva (near Horsey).

Humans have also had a significant effect on the watercourses and expanses of water which are so important to the character of this region. Perhaps the most significant area is The Broads. This comprises a large area of low-lying wetlands and bodies of water focused on a complex of rivers. Originally this area contained large deposits of peat formed by successive periods of marine transgressions on the muted landscape. For many years it was thought that the Broads themselves were 'natural' formations, however the work in the 1950s proved these water bodies to be the result of peat extraction (Lambert and Smith 1960).

Peat was probably extracted in the area as early as the Roman period, although the industry flourished chiefly in the Middle Ages. In the 12th century AD east Norfolk was recorded as being the most densely populated area in Britain and timber stocks were dwindling. The natural peat resource was consequently used as an alternative fuel. As a result of the extent of the peat deposits, peat digging became a major industry between the 12th and 14th centuries with almost every settlement in the area digging its own pit, or turbary, for extracting peat (http://www.broads-authority.gov.uk). Historical records show that these pits gradually filled with water and peat digging had been abandoned by the 14th century. As the pits flooded the area became a wetland (Lambert and Smith 1960).

The complex of rivers and peat extraction pits became essential channels of communication and commerce in the 16th century when Norwich became the second largest city in Britain. Wool, weaving and agricultural products were exported through Great Yarmouth (see Ports and Docks) via the broads, with a series of quays, known as 'staithes' developing in the Broads villages and the Norfolk wherry becoming the distinctive mode of transport. The wetlands continued to be maintained for commercial purposes which included harvesting reeds, rushes and sedges for thatch, animal feed etc. In the 1800s the character of the Broads

was dramatically altered by the arrival of the railway which also brought tourists to the wetlands. Since this time tourism and recreation have dominated the area (see Recreation).

In the absence of the large scale industrialisation seen elsewhere in the country the wetlands persisted in East Anglia and became important landscape characteristics in the 17th century due to the introduction of duck decoys from Holland. These distinctive wildfowl traps were prominent features of the landscape up to the 19th century when the wetlands and estuaries teemed with wildfowl (Williamson 2006, 201). More than 90 decoys were recorded in East Anglia, almost all of which were close to the coast. Early examples were recorded in Purdis Farm, Hemsby and Flixton. Most had dwindled by the second half of the 19th century due to changes in diet and drainage (Williamson 2005; 2006) (see Reclaimed Land), although Fritton continued to be used into the 1950s.

As wetlands decreased in importance many were drained in the 19th and 20th century to provide more agricultural land (see Reclaimed Land). This includes the area now known as the Minsmere to Walberswick marshes. However the levels were allowed to re-flood during the 1940s to act as protection against invasion. Following the war the importance of this landscape was recognized and the marshes were leased by the RSPB in 1947 and ultimately purchased in 1976 in order to create a nature reserve.

This encompasses 9.69 square km of reed bed, lowland heath, lowland wet grassland, and shingle vegetation and is used to demonstrate successful reed bed management (http://en.wikipedia.org/wiki/The_Broads). The Minsmere reserve contains a number of artificial saline lagoons known as the Scrape, deliberately created in the post war years to encourage birds such as avocets.

The remaining saline lagoons in the study area were formed through a number of different processes. The series of three large lagoons on the coast between Benacre and Easton Bavents were formed by the dynamic processes of the coastline (see Inter-tidal). Here shifting shingle bars have ponded back small rivers; seawater enters the lagoons via percolation or overtopping the barriers. The largest of these, Benacre Broad, was created by the closure of a haven by a shingle barrier in 1737. It is likely that these were also partly the result of peat cutting as seen in the Broads area.

Benacre Denes was formed through gravel extraction during WWII and is fed by seawater percolation and rainfall. This was originally the site of three lagoons, however the other two have been lost to erosion in recent years. Similarly, two areas of lagoons on Orfordness are the result of clay extraction. Ephemeral lagoons are also found at Shingle Street, but are constantly changing, and are fed by percolation and overtopping.

The processes which have shaped the watercourses of the region are intricately related to ports and commercial transport as well as inter-tidal deposits.

Values And Perceptions

This character type, although not fully maritime in nature, is directly linked to the sea and is perceived as being part of the coastal area. One of the most significant reasons this character type is valued in East Anglia is for the wealth of wildlife which it attracts, in particular birds. The wildlife in turn attracts enthusiasts who frequent the area. This is reflected in the number of designated areas (e.g. the Broads, Benacre to Easton Bavents) and nature reserves in the region (e.g. Minsmere, Halvergate island, Scolt Head Island, Holkham, Titchwell Marsh, and Snettisham).

The Broads landscape stands out within the region as having its own micro-character. This is partially related to its wildlife, as well as the well-established tourist industry focused on

boating. The waterways of the region as a whole are a haven for sailing enthusiasts as well as anglers in some places. There is good pedestrian access to this character type including well-established coastal paths and it is therefore valued by walkers.

Overall this character type is perceived as being very 'natural' and 'unchanged'. There is a perception of serenity and tranquillity which has been fostered by the lack of transport infrastructure bringing industry and commercial interests into the study area.

From an historical and archaeological point of view the waterways, including the Broads, are steeped in history associated with the heyday of the East Anglian ports in the Middle Ages (see the Character Type text for Ports and Docks). The Norfolk wherry characterises this industry and restored examples can still be seen on the Broads. The cliffs are also important from a much longer view into the past. These act as repositories for fossils including evidence of the earliest occupation of northern Europe (see the Palaeolandscape Character Type text).

Research, Amenity And Education

This character type has huge potential for research and education both in ecological and historical terms. The landscape attracts rare wildlife and flora which can be studied in its natural environment. This has been outlined above in terms of wetlands in particular, however the cliffs provide rare nesting habitat for birds such as sand martins and unusual plant colonies are found in both cliffs and sand dunes (English Nature 1997). This is reflected by organizations such as the Minmere RSPB reserve and the Broads Authority which have well-established education strategies.

In recent years a programme has been set up in the Broads to retrain a workforce in the techniques of the traditional marsh men in an effort to manage the wetlands. As such a long abandoned way of life can now be seen in its original context. Much of the reed from the area is still used for thatching roofs in the traditional local manner.

The cliffs in the area are particularly valuable for palaeontological research as a result of the land and sea fossils exposed within the cliff face. These include the remains of subtropical fish, sharks teeth and birds (English Nature 1997). The potential educational importance of the cliffs for increasing public understanding for finds such as these is well represented by the Natural England on-site noticeboard and leaflets. At the site of the noticeboard at West Runton fossil remains of an early woolly mammoth, the well-known West Runton Elephant, were found. Recently the remains of early hominins have been found at Pakefield and Happisburgh (see the Palaeolandscape Character Type text). The latter research topic is documented as a key activity for marine Palaeolithic research (Ransley and Sturt 2013, 10-12).

Condition And Forces For Change

One of the greatest factors of change for this character type in East Anglia is erosion. Rates of erosion have varied over time and tend to be intermittent, with higher rates of loss during storm events followed by quieter periods. For example, between 1836 and 1903 the Minsmere cliffs, south of the sluice, retreated by c 156 m, between 1903 and 1976 there was very little change, although erosion continued at a slow pace (Pye and Blott 2006). As a result of erosion some of the cliffs and sand dunes in the area are in a poor condition and many of the water bodies are threatened (see below).

This effect is being monitored through the Shoreline Management Plans (SMPs), which are used to conduct large-scale assessment of the risks associated with coastal processes aiming to reduce risks to people, as well as threats to historic and natural environments (http://www.environment-agency.gov.uk).

Smaller scale forces for change include boatwash and pollution in the waterways. This is particularly significant in the Broads area where speeding boats have severely damaged riverbanks via boatwash as well as polluting. The silt released from the banks collects within the channels which have to be dredged. The Broads Authority has launched a campaign to try and prevent these effects.

Increasing pressure for development along the land close to the coast is also a force for change of.

Rarity And Vulnerability

Many of the sub-types included within this character type are rare to some degree. Sand dunes are rarer in southern and eastern England than elsewhere in the country and can support rare flora. Many in the region as a whole are protected including Great Yarmouth North Denes which is a Special Protection Area. The cliffs although a common sub type around the country, are particularly notable in this region for the fossil remains which they contain. The cliffs around the Naze are recognised for this in terms of designation as an SSSI. The cliffs at Pakefield and Happisburgh have proven so far to be unique in terms of redating hominin occupation in Northern Europe (http://www.ahobproject.org).

The wetlands and water bodies with the region are particularly significant. East Anglia contains a huge reedbed resource with 474 ha in Suffolk alone making up one fifth of the national resource (English Nature 1997). Reedbeds notably support breeding bird populations. Saline lagoons are internationally important (a primary habitat under the EU Habitats Directive) due to the small size of the existing resource which support specialist and rare invertebrates. Minsmere – Walberswick as a wetland landscape contains a diverse assemblage of animal and plant communities including a number of nationally sparse species.

A good example of the significance of this landscape type is the Broads area which is afforded the same legal protection as a national park for its blend of wildlife, distinctive landscapes and buildings.

Many of the elements discussed within this character type are currently at risk. The majority of threats facing these sub types are related to sea level rise, in particular erosion. This threatens cliffs, sand dunes, wetlands and saline lagoons alike.

Cliff erosion is variable as discussed above but in some areas has been devastating, leading historically to the loss of settlements such as Dunwich and more recently Covehithe and Happisburgh to the north of the area. Rates of erosion have been recorded at up to 8 m per year between Benacre Ness and Easton Bavents (DEFRA 2002, appendix a), 3 m per year around Dunwich and 1.8 m per year at Pakefield (ibid). It has been estimated that the total effect of erosion at Dunwich has probably resulted in the loss of c. 8 km of land in the last 8000 years, and this suggests that the cliff face was once in the area equivalent to West Rocks, several km offshore (D'Olier 2002).

Between Benacre and Easton Bavents the knock-on effect of this erosion is the threat to the saline lagoons. Without intervention the erosion of the cliffs will continue until the shingle bar fronting the lagoons would be breached, taking both lagoons and reedbed. Two of the broads at Benacre Denes have already been lost to erosion. This is exacerbated by pollution from agriculture and sewage and coastal defence works.

It is predicted that as the global climate changes sea level will rise further and storminess will increase leading to a consequent increase in erosion rates, leaving the cliffs, sand dunes and wetlands of east Anglia increasingly vulnerable.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (MARINE)

Introduction: Defining/Distinguishing Attributes

The marine cultural topography in the area is clearly linked to the substrate and drift geology of the region. The underlying geology in this area is dominated by silty clays, sandy silts and sands of the Palaeogene London Clay Formation, Woolwich Beds and Thanet Formation (BGS 1989). The superficial geology comprises sand and gravelly sand throughout with pockets of gravel, sandy and gravelly mud notably clustered in the south around the entrance to Harwich Haven. Overall the North Sea is c 20-40 m deep in this area. The seabed in this area is mainly a thin, superficial layer of diverse sediments and exposed bedrock, with a variety of small and large-scale bedforms, including sandbanks, sub-marine dunes and sand patches (Sturt and Dix 2009, 12), overlying exposures of Quaternary, Cenozoic and Cretaceous sediments (Sturt and Dix 2009, ix). These bedforms can be dangerous for mariners if not avoided. Some of these deposits have high archaeological potential. The rich marine life and biodiversity of the marine cultural topography is linked to the long-term cultural association of the coastal populations with the fishing industry.

Deposits can vary widely. In the approach channel around the Harwich Haven geological sediments are locally covered by a thin veneer of fine sands and mud, with coarser sand near Shipwash Bank. To the north there is a patchy and thin covering of sand overlying a gravel or clay substrate. East of Shipwash Bank sediments are generally immobile coarse sand and gravel. To the South is predominantly mud and gravel, becoming sandy to the south-east. Around the Naze sand gives way to clay bedrock.

The Outer Thames REC (Regional Environmental Characterisation) recently conducted a large survey of the southern part of the area. The East Coast REC multidisciplinary investigation that employed 'state of the art' techniques to develop a broad understanding of the habitats and areas of archaeological interest over an extensive area of approximately 3,300 km^2 of the seabed off East Anglia (CEFAS 2011).

The REC divided the south of the area into three main zones based on marine features; the western zone is dominated by a large coast-parallel sandbank system made up of well-sorted sand with sandy gravels in the troughs between. The central zone comprises a bedrock platform overlain by a thin gravelly lag deposit, dispersed sandy bedforms and isolated sandbanks and the eastern zone is made up of extensive sand dunes (Sturt and Dix 2009, ix).

In the south the London Clay formation is at or close to the seabed across much of the area. This includes basal elements comprising erosion resistant bedrock formed by cemented beds of volcanic ash. These give rise to a number of named features on the seabed including Naze ledge, Kettle Bottom and West Rocks (D'Olier 2002, 19).

One of the most unusual features on the seabed in this region is the outcrop of bedrock (Pleistocene Coralline Crag) off the Thorpeness headland. This type of feature is unusual off this area of coast and attracts local sea life. The area is also a potential recreational dive site (Oxford Archaeology 2007).

Sanbanks off the Norfolk coast create conditions for fishing, but also pose a danger. The sandbanks are dynamic, constantly shifting and altering in form making navigation in this area dangerous. They consist of sandy sediments that are permanently covered by shallow sea water, typically at depths of less than 20m below chart depth

(http://jncc.defra.gov.uk/protectedsites/sacselection/habitat.asp?FeatureIntCode=H1110). The bank system is part of the Special Areas of Conservation (SAC). The Haisborough, Hammond and Winterton group consists of: Haisborough Sand, Haisborough Tail, Hammond Knoll, Winterton Ridge and Hearty Knoll. Hewett Ridge and Smiths Knoll form an older (~7,000BP) sequence of sandbank ridges located along the outer site boundary. Inshore are the Newarp Banks and North and Middle Cross Sands which lie on the south west corner of the site. These banks are believed to be geologically recent, their genesis dating to around the 5th Century AD (Cooper *et al*. 2008).

Historical Processes; Components, Features And Variability

The marine cultural topography of the region is largely a product of natural processes throughout history. The seabed has been (and is) shaped by the interaction of underlying geology and marine erosional and depositional processes. However, the survival of these features is dependent on both natural and human processes. For example, the increased human activity since the Second World War, in terms of aggregate extraction and offshore developments such as hydrocarbon extraction, and increasingly the development of offshore wind farms is having significant impact on the seabed.

The majority of bedforms are transverse to the dominant north-east to south-west tidal flow (Sturt and Dix 2009, 12). A series of ten enclosed deeps have been interpreted as being formed at the margin of the Elsterian-Anglian glacial maximum ice limit (Sturt and Dix 2009, 12), through drainage or discharge of glacial meltwater (Sturt and Dix 2009, 35). These are distributed within the central and eastern zones of the Outer Thames REC (see above) and are orientated NNE-WSW (Sturt and Dix 2009, 35, fig. 3.11). The stratigraphic relationship of these features with the Thames-Medway palaeochannel located in the south of the area, suggests that this feature was formed before the Elsterian-Anglian glaciation, possibly as early as Cromerian Complex II(OIS 18: c. 720,000 BP), when correlated with terrestrial river gravels on the Essex coast (ibid, ix). During the last marine transgression tidal flat deposits, known as Elbow Formation were laid down at the sea edge and eroded again as sea levels continued to rise (D'Olier 2002, 19).

There is a growing body of evidence for submerged palaeolandscapes accrued through marine industrial processes such as aggregate dredging and commercial trawling. Research in dredging area 240, for example, was catalysed by the 2008 discovery of 75 Palaeolithic artefacts including hand axes, flakes and cores and bones including woolly mammoth, bison and reindeer in stockpiles of gravel in Belgium. These were traced back to their origin, some 10 km off the coast of Great Yarmouth (Wessex Archaeology 2009). Mesolithic artefacts have also been dredged up offshore, including numerous artefacts from Brown Bank and Dogger Bank (see Palaeolandscape component). Subsequent to the Mesolithic/Neolithic transition (i.e. from c. 6000BP) the area was inundated and therefore unoccupied.

The sandbanks in the marine area are not fixed features as they are subject to sometimes large changes depending on coastal dynamics. For example, in 1868 Dunwich and Sizewell Banks were clearly distinct from one another. By 1949 they had merged, although the 20th century saw much further erosion and movement inshore. Currently the southern series of sandbanks measure 1-5 km across and 10-30 km long with crests commonly drying at low water (REC8). The channels in between are 2-5 km across and typically located at a depth of 20 m. The sandbanks form a protective barrier for the coastline, as well as providing fishing grounds. However, they are also dangerous because of their mobility and shallow depth, making this an area rich in wrecks. As a result, a system of lightvessels were deployed in the 19th century to warn ships from getting too close to the sandbanks.

Values And Perceptions
The biodiversity of the marine cultural topography, especially where it relates to fish stocks forms a component of the highly valued fishing heritage of the region. The high diversity of substrates, including fine and coarse sands and variation in degree of exposure has created a higher degree of biodiversity around The Wash. The marine cultural topography also has high archaeological potential, and can contribute to our understanding of past landscape use.

Research, Amenity And Education
The research, amenity and educative value of the resource include academic research, as well as public education and enjoyment. Research potential includes areas of maritime archaeological potential, defined as areas where high potential for shipwreck losses coincide with areas of high preservation potential. Palaeo-valleys (the Thames-Medway) are also areas of high research potential, including the reconstruction of submerged and buried landscapes, integrating geophysical, geomorphological and sedimentological investigation of offshore river systems and allowing areas of archaeological potential to be better understood. This contributes to the emerging field of submerged prehistoric archaeology.

The outcrop of Coralline Crag off Thorpeness provides a unique research opportunity in terms of its ecological and geological value, attracting species not usually found in this area.

Amenity and education value could include geological and oceanographic perspectives, as well as the study of how marine industries such as aggregate extraction interact with the natural environment, effecting the movement of sediment along the coast.

Condition And Forces For Change
The major forces for change of this character type tend to be ‘natural’ processes such as sediment deposition, and the tidal current. The activities of animal species such as fish and birds may also affect the environment to a certain extent. It is also likely that these processes, particularly rising sea levels and climate change are partly created by humans. Many of the geological features are constantly shifting such as the series of shingle bars at the mouth of the Deben, known as ‘the knolls’, as well as the sandbanks off the Norfolk coast.

Geological features are also added to and under pressure from offshore development activities. Conditions and forces for change also include industrial processes: trawling (commercial fishing), dredging for aggregates, the hydrocarbon industry, along with the transport of raw materials and consumer goods. The dredging of channels for large ships and military activities may also have an effect.

Rarity And Vulnerability
The marine cultural topography is under pressure natural and culturally induced processes such as erosion, sea-level rise and global warming. Ecosystems are under pressure from human activities such as trawling and offshore developments (wind farms, aggregate extraction). These activities as well as the movement of water and sediments could damage the prehistoric and historic features. Natural bedrock or hard substrata of any type are unusual on this coast (Moore and Bamber 1995). Therefore features such as the outcrop of Crag at Thorpeness are rare in this area.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (PALAEOLANDSCAPE COMPONENT)

Introduction: Defining/Distinguishing Attributes

The palaleolandscape component is most commonly found within the East Anglian region as palaeochannels and prehistoric land surfaces. Such features date from the Lower Palaeolithic through to the Neolithic era in places, spanning a time period of c. 950,000 years. Elements of palaeolandscape occur in coastal land, inter-tidal and marine zones as a result of the complex series of processes. In brief, hominin (humans and their ancestors) occupation of the region, and more generally what we now know as the British Isles, began in a period when Britain was still part of the European mainland and the North Sea was dry land. As a result the entire region has the potential to contain prehistoric remains and landscapes, many now submerged beneath the North Sea and periodically exposed in inter-tidal areas or stratified beneath some areas of coastal land.

Elements of palaeolandscape occur in the region in a variety of forms and locations. There is an extensive series of palaeochannels and rivers representing a number of relict river systems including the older course of the Thames, the Ancaster, Bytham and Yare. Recently Palaeolithic sequences have also been identified in the marine zone, most significantly in the vicinity of Great Yarmouth (Wessex Archaeology 2008a) Happisburgh and Pakefield (Wessex Archaeology 2008b), reflecting continuations of the onshore deposits.

Palaeolandscape in the East Anglian region is not restricted to the Palaeolithic, but also Mesolithic. Perhaps the most renowned later land surface discovered is the 'Lyonesse' surface, which outcrops in places on the stretch of coast between Jaywick and Dovercourt.

In addition to these known deposits there is considerable potential for further palaeolandscape components within the region and a series of 'hotspots' has been identified by Flemming (2002, 7). These include the fossilised river valleys and cliff coasts discussed above, as well as estuaries, wetlands, mudflats, and peat deposits, scattered all along the coastline of this region. These hotspots are particularly relevant to Mesolithic landscapes.

Historical Processes; Components, Features And Variability

The presence of submerged and buried palaeolandscapes in offshore and coastal areas of East Anglia is the result of a complex series of past sea level changes and subsequent palaeo-geographic variations. This is intricately connected to the cycles of glacial and interglacial which characterised the period from the earliest known occupation of Britain through to the present.

The earliest known evidence for the occupation of Britain were discovered at Happisburgh, Norfolk, and Pakefield, Suffolk. These push back the proposed earliest known date of human occupation in Britain, and consequently in Northwest Europe, some 200,000 years to 700,000 BP (Wessex Archaeology 2008b, 2). Excavation reports suggest that the date may be pushed even further back to c. 950,000BP (http://www.ahobproject.org/Happisburgh.php). During the period from which these finds come from, the southern North Sea was infilled by a massive delta created by sediment from several major rivers (Gibbard 1995) and Britain was a peninsula, joined to the mainland of Europe. The exposures comprised an extensive series of fluvial and related sediments that extended beneath the North Sea.

Prior to the Anglian Glaciation the River Thames followed a different course, entering the sea via the Suffolk coast. Remnants of the channel surviving in Essex and Suffolk have high potential for palaeolithic archaeological remains (Austin 1997, 5). Other palaeochannel systems of note include the Ancaster and Bytham rivers, the exact courses of which are unknown (Wessex Archaeology 2008b). These palaeochannels and their corresponding floodplains, rich in resources, acted as foci for palaeolithic hominins resulting in the presence of occupation evidence and larger-scale palaeolandscape features. These have been revealed in several ways, including the sediment sequences exposed in coastal cliffs at locations such Clacton in the early 20th century. The Clacton cliff contained at least three phases of Palaeolithic occupation, giving its name to the 'Clactonian' flint tool industry.

The Cromer Forest Bed and Wroxham Crag Formations are also of interest. The former is a deposit of organic detritus laid down within the channels and floodplains of rivers. This has produced significant evidence of wood and plant remains in the north of the region, as well as worked flint including a hand axe (Wessex Archaeology 2008b, 4) and butchered bone.

The recent project undertaken off the coast of Great Yarmouth (Wessex Archaeology 2008a) in Dredging Area 254 targeted peat and clay deposits close to the seabed thought to be infill deposits linked with the Yare Palaeo-valley. Discoveries in Dredging Area 254 have added to the growing body of evidence associated with submerged palaeolandscapes accrued through marine industrial processes such as aggregate dredging and commercial trawling (Wessex Archaeology 2009).

The region is also unique in having extensive deposits of Lowestoft Till, deposited during the later Anglian Glaciation. This is regarded as the single most important stratigraphic marker in Pleistocene Britain (Austin 1997, 5). East Anglia was at the maximum limit of the ice sheets during the Anglian glaciation, allowing Lowestoft Till to be directly related to Thames gravel terraces. These provide the longest record of Quaternary events in Britain and are rich in Paleolithic sites (Austin 1997, 5). Excavated sites can be related to this record and given a relative date, making East Anglia pivotal to understanding the Palaeolithic in Britain (Austin 1997, 5).

The series of glacial and interglacial periods which followed resulted in periodic abandonment and re-occupation of Britain. This was partly a result of the extreme cold and partly the result of the enormous changes which accompanied the climatic upheaval. The melting and freezing cycles resulted in sometime large and rapid fluctuations in sea levels, resulting in exposure of land in the now North Sea basin. The release and storage of water in glaciers (glacio-eustasy) was further complicated by the rise and fall of the earth's surface with the weight and release of the ice sheets (isostasy), leading to complex geological changes.

By the time of the Last Glacial Maximum (LGM; c. 20,000 BP) an ice sheet extended across the British Isles as far south as Norfolk, resulting in large-scale exposure of the continental shelf. As the ice sheet melted the study area underwent a long period of sea-level rise, steady at first but leading to a rapid rise from c. 15,000 BP.

Overall, the transformation of the North Sea area was complex process during this period. Research indicates that areas of the southern North Sea or 'Doggerland' (Coles 1998) was exposed and inhabitable at different times, reaching a situation similar to the current day by 6000 BP (Shennan *et al.* 2000). As a result of the preference for estuarine and marine locations during the Mesolithic the potential for submerged landscapes of this period beneath the current sea bed and around the present coastline is likely to be high. This is reinforced by the finds from fishing on the Dogger and Brown Banks, as well as the recent work off Great

Yarmouth (Wessex Archaeology 2008a). The former would have been islands, periodically cut off from the mainland but rich in resources at various times in the Mesolithic. Following this period of transgression and maritime exploitation settlement generally moved away from the coastline. A number of artefacts and features dating to the Neolithic and Bronze Age have been found at Clacton, in association with the 'Lyonesse Surface', including pottery and flintwork. However evidence suggests the surface was inundated in the Neolithic period, shortly after 3800-3700 BP (Wilkinson and Murphy 1995, 101).

The Lyonesse surface was discovered and named by Samuel Hazzledean Warren and contained a series of settlements dating from the Mesolithic to the early Bronze Age placed to exploit coastal and estuarine resources. Hazzledean Warren suggested that sites could be divided into campsites, pit dwellings, cooking holes, hearths and wooden structures (Wilkinson and Murphy 1995, 101), indicating a good degree of preservation across the landscape. Today the surface is depleted due to coastal erosion and development, though patches are present at the Walton end of the Naze (Wilkinson and Murphy 1995, 100). A significant assemblage of microliths has been found at Stone Point in the Naze and on Dovercourt beach. The assemblage from Stone Point included a tanged point which may place the origin of the settlement in the area as early as the Upper Palaeolithic (Jacobi 1980a). A logboat was also observed on Walton beach in 1936: although its date was unknown, it may have belonged to this surface too.

Mesolithic implements have also been recovered offshore; numerous artefacts have been dredged up by fishermen north of the region, particularly around Dogger Bank and Brown Bank. The latter feature is in the far north-east of the current study area and has produced thousands of bones, some of which have been identified as worked aurochs bones and dated to the early Mesolithic (Louwe Kooijmans 1970-1). It is thought that these represent the remains of coastal settlement in this area, possibly sheltered behind a coastal barrier (now Brown Bank) (Louwe Kooijmans 1970-1). A Mesolithic perforated mace head was also recovered from the coast near Great Yarmouth (Wymer 1977).

Mesolithic sites were often adjacent to wetlands and estuaries (Wymer 1977), therefore, the potential for such archaeological sites is high around the shorelines and rivers at each date, especially where shorelines were constant for hundreds or thousands of years (Wymer 1977). The coastline was at its present line by around 8000 BP (Williamson 2006, 19). Although it has been subject to gradual coastal erosion, the potential for prehistoric remains as far back as the Mesolithic in this zone is high eg the Naze in Essex, which once formed the northern side of the major river valley and the bed of the River Orwell from which an Acheulian handaxe was found.

Values And Perceptions

At present the public perception of submerged landscapes in the region is minimal and little value is placed on this remarkable resource from a wider perspective, although some relevant work was carried out by Natural England in their 'Undersea Landscapes' campaign that took place 2008-9. Value is becoming more positive on these remains and resource due to growing interest in submerged landscapes fuelled by the media and popular culture. A 'Time Team' special screened in 2007 entitled 'Britain's drowned world' presented a popular overview of current knowledge on submerged landscapes beneath the North Sea receiving high viewing figures.

There is also a developing interest in palaeolandscapes within certain sectors of society who have come into contact with the resource. In particular, fishermen and aggregate dredgers who often recover artefacts such as stone tools and bone, are reporting the discovery of finds

form the sea floor. 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. This is reflected in publications such as Wessex Archaeology's 'Dredged Up from the Past' Newsletter which reports on the finds from the reporting protocol.

Submerged landscapes are becoming ever more recognised and valued within the archaeological community. For example the North Sea Palaeolandscapes Project (Gaffney *et al.* 2007). However, although submerged landscapes remain under researched, the wealth of the evidence within this region is well recognised and it is anticipated that results of on-going work will help to raise the profile of this resource.

Research, Amenity And Education

The palaeolandscapes within the East Anglia region (covering the southern North Sea area) may be crucial to our understanding of human development and periods of prehistory for which we have little evidence. Buried landscapes have a high potential for making strong contributions to our knowledge as a result of being protected from erosion or human intervention.

Historically, submerged landscapes have had a very low profile within both the wider population and the archaeological community. However, their possible extents and significance have increasingly been recognised and work has begun to address this. Nationally important projects and publications include Southampton University's 'Reassessment of the Archaeological Potential of Continental Shelves' (Dix *et al* 2004) and Birmingham University's North Sea Palaeolandscape Project, has been extended to other areas. The North Sea Palaeolandscape Project has mapped extensive features from geophysics and borehole data, producing its own characterisation of the topography under the sea floor. These features includes areas of depression, interpreted as lakes, channels and 'island' clusters at 10,000 BP. These activities and the importance of understanding the submerged landscapes from new technologies make this one of the key research activities in understanding the early Holocene/Mesolithic (Ransley and Sturt 2013, 42-3).

In the East Anglian region the discovery of internationally important deposits has led to strong interest and the establishment of a number of research projects, many funded through the auspices of the ALSF including the work undertaken by Wessex Archaeology off Happisburgh, Pakefield and Great Yarmouth (Wessex Archaeology 2008a and b, 2009). *The Relic Palaeo-landscapes of the Thames Estuary: Site of the earliest hominid occupation of the British Isles* is being conducted by the University of Southampton (http://www.southampton.ac.uk/archaeology/research/projects/the_relic_palaeo_landscapes_of_the_thames_estuary.page?#overview). The aim of the project is to investigate the extensive, well preserved, submerged palaeo-landscape from Clacton to the south and Pakefield to north in order to enhance understanding of the earliest occupation of British Isles (University of Southampton *in progress*).

Such geophysical and geotechnical methods have been established as excellent techniques to investigate this resource which is often inaccessible, although they can be expensive. However, a great deal of work still needs to be undertaken in this field: accurate maps of past shoreline locations and a definitive reconstruction of past sea level change and palaeo geography are not currently available. The reasons for this are numerous, complicated by the fact that sea level curves often differ. The lack of knowledge about past land surfaces mean that modern bathymetry has to be used in reconstructions, despite many pitfalls and potential

flaws in attempts to relate marine bathymetry to past topography. It is anticipated that on-going work will help to rectify this situation.

The potential data which may be obtained through further research is likely to be of national and international significance, both for the archaeological community and the wider population. Detailed reconstructions may help us to understand our past and provide an excellent multi-purpose educational tool.

Condition And Forces For Change

The overall condition and extent of palaeolandscape within the region will never be fully known, however, current research indicates a remarkable state of preservation in places. In the coastal zone survival has been shown to be irregular and this may be exacerbated by on-going erosion and wave action. Continuing research is being carried out by the Regional Environmental Characterisation (REC) projects, the aim of which is to 'acquire data of the highest quality and detail possible; to enable broad scale characterisation of the seabed habitats, their biological communities and potential historic environment assets within the regions' (http://www.alsf-mepf.org.uk/projects/rec-projects.aspx). The region is covered by both the Outer Thames Estuary REC and the East Coast REC.

The condition of the resource is affected by conflicting influences. This area of coastline and offshore seabed is under increasing pressure from development and industry. This includes potentially damaging activities such as aggregate dredging, trawling and large developments both onshore and offshore such as recreation and harbour improvements. The Stour and Orwell estuaries, which can both be identified as hotspots for surviving palaeolandscapes, are both regularly dredged, possibly have an impact on their survival. This is further compounded by the considerable erosion along the coastline. This is particularly evident at Happisburgh, Trimingham, and to some extent at Hunstanton, and further south at Dunwich where large chunks of cliff regularly fall into the sea.

In contrast a number of other influences are changing our understanding of the resource in a positive manner. This is most clearly exemplified by the large amount of research being funded by the ALSF. The study area is a crucial resource for aggregates, both nationally and internationally with large licensed areas and this was offset by ALSF funding. Overarching academic research is also adding to this. Research includes the REC projects and HSC.

Erosion is a distinct problem along stretches of the Norfolk and Suffolk coastline and work to prevent the loss of any further land, particularly in cliff areas, may also prevent the exposure and loss of any further deposits. DEFRA and the Environment Agency are taking steps to deal with these issues as outlined in 'Adapting to Coastal Change: Developing a Policy Framework' published in March 2010. However, prevention of erosion is only one of the many complex issues considered in the Framework, which also considers allowing defences to be breached in places and the more effective management of coastal change. The Framework introduces 15 Pathfinder projects which explore in specific locations, a range of solutions to erosion and flooding and includes the views of the local community in the decision making process.

Rarity And Vulnerability

Palaeolandscapes are rare survivals in the UK and beyond. The palaeolandscape components in this region have a national and international significance.

The exposures at Happisburgh and Pakefield and their offshore components constitute the oldest hominin occupation evidence north of the Alps, and have the potential to significantly aid our understanding of Europe's earliest populations. Similarly the presence of well

stratified sequences throughout much of the Palaeolithic and the proximity to the edge of the ice sheet during the last glaciation means that the region is crucial to understanding of parts of the Palaeolithic. This is exemplified by the recent finds off the Great Yarmouth coastline which may indicate occupation during a period of supposed abandonment. In addition Clacton is an important Lower Palaeolithic type site, giving its name to a form of flint tool manufacture and has been identified across Northern Europe.

While the Mesolithic component may not be as prominent, this also has the potential to be internationally significant. The current research on the North Sea basin indicates that this area would have been rich in estuarine and maritime resources and therefore appealing to Mesolithic communities. Excavation over a number of years in Denmark has revealed some well-preserved Mesolithic settlement sites (e.g. Tybrind Vig; Andersen, 1987); a landscape that would have resembled Doggerland. In Holland, work at their ports has led to the recording of over 10 tonnes of bone trawled from palaeolithic surface deposits each year.

The vulnerability of the resource is amply demonstrated by the destruction of the Lyonesse surface since it was first recorded in the early 20th century. The advent of sea wall construction, coastal erosion and resort development have strongly impinged upon its survival leaving only fragmented layers of the sequence (Wilkinson and Murphy 1995, 1).

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: ENCLOSED LAND

CHARACTER TYPE: RECLAIMED LAND

Introduction: Defining/Distinguishing Attributes

Large swathes of reclaimed land survive in East Anglia, mainly as a result of its low-lying topography and proximity to the North Sea. Of particular note are the extensive areas of the Fens around The Wash that lie in Norfolk and the Broads region in the north east, including the seaward area of Halvergate Marsh. The former is reclamation from wetland, the latter from tidal marshes. However smaller areas of piecemeal reclamation exist throughout the coastal region. For example, approximately 30% of the Suffolk coastal NMP project area is composed of drained, reclaimed and embanked land (Hegarty and Newsome 2005, 79). Many areas along the North Norfolk coast, for example at Holkham, have been reclaimed from the sea or tidal marsh as a result of natural formations such as dunes, or from the construction of flood and erosion banks. In Suffolk areas of reclamation are notable around Orford and the estuaries.

Figure 6. Holkham reclaimed enclosed land (Oscar Aldred).

Distinctive types of landscape have been created through land reclamation in the region. One of the most distinctive landscape types is coastal grazing marsh, an artificial environment created by enclosing saltmarsh. This has traditionally been used in the region for grazing cattle in summer and sheep throughout the year (English Nature 1997, 8). The relict saltmarsh structure is often still apparent in early dyke systems. A distinctive feature of the built

environment which is intimately associated with reclaimed land in this region is the wind pump or drainage mill, used to prevent flooding.

Historical Processes; Components, Features And Variability

Large scale reclamation of coastal wetlands in East Anglia began in the Anglo-Saxon period, although small scale reclamation may have been attempted by the Romans. By the late Saxon period the Norfolk marshland contained small villages with irregularly shaped fields protected from the sea by walls and embankments (Williamson 2006, 193-4). It is possible that reclamation of the Suffolk coastal marshes also began at this time (Williamson 2005, 28).

Reclamation increased in scale in the 12th and 13th centuries as the wealth and prosperity of the region grew with the burgeoning textile industry, although rising sea levels resulted in the need to defend previously enclosed land. One area which is known to have been extensively reclaimed at this time is the marsh around Orford, following the construction of the castle in the 1160s (Williamson 2005, 28). It is also possible that the draining of Halvergate Marsh began early in the medieval period.

The naming of the 'Kings marshes' at Orford may indicate royal intervention in this reclamation (Hegarty and Newsome 2005, 81). In many cases it is likely that reclamation was a community activity, although piecemeal and small scale drainage also took place. Land was reclaimed for both grazing marsh and arable purposes, but also in creating a buffer between the sea and productive land.

The new fields were created in bundles of parallel strips and medieval documents indicate that grazing marshes were usually divided into discrete properties owned by specific individuals (Williamson 2005, 29). Dykes acted as fences dividing the property and also provided drinking water for stock.

There was a notable similarity between reclamation in East Anglia and Holland at this time. While this may have been parallel development there is a possibility that Dutch specialists were employed in the East Anglian process (Williamson 2006, 194). These early medieval reclamations are often recognisable today as the original pattern of the saltmarsh was retained as serpentine dykes.

Reclamation accelerated in the late medieval/early post medieval period. A number of religious houses such as Leiston Abbey and Butley Priory on the Suffolk coast were involved in draining large areas of the surrounding land prior to the dissolution. In the 1530s and 1540s 400 acres of marsh at Hollesley was reclaimed. Subsequently, in the 1570s 247 acres was reclaimed at Walton and in the 1590s a sluice was erected to drain the marshes around Trimley. It is likely that committees were established as early as the 16th century to maintain sea walls (Williamson 2005, 31).

In 1585 the General Drainage Act was introduced into parliament, allowing large landowners to overrule local proprietors and suppress common rights that obstructed the path of drainage schemes (Williamson 2006, 202). This had a profound effect on enclosure in East Anglia. In particular a large scheme was sanctioned in the 1630s to drain the Fens of West Norfolk and Cambridgeshire primarily through construction of the 'Old Bedford River'. This was only partially successful and very unpopular (Williamson 2006, 204) with local communities, leading to riots. This process continued before and after the English Civil War under the direction of Dutchman Cornelius Vermuyden including construction of the New Bedford River, the Forty Foot Drain and Denver Sluice. Nevertheless much of the Fens area remained common grazing.

In 1664 a Government Commission reported on the extent of salt marshes and derelict lands on the coast of Norfolk and Suffolk. Most of the 400 acres of unreclaimed wetland lay in the north, with small quantities in the south (Williamson 2005, 33). Reclamation of coastal marsh continued into the 18th century but slowed as most of the most easily 'inned' land had been reclaimed and there was little money to invest in improvement (ibid, 35). The land around Orford appears to have been modified after 1700 by filling in curvilinear dykes and replacing them with straight ones (Williamson 2006).

Reclamation began again in earnest in the late 18th century as the population rose and prices spiralled (Williamson 2005, 35). At this time a series of parliamentary enclosure acts allowed the conversion of common wetland into private property. This led to the enclosure of almost all remaining areas of damp common including the Fens, Broads and coastal marshes of Suffolk and Essex. Faden's dating of the progression of embankment in the Fens in his Map of 1797 shows the speed of the reclamation at this time.

The enclosed marshes were still predominantly used for grazing (Williamson 2006, 212). However, pressure to convert to arable increased in the 18th century as grain prices rose to unprecedented heights during the Napoleonic Blockade (Williamson 2005, 44).

The extent of this effort is shown by the activity in the Minsmere Level (1600 acres) which was drained following a parliamentary act of 1810. This involved the construction of a 5 km drain and embankments costing £1835 and ultimately a substantial sluice built of iron and connected to the sea by a 100 m long iron pipe, 4 m in diameter. These later reclamations are often recognisable in today's landscape as highly rectilinear patterns of dykes, in contrast to the serpentine medieval enclosures.

Drained land had begun to deteriorate as early as the end of the 17th century, resulting in the construction of wind pumps or drainage mills. The earliest map reference to such a structure dates to 1700; by 1800 there were c 50 and the first Ordnance Survey mapping of the 1880s indicates there were 110 drainage mills in the Broads (Williamson 2006), creating a distinctive landscape. Drainage was improved by the arrival of the steam pump in the mid-19th century, although they did not replace the ubiquitous windmills until the 20th century, later. Steam pumps were ultimately replaced by electric pumps much later.

The 20th century saw some dramatic changes to reclaimed land in East Anglia. Much drained land was progressively abandoned such as the area around the Blyth and Minsmere Levels. The latter was a form of defence against enemy incursions during World War II, although agricultural recession played a large role in this overall process.

The second half of the 20th century saw a reversal of fortunes and much of the remaining grazing marsh was converted to arable. This mainly occurred after the disastrous floods of 1953 which had inundated much reclaimed land in East Anglia. Subsequently sea walls were raised and pumps widely installed, transforming the landscape once again.

Values And Perceptions

Reclamation has dramatically shaped the coastal landscape in this region, although this aspect of human's influence can often be overlooked. In some cases reclaimed land has been assigned great cultural and historical value in the East Anglian region. Drained marsh is the dominant land cover in the Broads, and in the West Norfolk coastal area, close to Hunstanton and King's Lynn. Dykes and existing drainage mills can be hundreds of years old and are distinctive features of the East Anglian landscape.

The most notable example of this is Halvergate Marshes which remained grazing marsh until the 1980s when they came under threat from deep draining for conversion to arable. This

resulted in a campaign of direct action by Friends of the Earth which culminated in the establishment of the country's first Environmentally Sensitive Area (ESA). Landowners are now reimbursed for carrying out traditional grazing on the land. Sizewell, Bells and Tinkers Marsh are also managed in a traditional way.

Reclaimed grazing marsh is also an important habitat for breeding waders and wildfowl. The transition from brackish to fresh water within dykes also provides a great deal of environmental interest (Williamson 2005, 43).

Research, Amenity And Education

Reclaimed land has proved a great amenity in the past, providing extra fertile land at times when it was much needed. It continues to be an important for modern day agriculture in East Anglia.

Extensive research has been conducted into the history of reclaimed land, for example in the draining of the Fens and the Norfolk Broads (e.g. Darby 1940, 1956; Williamson 1997). However archaeological discoveries continue to add to our knowledge of the Fen and Broad landscape. In addition, the recent NMP survey in coastal Suffolk identified the remains of numerous sea walls used in drainage and rendered redundant by further reclamation (Williamson 2005, 30).

There is a great deal of potential for using reclaimed land in an educational context. This particular landscape type brings together examples of sustainability and loss. It leaves visible historical depth in the landscape and involves economics and engineering.

Condition And Forces For Change

The condition of reclaimed land in East Anglia varies. Much has been lost its reclaimed wetland character, and some areas are rapidly shrinking because of increasing levels of drainage. In other cases some areas of reclaimed land are still being used in their traditional context, such as Halvergate Marsh.

One of the main forces for change of this character type is the changing climate, as well as human-led development. In particular rising sea levels and erosion in this area are leading to further loss of reclaimed land and reversion to saltmarsh. The intensification of agriculture continues to have an impact on land use, with much grazing marsh abandoned in favour of ploughing for arable or vegetable production. In addition, the pressure of land development is a force for change in changing land uses, say from agricultural altogether. Large areas of reclaimed marsh are also threatened by development of ports and industrial facilities. This is particularly pertinent in the area around Harwich and Ipswich (Williamson 2006, 217).

Rarity And Vulnerability

Coastal grazing marsh, part of reclaimed land, is becoming rare with c. 300,000 ha in the entire UK remaining. Reclaimed land and particularly grazing marsh is vulnerable to processes of climate change. The government is attempting to deal with rising sea levels via the creation of certain management strategies, for example Shoreline Management Plans (SMPs). Archaeological evidence of reclamation such as embankments and sea walls is also vulnerable to rising sea levels and plough damage.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

CHARACTER TYPE: AQUACULTURE

Introduction: Defining/Distinguishing Attributes

Approximately 30% of cultivated shellfish from the UK come from East Anglia (http://en.wikipedia.org/wiki/Shellfish_Association_of_Great_Britain). Many of these are sourced from North Norfolk in the tidal creeks, although installations are also present in Walton Backwaters and the River Alde.

Aquaculture in the Walton Backwaters area is located in the small meandering channels and the Alde area is known as 'the Horse' within 'Home Reach'. These areas are often marked with withies and are sometimes uncovered at low tide. It is likely that other installations exist in all the major estuaries in the area although information is scarce.

The species cultivated in this area are generally oysters and mussels, although a much wider variety of shellfish are fished in the wild off the East Anglian coast and in the estuaries.

Shellfish farming is the only type of aquaculture currently undertaken in the coastal and offshore region, although much freshwater fish farming also occurs inland.

Historical Processes; Components, Features And Variability

Historical examples of shellfish cultivation, mostly in the form of oyster pits, have been found all along the coastline of the study area. Most are square or rectangular and cut into saltmarsh, ranging from 2 m square to over 70 m long but can vary from banked to unbanked, planned or chaotic. Such features are notoriously difficult to date. However it is likely that most known examples are medieval or post medieval. This is based on their position in relation to sea walls and to the date of reclamation (Hegarty and Newsome 2005, 86).

Shellfish were certainly commercially farmed all along the East Anglian coast in both the medieval and post medieval periods. Recent projects such as the Rapid Coastal Zone Assessment Surveys (RCZAS) and National Mapping Programme (NMP) have identified these aquaculture features in Suffolk. Relict oyster pits are dense north of the Alde/Ore/Butley confluence, in the Lantern Marshes and Kings Marshes and several have been found below Burrow Hill on the banks of the Butley River.

Notable examples of disused shellfish cultivation include possible lined shellfish pits found at Breydon water during the Norfolk RCZAS and a culvert associated with oyster pits in the Orwell around Nacton, built by the Ipswich Oyster Company. A large group of oyster pits were found south of Orfordness, on the saltmarsh of Stony Ditch during the NMP. These were 14 x 5 m and 20 x 8 m in plan and maps of sea walls of different date indicate they may have been constructed after 1601 (Hegarty and Newsome 2005 98). Notably, Norden's survey of the Stanhope estate (1600-1601) showed two 'oyster boates' at work in the river Butley (Williamson 2005, 42).

Operation of a highly developed, post medieval, commercial shellfish industry on the Suffolk coast is suggested by two groups of oyster beds on the River Orwell. The first was located on the west bank of the river over an area measuring 150 x 15 x 20 m. The second was below Fagbury Cliffs, Felixstowe, and comprised eight large rectangular pits and a complex arrangement of sluices enclosed by a bank. These were recorded on Ordnance Survey map of 1881 but by 1904 were marked as disused. These probably coincide with a peak in oyster consumption in the mid-19th century when oysters formed a common food for the urban poor.

Rights to shellfish belonged to manorial lords and were leased to individuals although frequent disputes are recorded (Williamson 2005, 42).

In the past European flat oyster (Ostrea edulis L.) was cultivated however these declined in the 20th century due to overfishing, disease and other factors. They were replaced with imported American oysters (Crassostrea Virginica (Gmelin)) and Portuguese oysters (Crassostrea angulata (Lamarck)) half grown and re-laid for a season. American imports ceased in 1939 and, as a result of disease in the 1960s and 1970s, import of Portuguese oysters was banned. Research at this time concluded that Pacific Oysters could be successfully cultivated and this species was subsequently planted. Cultivation areas included the Blyth and Deben as well as Walton Backwaters (Spencer 1990) and the Shellfish Association of Great Britain now reckons that East Anglia contributes 30% of the total UK crop of this shellfish.

Figure 7. Wells Next the Sea – where the Pevsner makes no comment on any of these buildings, but mentions only 'the scent of freshly-landed shellfish'.

Values And Perceptions

Modern aquaculture is increasingly coming to the attention to the wider general public because of its concern as a sustainable practice. Therefore, modern perceptions of aquaculture are often related to the destruction of the fish resource and the seabed. Aquaculture is far more common in the southern half of the region with a particular concentration in the Essex estuaries not particularly significant to the specific study area of this region as catching wild fish and shellfish is much more common and established. However the presence of the estuaries and the relict pits within suggest it was certainly once more prolific and probably continues in all of the estuaries as and when possible.

Shellfish as a whole are however very important to the region from an economic and recreational point of view and is very popular with tourists.

Research, Amenity And Education

There is real scope to investigate the relict oyster pits of the region many of which were identified during the recent NMP and RCZAs projects. In the past it is clear that large scale shellfish cultivation was undertaken in the region and it may be possible to reconstruct the history of this industry.

Shellfish as a whole are important to the region as a tourist amenity in the form of small vendors in coastal resorts. It is often these smaller industries which are supplied by the cultivation of shellfish.

Aquaculture can also have educational value in terms of public awareness of sustainability and over fishing.

Condition And Forces For Change

Aquaculture in this region primarily comprises shellfish farming. The industry appears to be relatively successful and is a sustainable way of producing shellfish for consumption. This is crucial in terms of the recent problems with over fishing and the quota system in the North Sea.

Shellfish cultivation has little impact on the surrounding environment and can have a positive impact on decreasing stocks. It is affected by the state of shellfish stocks in the North Sea and was also be affected by the Marine and Coastal Access Act, in particular through the replacement of Sea Fisheries Committees (SFCs) with lnshore Fisheries and Conservation Authorities (IFCAs) from April 2011.

Rarity And Vulnerability

Aquaculture is generally expressed through the husbandry of natural shellfish stocks and is closely tied in to the collection of natural shellfish resources. Aquaculture, therefore, is also vulnerable to forces such as overexploitation and climate change on the shellfish resource.

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 farming. Understanding historic aquaculture practices and their long-term sustainability may offer a valuable information that will affect future trends.

Although shellfish cultivation in this area is not prolific it is taking place, and is not rare from a national perspective. It is a low impact activity and is not likely to be easily affected by many changes, as such is not particularly vulnerable. However, the shellfish industry as a whole is vulnerable in the same way as all the local fisheries as stocks deplete. Shellfish are also particularly vulnerable to water pollution along the coast and in estuaries from sewage discharges and from fertiliser and nitrate leaks and run-off from agriculture.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

CHARACTER TYPE: FISHING

Introduction: Defining/Distinguishing Attributes

The North Sea has been an important arena containing fish stocks and a commercial industry. Overall the North Sea holds c. 150 species of fish, 15-20 of which are of commercial value. In the region important commercial fisheries include sole, herring, skate (thornback ray) and sea bass. It is also a major spawning and nursery ground for sole, a spawning ground for mackerel and a nursery ground for sea bass. This is particularly significant in the sheltered estuaries. Other fish landed in East Anglia include cod, roker, and shellfish such as lobster and crab. The estuaries have a slightly different suite of commercial fish including mullet, eel and brown shrimp as well as oysters (see Aquaculture).

Figure 8. Fishing equipment at Brancaster Staithe (Oscar Aldred).

The fishing industry in this region is dominated by boats based in Lowestoft which had 362 registered vessels fishing in 2009 (MMO 2010) a number exceeded only by a handful of ports around the UK. In addition a series of small fleets operate from ports and beaches along the coastline including King's Lynn, Great Yarmouth, Pakefield, Dunwich, Sizewell, Thorpeness, Aldeburgh, Orford, Felixstowe Ferry, Harwich, Walton and Clacton. Fishing in this region is usually undertaken on a daily basis, rather than extended periods at sea, therefore fishing grounds are generally within reach, perhaps 6-12 nm off the shore (Sturt *et al.* 2009, 93). Remarkably only one full time fisherman operated out of Great Yarmouth in 2009 and was reported as having to diversify to survive (ESFJC 2009, 23). Equally, only one

boat operated out of Dunwich and Sizewell at times during this period. In Pakefield 16 vessels were on the beach, although few were out at any one time and all were seasonally worked. In the south of the region there were 15 registered fishing vessels in Clacton and surrounding areas, six were full time, four seasonal and five were operated as hobby vessels. Many of the catches of sole, roker, cod and shellfish are sold directly to the public.

Inshore fisheries, outlined by CEFAS (Pawson *et al.* 2002), are associated with ports in the region (Pawson *et al.* 2002, 22-9 [which includes Norfolk and Suffolk, as well as Lincolnshire (a part of the East Yorkshire to The Wash region)]). In general the East Anglia region is characterised by its fishing in several different ways: from The Wash to Sheringham bait diggers operate in the inter-tidal waters; The Wash area associated with King's Lynn mainly fishes cultivated stocks of molluscs; King's Lynn and North Norfolk estuarine regions fish brown shrimp, mussels and oysters; chalk reefs off the North Norfolk coast support crab, lobsters and whelk fisheries; sprats and herring are fished in The Wash; south of Sheringham sea trout, bass, mullet, sprats and mackerel are taken; potting and demersal fishing activities beyond 3 miles from shore occur in the coastal area between Blakeney and Mundesely; pelagic fish are caught off North Norfolk.

The success of the industry varies along the coastline but is depleted compared to the recent past, having once been the mainstay of the economy in the region. This industry persists in the region despite adversity and has also become a tourist attraction. A number of offshore areas are recognised as good fishing grounds, often relating to marine features. These include Aldeburgh Napes, Cutler, Felixstowe Ledge, Gabbard, and in the Wallet and East Swin Channels. Walberswick Bay is notable for herring and the coast around Orford for sole, roker, bass and cod. Crustacean potting is carried out 4-6 miles offshore, often on wrecks. Offshore fishing occurs all over the area, especially in the Silver Pit area, the southern edges of Dogger, Dowsing, Smiths Knoll and the sand banks areas such as Leman Bank, Ower Bank and Well Bank (Butcher 1979; Butcher 1982).

A variety of different fishing methods are used throughout the offshore region. Trawling dominates, mostly beam trawls, catching mainly demersal species but also pelagic and shellfish. Netting includes drift netting, gillnets and entangling nets, seines and trammel nets. Traps and pots are used frequently, with only one area recording shellfish dredging with a mechanised dredge. Hooks and lines are still frequently used by the commercial industry in this area.

In the larger estuaries commercial fishing includes small trawlers and nets, although vessels over 15.24 m are not allowed to trawl in inshore areas. Commercial fishing in the Stour and Orwell is generally carried out by the small fleet from Harwich (Suffolk District Council 2004, 31). The estuarine mudflats are significant for shell fisheries (cockles and oysters) and bait digging (English Nature 1997). Shellfish gathering may occur when stock levels are sufficient to support a sustainable fishery.

Historical Processes; Components, Features And Variability

Little is known about Prehistoric or Roman fishing activities in the region. In contrast, from the medieval period onwards fishing has been well-documented in East Anglia. Some of the earliest evidence of fishing in the region is dated to the Anglo-Saxon period. Wooden structures were found on the foreshore below Sutton Hoo during the Suffolk RC ZAS, and these were radiocarbon dated to 450-590 AD. These are likely to be the remains of fishtraps (Good and Plouviez 2007, 62). The survey also identified two probable Anglo-Saxon fish traps and five timber circles in Holbrook Bay on the northern bank of the Stour estuary (Everett 2007, 62). These are very similar to the fish traps recorded in the Blackwater estuary

in Essex which were dated 680-850AD (Everett 2007). The fish traps survive as rows of posts with patches of wattle work constructed in V-shapes. Baskets or nets were placed at the point of the 'V' and fish were funnelled down, to be caught as the tide went out. Wattle walkways along the walls allowed access at low tide to retrieve the fish and repair the walls (Everett 2007). The southern arm of one of the structures was 310 m long, illustrating the size of this undertaking. Possible later reuse or repair to the structures was indicated by later radiocarbon dates in places.

During the Suffolk NMP survey a series of further v-shaped post built fish traps were identified off Stonner point in the Deben inter-tidal area. These were not dated but could belong to the medieval period (Hegarty and Newsome 2005, 105). In addition, an early medieval reference records the location of 'goys', another type of fish trap on Gunfleet sands. The goys trapped fish when the tide went out, indicating that the sand bank was immediately dry during this period.

During the medieval period fishing along the East Anglian coast became an industry of international significance. Domesday Book recorded the importance of the herring fishery in the area in 1086, with prosperous ports at Dunwich and Southwold. In some places tax was paid in herrings, with 3000 per annum for Blythburgh, 10,000 from Kessingland, 25,000 from Southwold and as many as 60,000 from the large port of Dunwich (Williamson 2005, 134).

Herring was important in the medieval and post medieval periods for a number of reasons. Although the fish must be cured within 24 hours, once cured it has excellent keeping properties and being able to be exported widely (Sear *et al.* 2009, 6). The fish could be eaten during lent or holy days and is a high protein food, once important in the diet of the lower classes.

The herring fishery was strong in the 10th and 11th century and persisted until the early 20th century. Herring swims in vast shoals off the East Anglian coast, passing every autumn, and was fished all along the coastline. The lack of natural coastal harbours in much of the area meant that fishing boats were dependent on river approaches although these were subject to silting therefore most fishing fleets continued to launch small boats off the beach up to the 19th century (Hegarty and Newsome 2005, 10). Maps from 1588 show fishing equipment and boats on the beach at Aldeburgh (Wheatley 1990, 68) which still had the largest fishing fleet of any beach landing in East Anglia in 1883 (Edwards 1991, 85).

It was the development of the herring fishery at Great Yarmouth that was to become internationally significant, creating a major industry. By the 12th century the herring fair was held in Yarmouth between September 29th and November 11th every year. Traditionally the fishing was open to all, although this caused major political rifts. The industry underwent a number of periods of decline, although in 1463 the Dunwich MP still took his pay in herring (Sear *et al.* 2009, 6).

In the 15th century East Anglian fishermen entered into the Icelandic cod fishing industry, possibly partially due to Dutch interest in the herring fishery (Jones 2006, 6). This was also to become a major industry following the Anglo-Danish treaty of 1490, which eased restrictions on fishing. In 1528 149 ships sailed to Iceland, nearly all from Norfolk or Suffolk (Jones 2006, 4) including Southwold, Dunwich, Walberswick, Aldeburgh and Harwich in Essex. This industry declined during the 1530s as a result of politics, and by the 1550s the fleet was reduced to 43 ships. However, an enquiry into the defence of Harwich in 1585 noted the majority of able-bodied men were away between February and June, fishing off Iceland and the Shetlands (Essex County Council, nd). Full recovery in the Icelandic fishery was not seen until the early 17th century; in 1614 125 ships sailed and in 1628 160 ships were recorded as

being 'ready to sail' (Jones 2006, 5). The industry was rocked by the Civil War but built up again until its complete decline by the 18th century, mainly due to the extortionate tax on salt, needed to preserve the fish (Jones 2006, 6). In 1533 22 ships sailed from Dunwich, whereas in 1640 only one was sent (Sear et al 2009). The last Iceland fishery ships left Harwich in 1713. Significantly ships sailed to Iceland in March, returning to East Anglia in August or early September, thereafter herring fishing continued on some scale during September-December. Herring also continued to dominate Great Yarmouth and to a lesser extent Lowestoft. The rivalry between the two ports leading to them taking different sides in the civil war. In 1722 Daniel Defoe visited Great Yarmouth and recorded that the locals claimed to have cured 40,000 barrels of herring in one season (http://www.maritimeheritageeast.org.uk/).

Southwold also had a thriving herring fishery, as recorded in Domesday, and in 1750 the Free British Herring Fishery headquarters were established in the town in an attempt to reclaim the industry from the Dutch. This threat was ultimately removed by the Napoleonic Wars during which the Dutch suffered significantly but their place was immediately taken by the Scots who were prominent by the 1830s. Herring was still processed in Great Yarmouth and in 1880 there were more than 60 curing houses in the town (Jones 2006). Seasonal workers including women to gut the fish would come from Scotland, swelling the population of the town by 10000 in 1907 when the industry was at its peak. Smaller fishing industries also existed during this time including whaling by boats from Ipswich in the Arctic and cod fishing to Norwegian waters and the Faroe Islands from Aldeburgh and Harwich (Edwards 1991, 85-90). In the late 18th and early 19th centuries, whaling operated from King's Lynn. Along the north-west and north Norfolk coasts there was a thriving shell fishery, for mussels, cockles and whelks. At Cromer, crab fishing and longshore fishing dominated. Inland, on the Broads, freshwater catches such as eels were exploited.

The East Anglian fishing industry as a whole began to decline in the 19th and 20th centuries. White's Directory of Essex 1848 records that 78 fishing vessels were based in Harwich in 1778 but only 10 in 1883. This was partly due to depletion of the herring stock caused by more efficient fishing methods and natural silting of ports such as Southwold and Aldeburgh. The industry was badly damaged by both World Wars. Following the decline of Great Yarmouth, Lowestoft became the fishing centre for East Anglia, building a harbour in 1832. The Albert Close fishing chart of 1953 records a number of good fishing grounds in the region, however the industry has not reached its previous levels and remains suppressed by environmental, economic and political factors.

Values And Perceptions

Commercial fishing has long been important to this region and the industry remains a distinctive element of the East Anglian coastal character. At sea drift net fishing for herring remains the most characteristic East Anglian fishery although it is significantly smaller than in previous centuries. Fishing boats still remain on the beaches all along the coastline, although some have now been abandoned as the industry struggles.

Fishing rights are still paramount amongst the local communities and the opposition to EU quotas is on-going. A real desire still exists here to revive one of its most traditional industries and economic mainstays.

Generally fishing fleets today have distinct fishing grounds, predominantly within 10 km of their home port. As such the local fishermen from each area know their particular area intimately. From a recreational point of view the traditional fishing industry has now taken on an almost 'quaint' character, a memory of better days. Tourists are attracted to the

deteriorating boats and the few traditional fishermen who sail regularly, as a bygone industry. Freshly caught fish remains one of the draws for holidaymakers all along the coast.

Research, Amenity And Education

The fishing industry has a great deal of research potential, particularly for the historic environment. Archaeologically fishermen have long been bringing up (and reporting) objects of interest in the wider region. This includes artefacts relating to the drowned landscapes of the North Sea Basin (see palaeolandscape) such as the bones and tools from around Brown Bank (Louwe Kooijmans 1970-1). Fishing can also reveal more recent artefacts lost at sea such as cargoes. Significantly net fastenings - objects upon which fishing nets snag - have long been a relatively reliable form of identifying wreck locations.

The success of the BMAPA/English Heritage 'Protocol for Reporting Finds of Archaeological Interest' (see Extractive Industry), shows how heritage and industry initiatives can be successfully applied and it would be valuable to implement a similar scheme for the fishing industry. Any such scheme could be based upon an equivalent Dutch scheme which has seen fishing vessels report and land their trawled mammoth, woolly rhino, etc., bone at their ports - currently at a rate averaging 10 tonnes per annum.

Historically, the declining fishing industry is crucial to the current character of the area and is remembered in a number of ways along the coastline. In particular, a number of small, local maritime museums tell the story of the great herring and Icelandic fisheries which were so important to the area. This is particularly true in the areas where the industries were key, such as Great Yarmouth (the Time and Tide museum) and the small maritime museum in Lowestoft (see http://www.maritimeheritageeast.org.uk/museums). The latter has been enhanced by a 'Maritime Heritage trail' nearby, leading out to Lowestoft Ness. Remnants of the fishing industry are key to this trail.

Another educational aspect of fishing is the current ecological focus into which research is on-going. This includes over-fishing and overexploitation and therefore sustainability of fish stocks.

Condition And Forces For Change

The fishing industry in this area has been undergoing dramatic change since the 19th century, going from a thriving economic mainstay to a scattered and depleted remnant. There are a number of reasons for this steep and on-going decline, including natural factors affecting the fish stocks in the North Sea, as well as cultural affects such as over-fishing, and economic and political forces. The efficiency of modern fishing methods has resulted in the reduction of many fish stocks including herring and cod, once so important to the region. This in turn has led to the implementation of fishing quotas (Total Allowable Catch or TAC) depending on the state of stock as defined by the International Council for the Exploration of the Sea (ICE S). These are based on whether stocks are inside or outside Safe Biological Limits (SBL) defined by a minimum safe stock size and maximum exploitation rate.

The main issue affecting fisheries in this area is the sustainability of the North Sea fish stocks and the consequent need to impose a quota system. Boats less than 10 m long, although regarded as a more sustainable form of trawling have just 3% of the UK's catch quota. As outlined above this applies to most of the traditional industry in this region. As such it was reported in April 2010 that the entire fleet was "on the verge of collapse" as smaller operations were filling their Government designated monthly amounts within days of the start of the month (East Anglian Daily Times April 15th 2010). Fishermen therefore have to stop

fishing for the remainder of the month or risk prosecution. Annual reports for regional fishing bodies indicate that more and more fishermen have to give up each year.

Other factors include global temperature change and water movement which can affect the distribution of fish. In addition the construction of wind farms and aggregate dredging can cause conflicts and temporarily suspend fishing in some areas. In the case of wind farms fishing is forbidden within a certain distance of the array and in some cases compensation has been given to fishermen. The restrictions can however mean the encouragement of fish stocks in these areas.

Much of this may be subject to further change once the Marine and Coastal Access Act passed in November 2009 comes into its own. This will herald a significant change in the approach to management of the marine environment off the English Coast (ESFJC 2009). The establishment of a framework to better manage marine activities will include fisheries in an attempt to better protect the marine environment. Current Sea Fisheries Committees (SFCs) was replaced with Inshore Fisheries and Conservation Authorities (IFCAs) on April 1st 2011.

Rarity And Vulnerability

As outlined above the fishing industry in East Anglia is at substantial risk. Few traditional boats remain in full time service and traditional methods of fishing have been partially replaced by trawling. Although Lowestoft has a large number of boats in the fleet most are below 10 m in length and therefore significantly restricted. The region is tremendously proud of it fishing heritage which is remembered in numerous small maritime museums and Monuments, however there is a real risk of losing the remaining traditional fishermen. The increase of trawling has also has an effect on the historic environment as bottom trawling effectively destroys past land surfaces and artefacts on the seabed.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: ENERGY INDUSTRY

Introduction: Defining/Distinguishing Attributes

The region contains several marine wind farms, a nuclear power complex at Sizewell, and is an important area in the North Sea for the gas and oil industry. It is notable for the relative absence of hydrocarbon fields or installations in the southern part of the region, with a large cluster of features in the northern part of the region, off the North Norfolk coast.

A single gas supply pipeline runs through the area from Bacton in Norfolk to Zeebruge in Belgium, crossing a number of telecommunications cables. Bacton is one of the UK's major hubs for gas imports consisting of five gas terminals taking gas from the southern North Sea to Belgium and the Netherlands. Submarine powerlines and hydrocarbon supply pipes are also located in Lowestoft and Gorleston harbours, at the head of the Orwell and in the River Alde.

Figure 9. Gas pipeline along groyne at Bacton, with Windfarm development in the background

The active Sizewell B nuclear reactor has a net electrical output of 1188 MW which is enough to supply over 2 million homes (roughly the equivalent of the daily domestic needs of Suffolk and Norfolk) and supplies 3% of the UK's entire electricity needs

(http://www.british-energy.com). Two intake pipes connect the power station to trestle platforms in the marine zone c. 100m inshore with generators that pump gallons of cooling water to the main turbines.

The region has been the focus of a number of wind farm developments as a result of its strong prevailing winds. Working arrays include Round 1 developments Scroby Sands, just off Great Yarmouth, and Gunfleet Sands 7 km off Clacton on Sea (with an extension as part of Round 2). These comprise 30 and 48 turbines respectively, producing 60 MW and 108 MW of power (41,000 and 85,000 homes). Round 2 saw the addition of the Greater Gabbard and London Array farms which are currently under construction. These will contain up to 140 and 341 turbines and are expected to produce 172 MW and 1000 MW of electricity (125,000 and 750,000 homes). Round 3 will produce a larger licensed area again in the north of the area close to Scroby Sands, expected to produce up to 7.2 GW of electricity.

Historical Processes; Components, Features And Variability

The East Anglian region has had many forms of energy, starting with peat extraction in the medieval period, possibly earlier. Peat was used in enormous quantity for domestic fuel and within the salt industry and possibly the cloth industry (sees Processing industry). Large scale peat extraction continued from the 12th through to the 16th centuries, although widespread flooding had caused many turbaries to close by the 14th century. The scale of the industry is illustrated by the Broads that has been created by peat extraction (Lambert and Smith 1960).

The North Sea has become a crucial source of oil and gas since the 1960s. Gas was first discovered in British waters in 1965 in the West Sole gas field off the north east coast. The discovery of oil at the Argyle and Forties fields followed in the 1970s. By the mid-1980s there were over 100 installations in the North Sea and Britain had become a net exporter (http://www.abdn.ac.uk/oillives/about/nsoghist.shtml). Although the oil and gas fields did not extend far south of the North Norfolk coast, Great Yarmouth and Lowestoft were the centre of operations for the industry in the southern North Sea, providing significant employment. Many fishing trawlers were adapted to work as service ships for the oil rigs following the decline of the fishing industry (http://www.townmanagement.co.uk/lowestoft_history.php). The Shell Southern Operations base was located on the north shore of Lowestoft Harbour until 2003. The hydrocarbon industry has been in decline since the start of the millennium and more than half of the North Sea oil reserves have been extracted, according to official sources in both Norway and the UK (http://en.wikipedia.org/wiki/North_Sea_oil). However, Great Yarmouth and Lowestoft continue to act as a base for a smaller industry which supports and decommissions local rigs.

The use of nuclear power to provide energy was born out of the post war production of plutonium for nuclear weapons (http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file28276.pdf) and the first reactor was opened at Calder Hall in Cumbria in 1956. This followed the publication of the White Paper 'A Programme of Nuclear Power' which outlined the need for this power and how its use would be implemented.

As part of this programme Sizewell A was built in the early 1960s and became fully operational in 1966. It was one of eleven Magnox power stations built in the UK and produced an electrical power output of 420 MW- enough to serve the energy needs of a third of East Anglia. The station started the 100 year-long decommissioning process in 2007 after it shutdown at the end of 2006, at a budgeted cost of £1.2 billion. Sizewell B, with its distinctive white dome, is the only large pressurised water reactor in the UK. It was

constructed between 1988 and 1995 as part of a third nuclear power programme instigated in the 1970s, and produces approximately 3% of the UK's electricity.

Wind power is the fastest growing form of global renewable electricity generation and has become increasingly important in the region in recent years, following the UNFramework 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 2009 The Department of Energy and Climate published The UK Renewable Energy Strategy which commits to sourcing 15% of its energy from renewable sources by 2020 – an increase in the share of renewables by almost a factor of seven from about 2.25% in 2008, in scarcely more than a decade (http://www.decc.gov.uk/ TheUKRenewableEnergyStrategyExecutiveSummary.pdf)

Britain has the best offshore wind resource in Europe and the marine zone of East Anglia is well placed to take advantage of this. Sites were selected on the basis of their relationships to shipping lanes, recreational activity and known archaeology. The turbines themselves have an impact on the seabed which is extended by cables connecting the wind farm to the shore, buried at c 0.3-5 m below the seabed by ploughing, trenching or jetting. Additional infrastructure to connect to the National Grid will also need to be added in the coastal zone, however the presence of existing energy installations such as Sizewell may make their placement easier.

Values And Perceptions

The North Sea as a whole has always been important to the energy industry, most notably for its natural oil and gas resources which have been heavily exploited since the 1960s. More recently nuclear power and renewable energy sources have become viewed as more important as a result of increasing concerns about CO2 emissions from energy generation using fossil fuels. The North Sea and in particular the East Anglian coast has remained crucial to these newer energy industries.

Sizewell has been a controversial addition to the coastline and a subject of various and contrasting opinions. The nuclear power station dominates the coastline in this area for miles in each direction, as do the power lines that emanate from it (Countryside Agency 1999, 60).

The development of offshore wind farms can be seen as a less obtrusive alternative to terrestrial arrays, but mostly public opinion objects to their impact on coastal views, with turbines extending up to 100 m above sea level. Stakeholder groups and societies also express differing viewpoints. Wildlife groups have expressed concerns about birds hitting the turbine blades whereas The Suffolk Preservation Society has shown support for offshore development of this sort. The London Array is expected to produce enough electricity to supply around a quarter of Greater London.

Research, Amenity And Education

Hydrocarbon resources have played a large role in the north of the East Anglian region and their research and education value is high. 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. Lowestoft and Great Yarmouth were one of the main centres considered in the project.

The advent of renewable energy has also been crucial. The development and maintenance of the offshore energy industry creates a large amount of data relating to the sea floor, most notably geophysical data. This is an invaluable resource for mapping the offshore historic

environment, providing information on past landscape surfaces, as well as enhancing knowledge about shipwrecks and other intrusive features. It is useful for archaeologists to work alongside wind farm developers at the stage at which geophysics is undertaken so as to help avoid and/or mitigate the damaging effects on the historic environment from development proposals.

In addition renewable energy developments are often accompanied by educational facilities to inform the general public about the benefits of this type of installation and any additional data produced. Scroby Sands was one of the first operational UK wind farms and was supplemented by a visitor centre on the esplanade at Great Yarmouth. This has attracted over 35000 visitors each year and contains interactive activities and displays aimed at both children and adults.

Condition And Forces For Change

As outlined above, one of the greatest forces for change in the energy industry is the opinion that greenhouse gas emissions should be reduced in order to reverse environmental decline. This is compounded by the fact that hydrocarbon sources are a finite resource and replacement energy sources are essential.

As such, existing oil and gas fields continue to be exploited, although the industry is in rapid decline. In contrast large wind farms are being developed off the East Anglian coast with each round of leasing undertaken by the Crown Estate. Round 3 will see the development of Zone 5 - covering approximately 6000 km2, located 14km off the coast of Norfolk and Suffolk. Although not the whole area will be developed this is expected to generate c. 7200MWof electricity, enough to supply 5 million homes. Construction of the wind farm is expected to start in 2015.

The construction of wind farms will affect the present-day seascape. Arrays are mostly sited in areas removed from shipping lanes, with low recreational and fishing activity, good seabed properties and the absence of known archaeology, with safe zones set up for recreational traffic and restrictions on fishing activity. However, some impact is inevitable. In addition, forces for change may be produced by the development of new wave and tidal power (http://www.thecrownestate.co.uk/mrf_renewables).

Rarity And Vulnerability

As a sub-type in its own right the energy industry is generally neither rare nor vulnerable. The main drivers affecting the industry are environmental concerns, changes to technology and depletion of fossil fuels or radioactive materials. With the increasing change from fossil fuels to renewable energy sources it is likely that elements of the hydrocarbon industry and possibly the nuclear industry will quickly become obsolete in the coming years. As such some provision to preserve some aspects of the industry may be appropriate, as illustrated by the ‘Lives in the Oil Industry’ project.

The Pressured Water Reactor dome at Sizewell is unique in England and has become a form of structure which is becoming increasingly rare. Recently it was announced that a similar dome at the former nuclear plant at Dounreay in Caithness was to be demolished as its preservation would be impractical.

There are various effects derived from the energy industry on the historic environment. For example scour around the base of turbines can affect the physical remains on or within the sea floor and precautions have to be taken to prevent this. However, the physical effects of turbines are expected to be relatively small compared with other potential impacts on the

historic environment, such as storm and flood events, commercial shipping, dredging and trawling.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: EXTRACTIVE INDUSTRY (MINERALS)

Introduction: Defining/Distinguishing Attributes

The marine aggregates extraction industry is particularly significant in the East Anglian region. Of the 20 million tonnes of material extracted each year in the UK, around half originates from east coast sites (http://hubpages.com/hub/Coastal-Erosion-in-East-Anglia) with the largest area of active dredging located just off the coast of Great Yarmouth. This is accompanied by a number of smaller zones between Felixstowe and Clacton and a small area off Southwold which is outside territorial waters. The sediment in the region is mainly coarse sand and gravel, with large areas of pure gravel. Overall larger licensed areas are present but not all are currently in use. Dredging activity is related to market demand, therefore activity can be sporadic and difficult to predict (Rogers 1997).

Onshore, aggregate quarrying occurs throughout East Anglia. In the absence of hard rock within the solid geology, this also comprises extraction of sand and gravel. River valleys are often good sources of this material and quarries currently exist along the River Waveney and at Nacton adjacent to the Orwell. Areas marginal to the Fens also contain sand and gravel deposits that are regularly extracted. Sand and gravel is extracted for onshore construction including concrete, mortar and asphalt, general fill, roadstone, and drainage, construction of harbours and coastal risk management (Cohen 2009, 11) both within the UK and in Europe where offshore dredging restrictions apply.

As a result of the natural geology good building stone is scarce in East Anglia although there is an abundance of flint. The exception is in parts along the Suffolk coast where hard Coralline Crag has been sporadically quarried (Williamson 2006, 17). In addition a type of limestone known as Septaria occurs in narrow bands or nodules within the London Clay. Because this was used for building in the past it is sometimes still quarried for use in restoration work.

Clay is naturally abundant in the region and is still extracted, particularly in Suffolk. Aldeburgh Brickworks still has two areas of quarry covering 5.05 and 2.6 ha of land. Smaller quarries exist at South Cove, Gisleham and Chilesford, along the coastal belt.

Another naturally occurring mineral in this area is copperas, also known as green vitriol. This is a form of ferrous sulphate extracted from iron-pyrite rich nodules. These occur naturally within Eocene clay deposits and can be found off the coast of Essex in the London Clay (http://www.eng-h.gov.uk/archcom/projects/summarys/html97_8/2059.htm). These are often loose nodules, although some quarrying has taken place in the past.

There are no coalfields or metal ores in East Anglia and therefore no active mines, although flint was mined in the past.

Historical Processes; Components, Features And Variability

East Anglia was not always lacking in mines. In early prehistory flint was the only material available in Southern Britain for making edge tools and was mined and exported from East Anglia (Williamson 2006, 17). This is best exemplified by Grimes Graves in Norfolk, an extensive series of over 400 pits, the deepest of which reach down over 30 feet. The reason for such depths was the desire to reach the three bands of flint – the topstone, wallstone and floorstone. Floorstone is the deepest and by far the finest type of flint, so superior in quality

that it was mined and exported on a large scale. The scale of exploitation of coastal flint is unknown, although coastal routes may have been used to transport the stone.

Flint has been extensively used to construct buildings in the study area since the Roman period and into the medieval and post medieval periods. Good examples of this can be seen at the Roman fort of Burgh Castle, as well as at a number of churches in the area such as the ruined structure at Covehithe.

The Romans and Normans also obtained septaria stone from the area around Dovercourt. This was quarried from the cliffs or dredged from the seabed and used as a building stone or as a constituent of cement. Buildings constructed using septaria include Orford Castle and the churches at Wrabness on the River Stour, Chlemondiston on the Orwell, Friston on Sea and Clacton (Ashurst and Dimes 1998, 118-119).

The lack of coalfields and metal ores in East Anglia is perhaps one of the reasons why the Industrial Revolution was concentrated elsewhere (Williamson 2006, 17). However a number of small extraction industries grew up in the post medieval period and now the large container ports such as Harwich and Felixstowe have made it an important regional and national centre for import/export industries.

During the large scale conversion of marshes and heaths to arable land which occurred during the agricultural 'revolution' of the 17th to 19th centuries, soil acidity was neutralised by mixing sandy soils with calcareous material. Clay or 'marl' was extracted from large pits in the area, and was used to buffer the acidity of the soil by spreading it over the field. This occurred in many coastal areas where soil was particularly acidic, specifically including the area around Woodbridge where shelly calcareous crag occurs. The Norden survey of the Stanhope estates in 1600-1601 identified a number of pits including one in a close called 'Marlingfield', however the heyday for marling was the 18th century (Williamson 2005, 64).

Septaria deposits at Beacon Cliff and Cobbolds Point, Felixstowe were re-opened in the 19th century, establishing a profitable cement industry from 1812. Septaria was gathered, broken up and burned in kilns to form fine cement powder. By 1835 there were five factories in Harwich. However as a result of the mining Beacon Hill headland rapidly eroded and Harwich harbour silted up. The works were closed in the 1860s, partly as a result of the damage and partly because of the rise of the Portland Cement industry on the Thames (Essex County Council nd).

Copperas, found as nodules on the coast and in river valleys, was one of the foundations of the modern chemical and pharmaceutical industries (Williams and Brown 1999, 21). It was used in the metallurgical industry and extensively in the textile industry which was so important to this area in the post medieval period. Copperas was used to make chlorine, used as bleaching agent in the 17th and 18th centuries and as a dye fixative for woollens. Other uses include as printers ink, a tanning agent for leather and in the manufacture of gunpowder (http://www.eng-h.gov.uk). The copperas industry is considered to be the first heavily capitalised industry (Williams and Brown 1999, 21).

The industry in this area was centred on Harwich and Ramsey, near Walton and has left its mark on the landscape in terms of place names. For example, the area around Wrabness on the bank of the Stour contains regions known as Copperas Bay and Copperas Wood. A large area of seabed just offshore of Frinton is also known as 'Copperas Ground'.

A coprolite (fossilised animal dung and bones) extraction industry also developed on the Suffolk coast in the 19th century. Coprolite is located between the London clay and the later crag deposits which exist in the region and is phosphate-rich therefore making good fertiliser when processed. Although there was a recorded case of coprolite spreading in 1717 near

Levington (Simper 1986) the industry expanded in the 19th century when an efficient refining process was discovered which efficiently extracted the phosphates.

Coprolite was initially extracted from eroded seams or from the ubiquitous crag or clay pits where the nodules would be clearly visible. Ultimately pits were purpose dug for coprolite extraction and are often marked on 19th century Ordnance Survey maps. Coprolite pits were often several hundred metres wide and some metres deep and were therefore substantial landscape features. However the pits were short-lived and backfilled once coprolite extraction was complete and is now difficult to locate. These sometimes survive as large but shallow depressions on agricultural fields and can be identified from aerial photography (Berridge 2004).

Map evidence also exists for short-lived tramways leading away from coprolite pits, however once removed from the immediate vicinity it is likely that most coprolite travelled on the waterways of the region. Shipping records from Ipswich indicate that in the late 1800s coprolite was a major import (Berridge 2004), presumably originating in the surrounding countryside. Stonner Point in Waldringfield on the banks of the Deben became a centre for coprolite shipping after a quay was built by Thomas Waller of Sutton Hall c. 1850 specifically for this purpose.

The coprolite industry was very profitable for a short while and two major manufacturers existed in the area – Edward Packard and Joseph Fison. The first Packard factory was in Snape on the Deben but moved to Bramford near Ipswich. This was also the site of the Fison factory and the two were amalgamated in the early 20th century, becoming the industrial giant Fisons. The coprolite industry declined in the late 19th century, possibly as a result of the influx of cheap raw materials from abroad although there was some suggestion that the supply had become exhausted (Berridge 2004).

There is little widespread evidence of historic aggregate quarrying in the region but small pits and quarries for the extraction of sand, gravel or clay were common throughout history. Clay was extracted on a larger scale from Boyton Marshes in the 17th and 18th century. In 1933 a gravel company set up a shingle extraction operation on Havergate island however this was found to be unprofitable and was soon abandoned. Around 7.1 million tonnes of aggregates were quarried in 2000, as the need for aggregates has grown (http://www.mineralproducts.org/qua_yourarea02.htm).

Marine aggregate dredging has increased since the 1960s to supplement quarried aggregates associated with greater pressure for land development. Dredging began off East Anglia in 1973, when 3 million tonnes of material were removed, and has steadily grown ever since with nearly 10 million tonnes of material being removed in 2001 (http://hubpages.com/hub/Coastal-Erosion-in-East-Anglia). In the south-east of England as a whole, 33 % of sand and gravel for construction comes from the seabed and has been used in a number of major developments in the east London corridor, with aggregates delivered straight to the wharves of the Thames (http://www.thecrownestate.co.uk/marine_aggregates).

Other developments which have resulted in large scale aggregate dredging in the region have included the construction of Sizewell B in the late 1980s and more recent beach replenishment schemes.

Values And Perceptions

The minerals extractive industry has played a part in the East Anglian development, and more so relatively, and as a whole leads to mixed personal feelings. In places where the smaller industries thrived such as the copperas and coprolite industries these aspects have become

part of the landscape and the character of those areas. A number of copperas place names exist such as Coprolite Street in Ipswich.

The larger and more recent industries of aggregate quarrying and dredging on the other hand have elicited mixed responses from different sectors of the community. Many people believe that the extensive dredging off the East Anglian coast is contributing to increasingly severe coastal erosion. In short it is felt that removal of sandbanks allows larger waves to reach the shore, stripping away material. Another effect of this is that the shore becomes steeper and deposition of new material more difficult (http://hubpages.com/hub/Coastal-Erosion-in-East-Anglia).

In terms of the historic environment, aggregate dredging has been perceived as destructive of past landscapes and features, however various measures are being taken to address or mitigate this, as outlined in the following section.

Onshore quarrying is equally subject to contested viewpoints including from noise and air pollution and further effects on the historic environment.

Aggregate extraction undoubtedly has a strong economic value to the area, employing large numbers of people both offshore, landward and at wharves and docks. In addition the aggregates are essential to the construction industry and therefore to further development.

Research, Amenity And Education

This character type has a lot of potential for research. In particular, offshore aggregate dredging can provide much archaeological and historical information about past landscapes. This applies to all stages of the dredging process including site location through to sorting on the wharves.

This has been significantly aided by the Aggregates Levy Sustainability Fund (ALSF), conceived to address the environmental costs associated with quarrying or dredging, not already covered by legislation. The fund was distributed by DEFRA through three different bodies including English Heritage. Between 2002-2008 the ALSF funded over 250 projects relating to the historic environment to a value of over £23 m; the anticipated value of projects 2008-2011 was £4.5 m (Flatman and Doeser 2010, 161).

The ALSF has been particularly valuable in terms of funding survey and mapping projects which help identify and manage historic sites and landscapes. In addition it has been key to establishing guidance in the form of 'Marine Aggregates Dredging and the Historic Environment' (2003). This was followed by the 'Marine Aggregate Industry Protocol for the Reporting of Finds of Archaeological Interest', a collaborative project between the British Marine Aggregate Producers Association, English Heritage and the Crown Estate. 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.

To finalise the development of a nationally-applicable method for characterising the historic dimension of England's coastal and marine environment, Historic Seascape Characterisation (HSC), conducted by Cornwall Historic Environment Service, consolidated a national HSC methodology from the lessons and the experience gained during the five pilot projects of the England's Historic Seascapes Programme undertaken in 2004-07. This was funded by the Marine Aggregates Levy Sustainability Fund and the resulting methodology provides the basis for the HSC method (Tapper 2008; Tapper and Hooley 2010). The HSC method is

relevant to both public awareness, and to contextualising marine aggregates extraction licensing.

One of the most significant consequences of the ALSF was 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.

The ALSF has also contributed to educating younger audiences in the form of 'Derek the Dredger', a project run by The Hampshire and Wight Trust for Maritime Archaeology. This includes two books which explain the role of both aggregates dredging and maritime archaeology.

Onshore, a great deal of research into flint mining in the area as a whole has been undertaken, mainly as a result of the excavation of Grimes Graves in Norfolk. The site itself is a successful tourist attraction.

There is scope for much more research to be carried out on the lesser industries of coastal East Anglia such as copperas and coprolite which until now have remained the realm of small scale local research. This could be developed into displays and educational material and could tie in with the natural elements such as geological strata and fossils.

Condition And Forces For Change

The extraction industry remains one of the largest industries in East Anglia as a whole, particularly as a result of the offshore dredging, although the intensity of these operations is dictated by the health of the construction industry. Onshore quarrying is not as lucrative but still functions as a viable industry. Little survives of the smaller 19th century industries within the landscape.

In terms of relict industries, forces of change mainly relates to development, where land containing industrial features is lost to construction or from the masking effects of agriculture.

Current industry is susceptible to a number of forces of change, most significantly economic. 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). However, dredging is entirely subject to market demands which can change on a regular basis.

As outlined above the established relationship between industry and the heritage sector in this industrial field is a positive force for change in relation to safeguarding the historic environment.

Rarity And Vulnerability

Current extraction industries are not rare, however they affect areas of vulnerable historic environment. Dredging of the seabed and quarrying on land effectively destroys any pre-existing historic environment evidence in that area. As such archaeological mitigation is crucial.

It has been noted here that we have lost much of our knowledge of relict industries, the remains of which are mostly abandoned and unrecorded. In some cases such features can also produce features valued for their natural environment characteristics. For example the cliffs in the area of septaria and copperas extraction are designated as SSIs.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: PROCESSING INDUSTRY

Introduction: Defining/Distinguishing Attributes

The main processing industry in modern day East Anglia is the food processing industry. This is partly a result of the dominance of agriculture in the region but also because of the prevalence of water which is crucial for many such industries. As a result a number of food processing centres are located on the coastline including the large Birds Eye complex at Lowestoft.

Figure 10. The tall building on the left is a grain storage silo at Bentinck Dock in King's Lynn. The taller pylon is carrying power lines across the River Great Ouse. To the right of the pylon is the Dow Chemical works. And on the far right is the spire of St. Nicholas' Chapel

Chemical works are seemingly rare in East Anglia, although a large chemical works is situated on the edge of Walton Backwaters in Great Oakley, and another north of King's Lynn. Walton Backwaters produces the cetane improver 2-ethyl hexyl nitrate, and also provides specialist explosives handling services. The factory is infamous for its fatal

explosion of 1928 which killed five people. King's Lynn chemical factory is also infamous, having exploded in 1978 from a detonation of zoalene, which is used as a poultry feed additive.

Iron and steel works are equally rare but can be found in the larger port towns such as Harwich and Great Yarmouth. The lack of iron and steel works may be attributable to the fact that East Anglia has never become heavily industrialised.

As a matter of necessity, there are numerous sewage works in the area, close to the water sources, although they tend to be located away from areas of natural beauty. Locations include Caister, Kessingland and Sizewell on the open coast, on the banks of the Alde and Stour, at Ditchingham and Brundall in the Broads area, and Clenchwarton next to the Lynn Channel.

Spoil and waste dumping sites can be found offshore, particularly around Harwich Haven and include a site at the Inner Gabbard and a disused dump near Roughs Tower. The Inner Gabbard site is used for dumping annual dredging spoil from Harwich Harbour and is being used for the development of the port of Felixstowe.

There are no nuclear reprocessing installations in the region and lime and salt working industries are limited to historical examples, although saltings are located close to King's Lynn during the 20th century. Other processing industries include small examples of water works and saw mills.

Historical Processes; Components, Features And Variability

Processing industries in East Anglia have traditionally been small scale and associated with agriculture. The region has been dominated by agriculture since the medieval period and did not undergo Industrial Revolution on the same scale as other regions. This has been attributed to many factors including the lack of fast-flowing watercourses on a gradient which could be used to power water mills (Williamson 2006).

Perhaps the earliest maritime-based processing industry in the region was salt production which may have begun in the Bronze Age (Hegarty and Newsome 2005, 55) but was certainly in existence in the Iron Age. Salt-working sites were originally located on the edge of the tidal zone, probably just above the reach of maximum high spring tide (de Brisay 1975; Fawn 1990). Containers were used to collect brine and were then heated to boiling point, evaporating the water and eventually leaving crystallised salt.

The industry expanded considerably in the late Iron Age and Roman periods and is represented in the coastal landscape of Suffolk and Essex by 'Red Hills'. These are mounds of industrial waste reddened by fire, sometime surviving as reddened patches of ground which can be up to 60 m in diameter. Salt was essential to the Roman economy, used for preserving meat and fish, for tanning and for making garum (fish sauce). It is believed that the origin of the word 'salary' is related to the partial payment of Roman soldiers in salt. In addition some roads and ports may have been built specifically to ensure the provision and transportation of salt (www.heritage-key.com).

The presence of extensive salt marshes in north Essex and Suffolk made the area ideal for salt production and these are the core areas for Red Hill survival. It has been suggested that their distribution reflects the Iceni/Trinovantes boundary (Hegarty and Newsome 2005, 57), although this is conjecture.

Approximately 400 Red Hill sites have been identified in Essex as a whole and 60 in north east Essex, although only c. 30 have been found in Suffolk which has a smaller area of saltmarsh. The sites are more commonly situated in southern Suffolk including the Blyth,

Alde, Ore, Orwell and Deben estuaries and the Alderton to Hollesley marshes. A possible site was identified at Easton and would be the most northerly example (Good and Plouviez 2007, 38). Although it is possible that more northerly examples may have been lost to erosion, the cliff dominated coastline would not be suitable for salt processing (Hegarty and Newsome 2005, 58). In north Essex numerous Red Hills are concentrated around the Naze/Hamford Water area.

Some place-names in Norfolk suggest salt production, such as Salthouse. Salt production in the region continued into the medieval period and Domesday records a number of salt pans along the coast including 118 salt works in Norfolk. These were essential to the herring fishing industry in this area and intricately linked to peat extraction in the Broads which provided fuel for the process. One was also known to have been constructed as part of Henry II's development of Orford in the 1160s.

Salt processing declined but did not disappear in the post medieval period (Williamson 2005, 42). A saltworks was founded in Southwold in 1660 by charter of King Charles I to support the fishing industry. Here brine was channelled by a wind pump into evaporating pans (www.southwoldmuseum.org). The saltworks was at its peak in 1750 with a warehouse at Blackmore Wharf capable of holding more than 1000 tons of salt (Williamson 2005, 43).

The salt and fishing industries were hit hard by the salt tax of 1702-1825 which made it cheaper to import salt from the continent. However Southwold continued to produce salt and the Free British Fishery was established there in 1770. The works discontinued in 1893 but staved off complete closure until 1900 by exploiting the tourist industry – offering brine therapy as a bath house (www.southwoldmuseum.org).

During the late medieval period a major textile industry developed in East Anglia as a result of the local wool resource and the proximity to the ports of the North Sea and estuaries which allowed easy transportation. Woollen cloth was produced on a large scale in South Suffolk and North Essex as early as the 13th century but expanded enormously over the 14th and15th centuries (Williamson 2006, 64). The principal manufacturing district for wool was the Stour valley.

By the 14th century wool exports were in decline and the cloth industry became key. This was facilitated by proximity to the continent from where specialist Flemish wool craftsmen were encouraged to emigrate to England, avoiding war and floods, principally by Edward III who was married to a Flemish princess. Different types of cloth production became widespread, including worsted production in eastern Norfolk, named for the village of Worstead. Linen was also produced from hemp on a large scale, mainly concentrated on the Waveney valley.

A second wave of Dutch workmen fled from religious persecution in the 1600s and settled in East Anglia bringing further prosperity to the cloth industry. At this time the industry became dominated and somewhat crushed by the clothiers of London; however Norwich stood alone and thrived into the 1850s.

With this exception the East Anglian textile industry ultimately went into decline in the 18th century when cloth production became mechanised in northern Britain. East Anglia did not have the fast flowing watercourses or coal to keep up and rejected changes to the old processes such as the Spinning Jenny.

The legacy of the once prosperous wool and cloth industries can be seen in the built environment in the region, particularly around the Stour valley. A string of soaring Perpendicular 'wool churches' extends from Lowestoft, through Covehithe, Kessingland, Blythburgh, Southwold and Walberswick.

As outlined above grain production dominated East Anglia for centuries resulting in two processing industries for flour and malt. Both were once again facilitated by proximity to the North Sea and estuaries which supplied an endless supply of water and a mode of transporting the goods.

Windmills were a late addition to the grain processing industry in East Anglia (Williamson 2006, 70), although a simple form of windmill called a post mill was used from the 12th century in which the entire body turned to face the wind. Water mills were the main form of processing grain in the medieval period.

A tidal mill existed in Woodbridge from the 12th century and is mentioned in an early charter when Baldwin de Ufford granted the tithes of the mill to the Austin Canons of Woodbridge Priory. The present structure was built in 1793 and its working life ended in 1957. It is the last tide mill in England whose machinery is still capable of grinding corn. The tidal range of the Deben here is 3-4 m and a large quay was located close to the mill.

Grain production increased in the 18th and19th centuries in order to feed the expanding population of the industrial north leading to technological developments in grain processing. Tower mils were introduced, in which the cap of the mill could be turned into the wind and in the late 18th century the fantail mill was created, turning the cap automatically into the wind. In 1807 Norfolk engineer William Cubitt invented the 'patent sail'. Southdown mill in Great Yarmouth, built in 1812 was 31 m high and probably the tallest in Europe at this time (Williamson 2006, 71). Water mills were also revolutionised as wheels became larger and more complex, necessitating complex schemes of engineering to create larger mill ponds. This resulted in the characteristic East Anglian mill; large and weather boarded with a large mill pool (Williamson 2006, 73).

Malt production became significant in the 19th century, although numerous small malthouses were in existence before the 18th century. Manningtree became a major centre of the Essex malt industry in the early 19th century due to its proximity to the Stour estuary, with five sites in operation by 1875. Barley was delivered and malt dispatched by boat from the docks. This was later eclipsed by the huge multi-storey maltings in adjacent Mistley.

The enormous Snape maltings was built on the River Alde in the 1800s, at the already busy port of Snape. Malt was traded from here on Thames Barges to London and the continent. The maltings is now famous as a world renowned concert hall with a suite of shops and galleries, following its closure in 1960.

Smaller processing industries were also established in the area in the post medieval period, taking advantage of its coastal and estuarine facilities.

Copperas, found as nodules on the coast and in river valleys, was one of the foundations of the modern chemical and pharmaceutical industries (Williams and Brown 1999, 21). It was used in the metallurgical industry and extensively in the textile industry which was so important to this area. Copperas was used to make chlorine, used as bleaching agent in the 17th and 18th centuries and as a dye fixative for woollens. Other uses include as printers ink, a tanning agent for leather and in the manufacture of gunpowder (http://www.eng-h.gov.uk). The copperas industry is considered to be the first heavily capitalised industry (Williams and Brown 1999, 21).

The copperas industry was centred on Harwich and Ramsey, near Walton and has left its mark on the landscape in terms of place names. For example, the area around Wrabness on the bank of the Stour contains regions known as Copperas Bay and Copperas wood. A large area of seabed just offshore of Frinton is also known as 'Copperas Ground'.

A coprolite (fossilised animal dung and bones) processing industry also developed on the Suffolk coast in the 19th century. Coprolite is located between the London clay and the later crag deposits which exist in the region and is phosphate-rich therefore making good fertiliser when processed. Although there was a recorded case of coprolite spreading in 1717 near Levington (Simper 1986) the industry took off in the 19th century when an efficient refining process was discovered which efficiently extracted the phosphates.

Shipping records from Ipswich indicate that in the late 1800s coprolite was a major import (ibid), presumably originating in the surrounding countryside. Stonner Point in Waldringfield on the banks of the Deben became a centre for coprolite shipping after a quay was built by Thomas Waller of Sutton Hall c. 1850 specifically for this purpose.

The coprolite industry was very profitable for a short while and two major manufacturers existed in the area – Edward Packard and Joseph Fison. The first Packard factory was in Snape on the Deben but moved to Bramford near Ipswich. This was also the site of the Fison factory and the two were amalgamated in the early 20th century, becoming the industrial giant Fisons. The coprolite industry declined in the late 19th century, possibly as a result of the influx of cheap raw materials from abroad although there was some suggestion that the supply had become exhausted (Berridge 2004).

A cement making industry was established in the 19th century on the basis of processing locally obtained septaria from deposits such as Beacon Cliff and Cobbolds Point, Felixstowe. Septaria was gathered, broken up and burned in kilns to form fine cement powder. By 1835 there were five factories in Harwich. However as a result of the mining, Beacon Hill headland rapidly eroded and Harwich harbour silted up. The works were closed in the 1860s, partly as a result of the damage and partly because of the rise of the Portland Cement industry on the Thames (Essex County Council 1999). However a cement works was constructed at Waldringfield on the Deben estuary in 1872 and was described as an 'industrial inferno' before closing in 1907 (Edwards 1991, 46).

Small scale lime production was also present, as attested by place names in the region such as Lime Kiln Farm and Lime Kiln Cottages. Beaumont Quay was constructed in Hamford Water in 1832 at the head of a cut, taking advantage of a straight, deep channel. The land was owned by Guys Hospital who used the stone of the demolished London Bridge to build the quay. A lime kiln was constructed shortly after the quay and survives in the modern landscape.

Brick production was also carried out using locally sourced clay with centres at Ipswich and Aldeburgh as well as numerous smaller examples.

Values And Perceptions

Overall, the processing industry in East Anglia, which has been so intimately connected to the coast and estuaries, is somewhat overlooked today. The textile industry is revered in some quarters and the town of Lavenham in Suffolk stands almost as a monument to the industry. There are remnants of the industry in Norwich and its significance is illustrated by the creation of the Norwich Textiles project (http://www.norwichtextiles.org.uk). However for the majority of the community, this along with the later post medieval industries is all but forgotten.

Specific features rather than landscapes remain important such as the tidal mill at Woodbridge and Snape Maltings. The perception of the latter has been drastically altered due to its role as a concert hall and tourist attraction.

More modern industries such as chemical works and sewage plants are often viewed as blots on the landscape, noisy, smelly and sometimes dangerous.

Research, Amenity And Education

Some research has been carried out into the small processing industries on a local level such as coprolite and copperas. However there is scope for much larger studies into these industries and use within the education system as case studies.

The salt industry is well researched and understood, however more evidence is identified by processes such as the RCZAS and NMP. The Suffolk RCZAS found five salterns in estuarine sites to add to the known record.

The Norwich Textiles project is a good example of both research and education. This is collaboration between Norfolk Museums and Archaeology Service and the Norwich School of Art and Design. It involves local researchers and curators contributing to providing a comprehensive resource on the long standing textile industry in Norwich. In addition, students and practitioners working within a modern textiles environment have created a contemporary perspective on the Norwich textiles story (www.norwichtextiles.org.uk).

Most modern processing industries are amenities in some way and particularly sewage works. Although they may not be popular they are critical to local communities.

Condition And Forces For Change

Most of the industries discussed above are no longer in existence in their original form and surviving features are rare.

Red Hills are relatively common and well recorded and a number of water mills are preserved and maintained. Remnants of the textile industry are limited to the built environment in the form of the wool churches and domestic dwellings in settlements such as Lavenham and Manningtree. Some industries have completely disappeared including coprolite, and copperas.

Some industrial complexes have been converted to other uses, most notably Snape Maltings which is a successful tourist centre.

Rarity And Vulnerability

As discussed above a number of these processing industries have disappeared altogether. Remains of coprolite extraction pits and associated infrastructure have been identified but most are within arable fields which have been ploughed.

Although much is known about the Roman salt industry in the region, Red Hills are also often at risk from cultivation. An increasing number of reclaimed marshes are ploughed resulting in salt working sites remaining only as cropmarks (as identified during the Suffolk NMP project) or being removed altogether.

Some features are particularly rare including the Snape maltings complex which to some extent preserves elements of the old industry.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: SHIPPING INDUSTRY

Introduction: Defining/Distinguishing Attributes

The offshore zone in this region is a crossroads for shipping with constant streams of commercial traffic transiting from Harwich, Felixstowe, Ipswich, the Thames Estuary, northern England and the continent. Part of the offshore zone acts as the main deep water route into the Port of London from the North East.

Harwich International Port and the port of Felixstowe are two of the UK's leading multi-purpose freight and passenger ports handling freight and passenger traffic to and from Scandinavia and the Low Countries (http//www.harwich.co.uk) As such the traffic using this area is continuous and dense.

There is a busy coastal trade around East Anglia, which tends to stay close to the coastline, with deep water traffic generally crossing further out to sea. There is a deep water shipping route immediately adjacent to the median line with Holland in the eastern sector of the region. As such, this area has denser shipping routes. Shipping includes vessels such as cargo and bulk ships, ferries, gas carriers and tankers (Jones *et al.* 2002).

Figure 11. Sailing south of Blakeney Point and the old lifeboat station, a mile out from Morston Quay

Of the other waterways, the Orwell Estuary is transited by a considerable amount of large traffic at all times of the day and year. Smaller estuaries, linking small coastal villages to the sea by channels tend to have local traffic, for example Brancaster, Wells, Blakeney. King's Lynn's shipping traffic is relatively low, occupied by small craft, although there is some transportation of cargo. In 2010, 306 vessels, handling c. 700,000 tonnes of cargo (http://www.portauthoritykingslynn.fsnet.co.uk/page2.html).

Contemporary shipping traffic within the region is extremely dense, with traffic concentrated in the south-west corner of the region, in the region of Harwich and Felixstowe, as well as in two dense shipping lanes which run up the western and eastern sides of the region respectively. The remainder of the area sees less traffic, but is never the less criss-crossed with shipping lanes running from south-west to north-east and from south-east to north-west.

Historical Processes; Components, Features And Variability

Britain as a whole has always been a trading nation and emerged as one of the leading industrial powers of the 19th century due in no small part to the strength of the shipping industry (Hedges 1974, 5)

The region has been an important maritime centre for millennia. Probably the earliest evidence for boat building comes from Walton, where a logboat was discovered in 1936 close to an area where Neolithic finds were also discovered (Sturt and Dix 2009, 46). England has had long distance trade connections with the continent since at least the Bronze Age, although no certain boat remains have been discovered from East Anglia.

It is likely that ports existed at Felixstowe (Good and Plouviez 2007, 69) and Dunwich in the Roman period and therefore that shipbuilding activity occurred there.

Thirteen amphorae from a garden in Aldeburgh (ibid. 54) also indicate the importance of shipping in the period.

East Anglia was settled by Germanic peoples from the continent following the end of the Roman period and Ipswich, Dunwich, Southwold and Beccles became important ports during the Anglo-Saxon period. The 7th century ship burial from Sutton Hoo on the River Deben provides concrete evidence of the importance of shipping to the region at this time. A similar ship burial, probably of 6th century date was found at Snape on the River Alde. A longboat found of the coast at Covehithe dates to the middle Saxon period.

A major shipbuilding industry was located in East Anglia in the medieval and post medieval periods. Ipswich was an important centre for shipbuilding from the medieval period onwards, reaching its zenith c 1500 when the port was known as the shipyard of London, constructing vessels up to 100 tons (Wren 1976, 134). Between 1740 and 1812, 48 Royal Navy ships were built at Ipswich, which had five dockyards at this time. At one time the shipyards extended six miles downstream to Pin Mill situated on the south bank of the Orwell and many Thames Sailing barges and large colliers were built there (Wren 1976, 134). Pin Mill's heyday ended with the introduction of the iron hull (Edwards 1991).

Orford also possessed a thriving medieval shipbuilding industry, which provided ships for Edward III in his battles against France. This continued into the post medieval period and Sir Francis Drake's ships Greyhound and Pelican (renamed the Golden Hind) were built in Orford, in 1545 and 1577 respectively.

Harwich had a shipbuilding industry by the 15th century (Weaver 1990). Private shipbuilding continued in the naval yard untill1827. The yard was taken over in 1740 by John Barnard, shipbuilder of Ipswich.

Woodbridge retains its thriving boat building industry**.** The town was known for building merchant ships and men of war for the navy from 1500 to 1850 (Wren 1976, 189) and the area enjoyed coastal and continental trade until the railway opened in the 19th century.

Smaller shipbuilding centres included Aldeburgh and Walberswick in the medieval period (which was used as a port by the Icelandic fishing fleets in the Tudor period Wheatley 1990) and at Slaughden quay until 1880; the latter included collier brigs, cod smacks and shrimp boats.

Many of the settlements along the North Norfolk coast have developed from small fishing settlements (Fox 2001) and had access and had relatively good harbours in the past. For example, records for settlement character type Cley-next-the-Sea date back to the medieval period when St. Mary's church was built during the 13th century. Blakeney was once a medieval port and had been ranked as one of the most important ports in England. However, the port began to lose its importance into the 17th century as land reclamation increasingly dominated the shoreline. This had the effect of reducing the navigability of the channels which were important in securing harbouring and fishing activities, as well as hindering European connections. Brancaster's historic quay was built in the 1700s, and used by local fishing vessels and larger cargo ships, although trade began to decline in the late 19th century. King's Lynn was established an established harbour in the medieval period. King's Lynn was one of the ports associated with the Hanseatic League, a European trade emporium operating between Britain and the Baltic. With imports from Europe, King's Lynn flourished as a town, in which there was a large and prosperous shipping industry. From the 16th century onwards, with the draining of the Fens, King's Lynn became an even more important trade centre because of the production of agricultural produce. It also attracted industries related to fishing and marine trade, such as boat builders, sail makers and rope making (Parker 1971).

Values And Perceptions

The traditional hubs of the shipping industry, including Harwich, Ipswich and Woodbridge located along the coast of the area, provide an important sense of place for the local community and an important economic resource, attracting investment through the tourist economy. Awareness of the importance of the medieval and post-medieval ship building industry for the area provides an important sense of historical identity. The modern shipping hubs of Harwich, Felixstowe and Ipswich are also crucially important for the local and national economy and also lend distinctive cultural characteristics to the region.

Research, Amenity And Education

Research into the archaeology of shipping in the region has been conducted, especially on early Anglo-Saxon ships, such as the example from the Sutton Hoo ship burial. There is scope for much more research on the topic. There is also scope for a regional study of shipbuilding. Communities in the region have strong links to the shipbuilding industry as a local tradition. The study of shipbuilding and wreck sites gives cross-curricular educational opportunities, in science, mathematics, English, history and environmental studies. Museums and historic shipyards could also constitute valuable educational resources.

Condition And Forces For Change

The character of the area with regards to shipping routes may change in light of the forthcoming London Gateway Project - a proposed redevelopment of the former Shell Haven Refinery on the north side of the Thames Estuary.

Rarity And Vulnerability

There was a large and extensive medieval and post-medieval shipbuilding industry in the region, which has now largely been lost due to changes brought about by the British industrial revolution. However, the volume of shipping in general is not rare, and is even increasing.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

CHARACTER TYPE: MILITARY DEFENCE AND FORTIFICATION

Introduction: Defining/Distinguishing Attributes

The proximity of the region to continental Europe and its strategic importance, particularly with respect to London, has resulted in a defence heritage resource in East Anglia (Williams and Brown 1999, 34). The coast faces towards Europe and has low cliffs, an absence of rocks or reefs and miles of gentle, inviting beach (Williamson 2005, 144). Defences and fortifications of all periods from Roman to Modern can therefore be found along the coastline with some strategic ports such as Harwich bearing witness to centuries of re-fortification.

Roman fortifications are known to have been located at Burgh Castle and Caister-on-Sea, possibly at Brancaster, in the north of the region. Roman fortifications to the south have not survived for a number of reasons. Medieval fortifications include Caister Castle and Orford Castle in Suffolk, and Castle Rising in Norfolk.

Post medieval fortifications and defences are much more common and include a range of structures from the unfortified location of the six Elizabethan 18 pound culverins on Gun Hill in Southwold to the much more substantial and long-lived Landguard Fort overlooking the peninsula in Felixstowe. As well as King's Lynn being a port, it was also a defended place with medieval fortifications that were added to in the 16th century and continued to be added to until the 19th century. A military unit was posted to King's Lynn, until its decommissioning in the 19th century.

Many of the post medieval defences in this area were a reaction to the threat from Napoleonic France including the string of 'Martello' towers stretching southwards from Aldeburgh and ultimately around to the south coast, and the Redoubt fort in Harwich.

The area was also highly significant for defence in both World Wars and a number of defences remain. In particular the WWII anti-invasion defence system originally stretched along almost the entire length of coast. Parts of this system remain throughout including most commonly features such as pill boxes, gun emplacements and anti-tank cubes along with associated fieldworks structures such as linking trenches. Other fortifications which survive in places include monitoring posts, anti-aircraft batteries, scaffolding obstacles and bombing decoys.

Offshore a series of four forts (known as Maunsell Forts) were built around the Thames estuary which were intended to act as an early warning system, break up aircraft formations and prevent mine laying. Two of these were located within the region and one (Rough Sands) survives today, having had a colourful history culminating in its being declared as an independent state.

The area also comprises a number of naval battlefields including Sole Bay, Kentish Knock and the Gabbard, all of which took place during the 17th century Anglo-Dutch wars.

Historical Processes; Components, Features And Variability

There is no evidence of attempts to fortify the coastline prior to the Roman invasion despite evidence indicating extensive trade and other cultural links with the Continent across the sea from the Neolithic onwards. As such the earliest defensive structures we know of are Roman in date. As outlined above two Roman fortifications still exist in the north of the region, a further structure which once stood at Walton but has since been lost to the sea. Another was

located at Brancaster (indicated by the place-name), although some remains can be found. All of these structures were part of the system of 'Saxon Shore forts' built in the 3rd century AD to defend against the increasing threat of Germanic invasion and piracy. The line of forts stretched from Brancaster in Norfolk (Branodunum) to Porchester in Hampshire (Portus Adurni). The surviving forts at Caister and Burgh Castle were originally placed either side of a wide estuary complex (Malster 2003). This complex gradually silted up and accreted leaving the structures much further inland today. The outer walls of Burgh Castle remain almost intact although the Caister fort is now ruined.

The shore fort at Walton would have been a similar structure but in direct contrast with the northern forts this was lost to the sea as a result of coastal erosion. The fort was probably located c. 2 miles seaward of the current shore. The last of the structure is thought to have fallen into the sea in the 17th century and although drawings of the fort survive it is unclear if these are antiquarian forgeries (Williamson 2005, 13).

Following the withdrawal of the Romans and the Saxon settlement of the area the next threat from overseas came from the Vikings in the 9th to 11th centuries. No evidence survives of defensive structures, however Alfred is said to have destroyed a fleet of sixteen Viking ships attacking Harwich in 885 AD.

Construction of defensive coastal structures continued into the medieval period. A keep was built inside the walls of Burgh Castle shore fort between 1095 and 1110. Records indicate that the castle still existed in the 13th century when towers and a gatehouse were added.

One of the most notable coastal defences is Orford Castle. This was built overlooking the port in 1173 by Henry II in order to help consolidate power in the region. The castle became less important after Henry's death in 1189 (http://en.wikipedia.org/) and was briefly taken by Prince Louis of France in 1216. In 1336 Edward III sold the castle to Robert Ufford, Earl of Suffolk. By this time the port was declining as a result of silting of the harbour. The Earl of Hertford, owner of the castle in 1809 wanted to demolish the building, however its function as a navigational aid saved it. As a result of the siltation of the river the castle now stands 500 m inland.

A castle was also built at the port of Harwich, in the 14th century, known to have still been in use in 1547, with a small harbour (the King's Quay) built onto the eastern side in the 1580s. It is likely that the first Beacon Hill fort was also constructed in the 16th century (http://unlockingessex.essexcc.gov.uk). The castle may have housed the gaol in the early 1600s but was abandoned in 1625 and a new fort erected on King's Quay. Nothing remains of the castle today.

A four turreted castle is also mentioned as being located in Great Yarmouth in 1399 and again in the late 16th century, however there are no physical remains of the fortification.

Caister Castle was constructed between 1432 and 1446 by Sir John Fastolf and was notable for a number of reasons. The castle was one of the first to be built with brick and was the recipient of one of the five licences to crenellate issued by Henry VI, during his reign (http://en.wikipedia.org/). The castle was besieged and captured by the Duke of Norfolk in 1469 and fell into ruin after 1600 when a newer house was built nearby.

Castle Rising was built in the 12th century. Although the castle is some way from the coast, it would have dominated the landscape in the area, restricting through movement of people and goods from the coast from Norfolk and the Fens.

The post medieval period saw an expansion in the construction of coastal defences. The first of these occurred under Henry VIII due to concern about invasion from France and the Holy

Roman Empire. In 1539 Henry ordered a survey of coastal defences which found them to be wanting. Subsequently Great Yarmouth was substantially fortified beginning with the construction of three earthen bulwarks near the entrance to the harbour. These were declared useless by 1546, possibly because they had no guns. In 1540 two batteries were also constructed in the town.

At the same time the first defences comprising a blockhouse and a few earthwork were erected at Languard Fort in Felixstowe to protect the entrance to Harwich harbour. This was by far the best deep water harbour on the East Anglian coast and was viewed as a 'potential back door to London' (Williamson 2005, 145). The fortification was dismantled in 1552 but restored in 1588 due to the threat of the Spanish Armada.

This period also saw the construction of 'the Mount' in Great Yarmouth erected in 1569, an earth platform built against the inside of the inner town wall. Batteries were constructed at Southwold and Aldeburgh. Later the 'South Mound' was built between the South Gate of Yarmouth and the River Yare and topped with heavy guns to cover the southern approach to the town.

During the 17th century both France and the Netherlands were perceived as major threats. A true fort was constructed on Landguard Point between 1624 and 1626 including four bastions, brick barracks and turf ramparts. In 1667 the garrison of 400 musketeers and 100 artillerymen successfully repelled a Dutch invasion force of 1500 men that had landed on Felixstowe beach.

The Anglo-Dutch wars of the mid- to late 17th century saw numerous sea battles within the region. Famous battles include Kentish Knock, the Gabbard, Lowestoft and Sole Bay. The battle of Kentish Knock took place in October 1652 during the First Anglo-Dutch War. A total of 68 English ships led by Robert Blake met the 62 ships of the Dutch led by Witte de With. The English ships were larger and better equipped than the Dutch who were fighting amongst themselves and finally withdrew.

The Battle of the Gabbard took place in June of the following year. The English fleet comprised 100 ships, led by Generals George Monck and Richard Deane. The Dutch had 98 ships under Lieutenant-Admiral Maarten Tromp and vice-Admiral Witte de With. On the 12th June the Dutch attacked and were forced back. A second attack on the 13th June resulted in disaster for the Dutch who lost 17 ships. The Royal Navy ship HMS Gabbard was named in honour of the battle (http://en.wikipedia.org/).

The Battle of Lowestoft took place on June 13th 1665 during the Second Anglo-Dutch War. More than 100 ships under Jacob van Wassenaer attacked an English fleet of similar size under James, Duke of York (later James II), and 40 miles east of Lowestoft. The aim of the Dutch was to try and prevent another English blockade of their ports. However the battle was a decisive English victory.

The Battle of Sole Bay took place on 7th June 1672 and was the first naval battle of the Third Anglo-Dutch War. Sole Bay was the embayment containing Southwold, a major fleet anchorage in the 17th century. The English and French fleet had been assembled under James, Duke of York to carry out maintenance and supply before going to Dogger Bank to blockade the Dutch ports. The aim was to enable the English and French to take control of the lucrative trade with Asia built up by the Dutch East India company. However while at anchor the Dutch under Admiral de Ruyter attacked unexpectedly. The Anglo-French fleet was caught unprepared, with many of the crew still on shore leave. Although a French frigate warned of the Dutch approach, the Anglo-French fleet was surprised when the attack came from the north-east rather than the south-east. The French fleet became detached from the English,

who were left to fight alone. The battle was inconclusive, with both sides claiming victory, but the losses to the English fleet, including the destruction of the flag ship Royal James, were such that the proposed blockade of the Dutch fleet was never attempted. Five wrecks from the battle are known (http://en.wikipedia.org/).

Fortification continued through the 18th century including a new battery at Languard Fort in 1716 and a completely new fort in 1745-1751. In 1744 new batteries were established at Southwold and Aldeburgh during the War of Austrian Succession. It is the culverins given to Southwold at this time which still stand on Gun Hill. In 1778 eight forts were built in Yarmouth as a reaction to the American War of Independence, and they were maintained until 1815.

It was however the threat of French invasion which once again inspired large scale fortification of the coast in the early 19th century. This was particularly significant in Harwich and included the Redoubt (1808-1810) a circular fort, surrounded by a moat, over 60 m in diameter with walls 2.5 m thick. The fort possessed ten 24-pound guns placed on the roof and a circular parade area, surrounded by brick-faced ditch. In 1811 small gun batteries were also erected on Bathside Bay, Angel Gate and Beacon Hill, the latter eroded into the sea by 1822.

A string of 105 structures known as Martello Towers were also built along the coast between Aldeburgh, Suffolk and Seaford in Sussex between 1804 and 1812. These were squat, circular towers named after a similar structure at Mortella, Sicily. Those in the region, of which 10 remain, were among the latest dating to 1810-1812 and were supplied by the Redoubt. The towers were placed to protect exposed beaches, mouths of estuaries and strategic points. The structure at Felixstowe Ferry replaced a floating battery with four guns which had been stationed at the mouth of the Deben.

The towers were generally 10 m high, brick-built and rendered to resemble masonry containing two floors and a heavy gun on top, protected by a parapet. The Suffolk towers were generally egg-shaped in plan, the narrower end with the thickest wall facing the sea. The northernmost structure at Slaughden had a unique quatrefoil layout. The towers were never tested against a Napoleonic fleet and found different uses after the threat had passed, including as private residences, restaurants, museums and galleries. Some were also washed away and a number were taken over by the coastguard to prevent smuggling.

Later in the 19th century the fortifications were maintained by remodelling of the Redoubt in 1861 and a major rebuild of Landguard Fort during the 1870s when the interior barracks were rebuilt to a keep-like design and the river frontage rebuilt with a new battery. A new seven sided fort was built on Shotley Point in 1862 and a battery was also constructed on Beacon Hill in the 1890s, completing the protection given to Harwich harbour as the strategic regional port.

Latterly the coastal area was well fortified during the World Wars. Little remains of the WWI fortifications other than pill boxes and other small features. The East Anglian coast was littered with fortification and defensive structures that date from WWII. The WWII remains survive much more extensively along the entire length of the study area coast. Following the German invasion of France in June 1940 a huge programme of military coastal defence construction was undertaken. This included long linear obstacles like barbed wire, scaffolding and anti-tank cubes, which linked together important nodal points such as pill boxes, anti-aircraft batteries etc. (Hegarty and Newsome 2005, 126). Defences also included underground monitoring posts, barrage balloon sites, check points, infantry strong points and enclosed minefields. Three WWII bombing decoys at Kirby-le-Soken are recognised as Scheduled Monuments.

Figure 12. Wartime relics close to Weybourne.

Much of the length of East Anglian coast was fortified in some way, with gun posts, batteries, pill-boxes, tank lines, radar stations, which were a part of the home defence during WWII. Or for example the pill-box at Weybourne was part of a defensive system that included the remains of an anti-tank ditch. Some areas such as Harwich and Felixstowe were more heavily defended, including refortification of Beacon Hill and Landguard Fort. The latter was used as a barracks and training ground until 1945 as well as a launch site for Operation Outward, a project to attack Germany by means of thousands of unmanned hydrogen balloons.

Offshore, the area was defensively mined as part of a large coastal barrier during WWII (Foynes 1994). The wreck evidence in the area illustrates the significance of Harwich Haven in particular with a number of aircraft and mined vessels resting in the Haven including the remains of a WWII Lancaster Bomber, HMS Gypsy, HMS Sisapon and HMS Tunisian.

The area also contained two of the four Maunsell forts built to protect the Thames Estuary - Sunk Head and Rough Shoals, named for local marine features. The forts were designed by G A Maunsell to protect London and the coastal areas from enemy aircraft and shipping attacks, and were placed in 1943. This was particularly crucial as a result of the new German Magnetic Influence Mines which were being dropped by parachute from seaplanes, resulting in heavy shipping losses (http://www.bobleroi.co.uk). Each fort had a steel gun platform with two anti-aircraft guns, a control tower and radar equipment. The platform of the forts were supported by two 8m diameter concrete towers on a floating pontoon base. Each tower contained seven floors comprising living quarters and storage areas and would have been

occupied by 150-300 Royal navy personnel. The forts adopted the MOD code Uncle with each given the abbreviation U. The Rough Shoals fort was known as U1 and Sunk Head as U2. For unknown reasons the latter was often called Churchill One.

The forts were abandoned in 1956 and some utilised by pirate radio stations in the 1960s. Sunk Head fort was blown up by the military in 1967 to avoid further use. Rough Shoals is presently occupied by the family of Paddy Roy Bates, a former radio broadcaster and British Army major who took the fort by force in 1967. The Royal Navy tried to forcibly evict Bates at this time but were repelled by warning shots. As the fort was outside territorial waters at the time a court ruled in Bates' favour. Although the fort has no legal status the family claim it is an independent state of 'Sealand'. Following this they introduced a flag, constitution, currency and passports (http://en.wikipedia.org/). In 2010 the fort was put up for sale by the family.

Military defences continued to be important in the region after WWII, most notably at Orfordness which was under the control of the military from 1913 through to the 1970s (see Military Facility). During the cold war period the ness was used as an atomic research establishment and in 1971 the base was used for development of COBRA, an over-the-horizon early warning system which was abandoned as a failure. Orfordness is now owned by the National Trust and maintained as a nature reserve, including the military structures.

Landguard Fort continued to be used as an anti-aircraft operations room for Harwich in the 1950s. The fort was designated as a Scheduled Monument in 1961 and is now a tourist attraction housing Felixstowe museum.

Values And Perceptions

Remaining fortifications of different dates are perceived in very diverse ways by the general public. For example visiting structures such as the Roman shore forts and medieval castles has very much become a recreational activity. The WWII defences in contrast have traditionally been viewed with more foreboding, possibly as a result of the temporal closeness of the threat they represented. This opinion has started to change in recent years with more people beginning to appreciate the 20th century defensive heritage.

Overall the defence heritage along the coastline in this area is perceived by most as being an important aspect of the landscape. This applies to both what is represented by the fortifications and more practically to the value of structures such as Orford castle as navigation aids.

Research, Amenity And Education

Most of the fortifications outlined above act as major tourist attractions in the region. In many cases these have been developed to make the most of this. For example Caister Castle has been combined with the motor museum which attracts many people. Landguard Fort is in an area which is very significant for wildlife watching and Orfordness is run as a nature reserve. In addition a number of the Martello towers have been converted to public amenities such as museums and galleries. Jaywick tower is a good example of this, displaying exhibitions relating to the themes of Community, Heritage and Environment in an impoverished area.

Much research has been conducted in recent years on 20th century defences, most notably the Defence of Britain Project, which ran from 1995 to 2002 under the auspices of the CBA. The project aimed to record to record the 20th century military landscape of the United Kingdom, 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/). During its lifetime nearly 20,000 20th century military sites in the United Kingdom were

recorded by c. 600 volunteers. This has been enhanced and verified by the recent Rapid Coastal Zone Assessment Surveys (RCZAS).

Smaller heritage projects have also included recent archaeological exploration into the lost curtain wall at Orford Castle. The castle has a display run by the Orford Museum Trust exhibiting archaeological artefacts found locally, including Roman brooches, medieval seals and coins, as well as the castle history.

Condition And Forces For Change

The earlier fortifications which remain in the region are mostly in good condition. The standing walls at Burgh castle for example are striking and Orford Castle is one of the best preserved keeps of its period. In other areas structures have been lost to sea or are at risk of being lost to erosion, such as the shore fort at Walton. Some of the structures at Orfordness may also come under threat in the near future.

In some cases the 20th century defences in particular have been forgotten and allowed to deteriorate and there are very few traces of WWI defences left. However, this lack of knowledge has begun to be rectified by the Defence of Britain project and RCZAS projects which have cultivated interest in the later fortifications.

Increasingly these lines of defences are becoming tourist attractions as interest in the World Wars grows and they gradually take their place in perception as a part of the nation's history beyond most people's living memory. These features are well placed to create heritage tours along the coast which will be helped by the opening up of coastal access by the implementation of the Marine and Coastal Access Act. The main objective of this Act of relevance here, is to ensure that there is a route for the whole of the English coast to allow recreational journeys on foot or by ferry. The route will in many cases cross previously private land and will open up many previously inaccessible sites of interest. http://www.publications.parliament.uk/pa/cm200809/cmbills/137/2009137vol1.pdf. http://www.insights.org.uk/articleitem.aspx?title=Tourism%20and%20the%20Proposed%20Marine%20and%20Coastal%20Access%20Act%202009.

Rarity And Vulnerability

As outlined above many of the 20th defences are at risk from erosion and significant numbers of features have already been lost this way. However the increasing recognition of these Monuments as a valued part of our tangible heritage means that many are now being preserved. The WWI structures in particular are relatively rare.

In addition although in good condition, features such as the Roman forts and medieval castles of the region are part of quite limited survivals of structures dating to these periods which can give us insight into coastal defences through the ages.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

CHARACTER TYPE: MILITARY FACILITY

Introduction: Defining/Distinguishing Attributes

The area has always been very significant militarily due to its proximity to continental Europe and its strategic location, particularly with regards to London (see also Military Defence and Fortification).

Installation of new military facilities has become less frequent in East Anglia with increasing European collaboration. Many earlier examples still exist, though most are in ruins. These include earlier post medieval facilities such as Landguard Fort in Felixstowe and the defunct naval yard at Harwich. More recent and unique facilities are still very much in evidence at the nuclear testing facility on Orfordness, Bawdsey Radar Station and Naval training centre HMS Ganges in Shotley.

Figure 13. Langham Airfield Dome Trainer, Langham.

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During WWII East Anglia functioned as England's Airfield (Williamson 2006, 77). A number of airfields were located in the coastal area, the remnants of which can still be seen at Woodbridge and Rendlesham (RAF Woodbridge and Bentwaters respectively). Less survives at Leiston and Burgh Castle where airfields also existed albeit temporarily at the latter, and at other areas along the Norfolk coast, such as Langham (which has standing and visible

remains). However, many of the coastal airfields, such as Hunstanton, Weybourne, Cromer and Bacton, are no longer visible today.

Much of the southern part of the offshore area is delineated as a series of military practice areas. These are named after the prominent sandbanks in their vicinity – Gunfleet, Kentish Knock, Galloper and Outer Gabbard. These areas are used by the navy for mine laying and mine counter measure exercises. The areas are permanently earmarked for military practice though access is only restricted during active exercises, notification of which is given by radio shortly before mine laying takes place. There is also an ordnance dump within the Gunfleet practice area.

Historical Processes; Components, Features And Variability

Perhaps the earliest large-scale military facility in the area was Harwich naval dock yard. Harwich, the best natural deep water harbour in the region, gained significance in the 16th and 17th centuries as a defensive area as a result of successive wars with France, Spain and Holland (see Military Defence and Fortification). During this period, warships began to muster in Harwich harbour and in 1650 it was appointed victualling station for the navy. This facility was subsequently transferred to Ipswich and a naval dockyard constructed in Harwich in 1657.

A survey in 1661 recorded the presence of storehouses, a dwelling house, sheds, pitch and tallow houses and 2 windlasses. The dockyard had a volatile existence, closing in 1672 and re-opening in 1689 with the advent of new hostilities. The dockyard remained in use as a base until 1713. It was leased to private shipbuilders, constructing civilian ships, in 1730 until it was sold by the Admiralty in 1827.

In order to protect Harwich harbour Landguard peninsula was fortified from as early as 1540 (see Military Defence and Fortifications) but became a major facility at various times during its lifetime. New works were added in 1624-6, a new battery in 1716, and a completely new fort was built in 1745-1751. The current layout is the result of a major re-build during the 1870s, when the interior barracks were rebuilt to a keep-like design and the river frontage rebuilt with a new battery.

During the Napoleonic War Great Yarmouth became an important strategic position and naval base. A naval hospital was constructed there between 1809 and 1811 which was incorporated into the militia barracks, before becoming a civilian hospital.

Shotley also became a significant maritime centre in the 19th and 20th centuries, with the construction of a coastal battery in 1862 and later establishment of the naval training base, HMS Ganges. HMS Ganges was originally a three decker ship launched in 1821 at the Bombay Dockyard. She saw several decades of action, including spells in South America, the Mediterranean and the Pacific. In 1866 she began service as a training ship in Falmouth and was moved to Harwich harbour in 1899, where she was used until 1905. At this point HMS Ganges became a shore establishment in Shotley training boys, and later men, until it closed in 1976 (Edwards 1991, 16). The establishment is particularly famous for its 143 ft high ceremonial mast which all boys were expected to ascend. The mast remains in Shotley village and is a Listed Building (No. 1036850).

The area again became important during World War I with Harwich once more established as a naval base. The port was declared a Class A fortress because of its strategic position and the harbour sheltered the destroyers of the Harwich Force. This included six cruisers, 50 destroyers, nearly 100 minesweepers, 18 submarines and a depot ship, four seaplane carriers

and auxiliary vessels. Harwich was ultimately the location for the surrender of the German U-boats in WW1.

In 1915 the decision was made to utilise the remote and isolated Orfordness as a military facility. Initially the Royal Flying Corps had an airfield on the Ness alongside an experimental squadron who carried out research on machine guns, bombs and navigation. The site was also used as a WW1 prisoner of war camp. The Roman fort at Burgh Castle was used as a base and night landing airfield during WW1.

While the other military facilities fell out of use at the end of the war Orfordness continued to be used by the Royal Flying Corps for experimental flying until 1921. From 1921 to 1939 the ness functioned as an Aeroplane and Armaments experimental establishment, firing and bombing range. After 1936 experiments conducted included radar, rockets and radio navigation. Following some success with radar RAF Bawdsey was established in 1936 for the development of the first RADAR system. The team was headed by Robert Watson-Watt and the site saw the erection of four 360 ft high transmitter masts. This would become the first of a chain of radar stations around the coast of Britain by WWII.

The Second World War saw the re-establishment of Harwich as a naval base and vital deep-water anchorage for allied shipping. The port was strengthened with casemates and towers for radar and observation. Orfordness became an army training ground in 1940 and Languard Fort was again used as a barracks and training ground. The latter was also used as a launch site for Operation Outward, a project to attack Germany by means of thousands of unmanned hydrogen balloons. Bawdsey continued as a radar station and was bombed on at least 12 occasions during WWII. Both Sudbourne Hall and Benacre hall were occupied by the military during the war years.

It was during WWII that the region also became important to the Royal Air Force and United States Air Force. In 1934 there were four active air bases in East Anglia as a whole, by 1945 there were 107 (Williamson 2006, 77). In this region the airfields included RAF Woodbridge, Bentwaters and Leiston. The runways for the former two were used by the USAF into the 1990s and are still features on the landscape.

After the war the facilities at Landguard, Bawdsey and Orfordness remained in military use. Landguard Fort became an anti-aircraft operations room for Harwich in the 1950s and was designated as a Scheduled Monument in 1961. Bawdsey was maintained by the RAF until 1991, when it was used to house the Bloodhound missile. A variety of military structures still survive within the base, including pillboxes, anti-tank obstacles, air-raid shelters, anti-aircraft gun emplacements, bomb stores, blockhouses and strongpoints.

However it is Orfordness which became the most significant facility in the region and the largest above ground monument to the Cold War in the UK (Countryside Agency 1999, 59). During this period the ness was used as an atomic research establishment and developed the firing mechanisms for nuclear devices. At this time a series of enigmatic pagoda structures were constructed on the ness. These were designed to absorb any accidental explosion, allowing gases and other material to vent and dissipate in a directed or contained manner (http://en.wikipedia.org/). In 1971 the base was used for development of COBRA, an over-the-horizon early warning system; this was abandoned in1974 as a failure. The military establishment is now incorporated within a wider nature reserve and is accessible to the public, but the activities which took place remain undisclosed by the Ministry of Defence.

Orfordness is ecologically an extremely sensitive area, and although a variety of military uses over the years has had an adverse impact on some parts of the area, the military presence has effectively safeguarded the majority of the site from public access and potential damage to

the fragile resource. It contains a variety of important habitats including shingle, tidal rivers, mud flats, sand flats, lagoons, salt marsh and grassland and is an important breeding area for the Little Tern. http://www2.suffolkcoastal.gov.uk/planning/local_plan/ws/cpt10.html

Langham Airfield opened during 1940 as a satellite airfield for Bircham Newton. Flights of No 1 Anti-Aircraft Co-operation Unit notably resided at Langham until the end of 1942, providing vital target-towing facilities for army firing camps at Stiffkey. Langham became an independent RAF station in July 1942 but then reverted to Care & Maintenance for extensive redevelopment. The airfield reopened in February 1944. Squadrons formed a Strike Wing to mount anti-shipping operations over the North Sea amid frequently ferocious fighting. Vickers Wellingtons Squadrons subsequently attacked German E-boats at night until the end of WW2. Langham became noteworthy for meteorological reconnaissance duties. The airfield closed to flying in May 1946 but was used as a Technical Training School for the Royal Netherlands Air Force. Langham again reopened between March 1953 and November 1958. There was also limited American military use during the 1950s as U.S. Army radio-controlled model aircraft were used here, again for gunnery practice. Langham Airfield was eventually sold in October 1961, after serving as a very basic Emergency Landing Ground for Sculthorpe, and is now a Bernard Matthews turkey farm. Evidence of the airfield is still fairly legible, with the runways, perimeter track and control tower still existing. The Dome Trainer on the east side is one of the best known individual airfield buildings in Britain and is Scheduled (list id 1003173).

Values And Perceptions

This character type once dominated much of the landscape in this region and in the case of areas such as Orfordness, it still does to a large extent. The general public is mostly proud of the defensive role played by the region, particularly in the World Wars, and Harwich and Great Yarmouth still have deep naval associations. Much of the population of East Anglia was once very familiar with the continuous air exercises and the integration into the communities of British and American air-men and their families.

In addition, some of the more specialised military activities have taken place in the region which have given it an air of mystery. This is particularly true of Orfordness which was shrouded in secrecy for many years. Due to its history, stark appearance and closure to the public for so long, several stories have circulated about Orfordness. Best known is the suggestion that Nazi troops attempted to invade England and actually disembarked on the tip of the peninsula before being repelled by a wall of fire. This has now been dismissed as myth.

From a maritime point of view many of these facilities also functioned as navigation aids, including the masts and structures of Orfordness, the Bawdsey radar masts and the mast of HMS Ganges at Shotley.

Research, Amenity And Education

The military facilities of the region have provided a basis for much local research, especially into the naval and air bases. On a professional level the facilities have been the subject of many studies recently including the Defence of Britain project, the Rapid Coastal Zone Assessment Surveys and the National Mapping Programme. All have mapped huge areas of military facilities.

Some of the older facilities have been taken out of military service and reused including the airfields for civilian air traffic. Others have been converted into museums or reserves with educational and tourism roles. Orfordness is now owned by the National Trust and is mostly open to the public, except some of the more secretive or unsafe structures. The ness proves to

be a valuable amenity for studying inter-tidal landscapes and ecology as well as housing numerous displays relating to its military use.

A charity known simply as Bawdsey Radar has been established in order to restore the Transmitter Block at Bawdsey, 'to create a unique exhibition, educational facility and visitor attraction' (http://www.bawdseyradar.org.uk/). Currently the old facility is open to tours on a few days per year. The unusual nature of the station has led to its featuring in television programmes such as the BBC's 'Restoration' and 'Coast'.

Condition And Forces For Change

The military facilities of East Anglia have undergone extreme changes as a result of successive defensive reviews during the last few decades. Many closed during the 1990s and some have been abandoned whilst others have seen major reconstruction and re-use as outlined above.

The drive towards preservation of these facilities and their use, particularly for education, has led to a number of groups, such as the National Trust and local charities, taking on redundant military facilities. The former naval dockyard at Harwich is now under active conservation.

Modern active military facilities in the area only exist at sea currently: the military practice areas and are subject to changes associated with industries such as aggregate dredging and wind farms, however the military function will always take precedence when required.

Rarity And Vulnerability

Published Sources RAF Bawdsey, HMS Ganges and Orfordness are considered to be some of the most important and unusual relict military facilities in the UK. All are being conserved and enhanced under current owners. However the natural processes of erosion may ultimately threaten the structures at Orfordness, particularly those such as the Black Beacon which are close to the current shoreline.

Landguard Fort has been designated as a Scheduled Monument due to its individuality and importance and is also located within an SSSI on Landguard Point. Similarly Orfordness as a whole is a National Nature Reserve (NNR) an SSSIand an SAC. The mast of HMS Ganges is also a Scheduled Monument.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: MARITIME SAFETY

Introduction: Defining/Distinguishing Attributes

Lighthouses are a common type of site along the coastline. Working lighthouses are located in Gorleston, Lowestoft, Southwold and Orfordness, as well as at Happisburgh, and Cromer. At Gorleston the Range Rear lighthouse is a red brick tower which sits amongst the houses just off the front. A second later brick and concrete built lighthouse is located on the south pier. The Lowestoft lighthouse is set well back from the coast and that at Southwold also sits amongst the town's houses, both painted a striking white. The Orfordness lighthouse is located at the end of the spit and is distinctively red and white. At Happisburgh the lighthouse is the oldest working lighthouse in East Anglia. It is painted white and red, with white flashes every 30 seconds, standing at a height of c. 41m, with a range of 14 miles. The Cromer lighthouse is automated in 1990, and was located half a mile from the cliff edge when it was rebuilt in 1866.

Figure 14. Happisburgh lighthouse and cliffs in 2005.

Inactive lighthouses often still perform a daymark role. Remains in Lowestoft harbour in the form of two brick towers on either pier are related to an old lighthouse. A small lighthouse at Pakefield is situated in the grounds of Pakefield Hall. In addition two sets of defunct lighthouses still stand at Harwich/Dovercourt. The high and low lighthouse in Harwich proper and two cast iron structures set about 200 m apart at either end of a stone causeway which projects into Dovercourt Bay. There are inactive lighthouses also at Old Hunstanton and at Winterton.

Buoyage, beacons and lights are used extensively in the offshore area to mark the numerous sandbanks and marine features and aid navigation. Such features are particularly dense across the sandbanks to the north of the region around Great Yarmouth and in the south around Harwich haven, extending out to the Outer Gabbard. Safety lights/buoys etc. are also found along all the river channels and extensively around the Harwich deep water channel.

Other safety features include traffic separation schemes such as those around the Sunk, pilot boarding areas and radio-call in points. The offshore area also has numerous caution areas due to elements such as submarine cables and high speed craft and a large precautionary area is in operation around the Sunk.

There were several lightships or lightvessels close to the sand banks that lie off the Norfolk coast. For example there were lightships at Cromer Knoll, Leman and Ower, Blakeney Overfalls, The Would, Newarp, Smith's Knoll, Haisboro'and Haisborough Gat. Since 1940s, these have disappeared but were a feature of navigation safety since the 18th-19th centuries.

The region also has many daymarks that were marked on Admiralty Charts. These include masts, beacons, lighthouses, as well as land marks such as churches (with spires, towers), windmills and columns associated with country houses (such as at Holkham Hall). These were located up to 5 miles from the coastline across the entire Norfolk coast.

In terms of maritime rescue, large coastguard stations are located at Great Yarmouth, Happisburgh and Mundesley, Wells, Hunstanton and Clacton with smaller offices at Gorleston. Lowestoft, Aldeburgh, Shingle Street and Felixstowe. RNLI Lifeboat stations are located at Happisburgh and Mundesley, Wells, Hunstanton, Great Yarmouth and Gorleston, Lowestoft, Southwold, Aldeburgh, Walton and Frinton and Clacton.

Historical Processes; Components, Features And Variability

Over the centuries many different types of structures have functioned as daymarks. In most cases this function was incidental to their main purpose, however many of these structures have been of maritime character, depending on the significance of the East Anglian coast at that time.

Little is known of very early daymarks although the varying topography and other modified features were used to navigate (see Parker 2001). It is probable, particularly in the Deben and Alde estuaries that burial mounds such as those at Snape and Sutton Hoo were used for navigation. One of the earliest remaining historic daymarks on this coastline is Orford Castle. The castle was constructed in 1173 by Henry II specifically to overlook the coast. The position of the structure has changed dramatically as a result of the development of Orfordness and is now much further inland, however the castle can still be seen from sea. In 1809 The Marquis of Hertford, owner of the castle, wanted to demolish the building however he was refused permission as it was a "necessary landmark" (Williamson 2005, 133). A representation of Orford Castle on one of John Norden's maps of the Stanhope Estate 1600-1 showed a beacon on the top, presumably placed to aid navigation at night (ibid).

During the late medieval and early post medieval periods the region was very important to the wool and cloth industry as a result of its numerous ports and position in relation to London and the Continent. Although most ports silted up or fell out of favour many can still be recognised by their large Perpendicular style churches built by wealthy merchants. These include Blythburgh and Southwold. As a result of the flat countryside and wetlands in these areas these churches can still be seen from sea and have been used to navigate for hundreds of years. It is possible that the chapel of St Margaret at Minsmere was maintained to serve this function long after Leiston Abbey moved and may explain the height of some of the towers (Williamson 2005, 133). Alderton church was saved from a proposed reduction in height through decay in 1686 as the incumbent appealed to Trinity House on the grounds that it was a daymark (ibid).

In the 18th century Harwich was important for fishing, shipbuilding and as a naval base and was therefore heavily used. As a result of the treacherous approach the Naze Tower was built by Trinity House in 1720 on top of the Naze cliffs, specifically as a day mark. It still serves this function today for traffic approaching Harwich. Since its construction the tower has served as a Georgian tea room, an army lookout post, navy signalling point, RAF radar installation and telephone relay station. Today it is once again a tea room and tourist attraction (www.hometown.aol.co.uk).

A series of military fortifications were erected along the east and south coasts between 1804 and 1812 to defend against Napoleonic France (see Military Defence and Fortification). Although the towers were never tested defensively many remain along the coast as far north as Aldeburgh and are used as daymarks. The Martello towers have undergone a variety of later uses including as private residences, museums, restaurants etc.

Nelson's Monument in Great Yarmouth was built in 1819 and was also constructed as a daymark. Following Nelson's death at the Battle of Trafalgar in 1805 it was decide to erect a monument in his home county of Norfolk. Although a monument in Norwich was proposed, ultimately it was deemed more appropriate to construct the memorial in a coastal location in the form of a column so that it could serve as a navigation mark (http://www.nelsonsmonument.org.uk).

During the 20th century the region's coastline once again became important militarily and a number of facilities were constructed to defend the country. These included the base at Orfordness which served a variety of functions, and the Radar Station at Bawdsey. Both facilities contained masts and other tall structures which still serve as daymarks.

More recently settlement and recreation have become key to the area. This has led to the use of more mundane buildings, masts, beacons and others monuments as daymarks. One of the more interesting 20th century daymarks is the House in the Clouds in Thorpeness. This was originally a water tower which was masked as a weather-boarded building to fit in with the mock Tudor village of Thorpeness and can be seen many miles away.

Lighthouses have been important to the region for many centuries. The first lighthouses ever built by Trinity House were located at Lowestoft, Caister and Winterton in response to requests to erect these features in 1609. The Caister lighthouse was shown on Fadens map of 1797 but no longer stands. In Lowestoft high and low lights were constructed on the ness with tallow candles used to produce the light. When lined up the lights guided vessels through the Stamford Channel. These original structures were rebuilt in 1628 and 1676, the high lighthouse becoming a substantial brick structure.

Further south the first lighthouse was built on Orfordness in 1634 by John Meldrum, who was granted a patent to build two temporary lights between Sizewell Bank and Aldeburgh Napes.

These were replaced under Charles II by two timber towers located so as to indicate a safe passage through the narrow gap between the Sizewell Bank and Aldeburgh Napes. These wooden structures were the scene of a limited attempt at invasion of the British Mainland when, in 1707, during one of Britain's wars with France, the lighthouses were attacked by a French privateer who severely damaged a lantern and stole various goods, including the keeper's beds (http://www.trinityhouse.co.uk/interactive/gallery/orfordness.html).

Following this in 1720 the wooden lighthouses were replaced with brick towers at a cost of £1,180. In 1792, Lord Braybrooke, who was the owner at this time, had a new brick tower built much further back which became the great light and the previous great light then became the small light. The tower which was built in 1792 remains to this day.

Until 1818 ships were guided into Harwich harbour by two lights – a fire in a room above the town gate and a wooden lighthouse above the beach. These were replaced by the brick High and Low lighthouses in 1818, built by eminent engineer John Rennie the Elder. However these became redundant in 1863 due to the changing course of the channel and the cast iron Dovercourt lighthouses were constructed, also becoming obsolete in 1917; all four lighthouses still stand.

Similarly a small lighthouse was built in the grounds of Pakefield Hall in 1832 to steer ships through the Barnard and Newcome sandbanks. The sandbanks had moved so much that another lighthouse was built in Kessingland in 1850 and Pakefield was obsolete by 1864 (www.suffolktourist.guide.com). The building has since functioned as a bar and later a darkroom for the holiday camps which occupied the grounds, as well as being used before and during World War II for military purposes. Today it serves as a Coastal Surveillance Station.

In 1836 an Act of Parliament gave Trinity House compulsory powers to levy out the private individuals who owned lighthouses. Trinity House paid the third Lord Braybrooke £13,414 for Orfordness Lighthouse. Following this lighthouses were erected at Gorleston (1852 and 1878) and on Gunfleet Sands (1852), a new high lighthouse at Lowestoft (1874) and at Southwold (1890).

At Gorleston an octagonal brick tower was built on the south pier and a later round brick tower amongst the houses. The former was replaced by a brick and concrete building in 1955 which also functions as a coast watch station.

A lighthouse was constructed on Gunfleet Sands, in a horseshoe shaped bay within the western part of the sandbank in 1852 and still stands today. The structure is iron lattice built on seven screw piles driven into the sands. A hexagonal living space is placed on top of this and finally the light at the summit. The light could be seen for 10 miles. The lighthouse was decommissioned in the 1920s and is currently used as a weather station (http://www.lighthouseeclips.org.uk/).

At Lowestoft the high and low lights were replaced with the existing structure following periods of disuse of the low light. This makes Lowestoft the longest established light station in Britain. All the lighthouses which remained were converted to electricity in the 20th century and eventually became completely automated.

Historic maps show early positions of buoyed channels and lightships at sea. These often marked the same features which are highlighted today. However the shifting nature of the seabed here means their position shifted over the years.

The Old Hunstanton Lighthouse was built in 1840 although there has been a lighthouse or beacon on the site since 1665. The first lighthouse was built of wood with an iron basket of

burning coals as a light. A later lighthouse had the world's first parabolic reflector which was built in 1776.

The lighthouse at Cromer was built on the cliff top at Foulness, east of the town of Cromer since 1669 by Sir John Clayton. The Clayton lighthouse, as it became known, was rebuilt in 1719, and then again in 1792. The latter lighthouse was lost to the sea with a cliff fall in 1866, although there had been an earlier building of another lighthouse away from the cliffs in 1833. This lighthouse survives today and is owned by Trinity House.

The lighthouse at Happisburgh was constructed in 1790 as one of a pair of candle-powered lights. The Low lighthouse was destroyed in 1883 before it was lost to coastal erosion. The lighthouses provided safety for mariners in the area called the 'The Would'.

Lightvessels (ships which act as lighthouses in areas unsuitable for lighthouse construction) were also historically employed across the area. Most were commissioned during the 19th century, particularly around the approach to the Thames estuary with its treacherous sandbanks, and all were maintained by Trinity House. In the 1880s an experiment was conducted, placing a nine-mile undersea cable from the Sunk lightvessel to the post office at Walton-on-the-Naze. The experiment was plagued with delays and the cable repeatedly snapped (http://wapedia.mobi/en/Lightvessels_in_the_United_Kingdom). Lightvessels were placed at Sunk (still maintained), Cork, Black deep, Corton, Galloper, Gunfleet, Kentish Knock, Outer Gabbard and Shipwash. Most were decommissioned in the 1970s-1980s and replaced with bouys. Some buoys remain and have now been converted to unmanned operation and solar power.

Lifeboat stations were operational in this region from a very early date. The earliest recorded was at Caister-on-Sea in Norfolk in 1791, although this was run by the Caister Beach Company whose priority was salvage. Both Lowestoft and Great Yarmouth had lifeboats by 1801-1802 although the first Great Yarmouth boat was not needed during its time in service. In 1823 the Norfolk Association for Saving the Lives of Shipwrecked Mariners was established and a more sophisticated lifeboat launched at Great Yarmouth in 1825.

Following this the Suffolk Association for Saving the Lives of Shipwrecked Seamen was established in 1826 and an 8-oar boat based at Sizewell. This moved to Aldeburgh in 1851 when the RNLI took over. Further south a lifeboat was launched at Harwich in 1821 but withdrawn in 1825. The Southwold lifeboat was established by 1841 and an official station opened in Caister in 1845.

The RNLI began to take control of the lifeboats in the 1850s and consequently permanent stations were also set up in Lowestoft in 1855, Harwich in 1875, Clacton in 1878 and Walton and Frinton in 1884. Both Caister and Harwich received a second station by 1890 (http://www.rnli.org.uk/).

The Harwich lifeboat house was established as a direct result of a disaster at sea. In 1875 a German passenger ship named the *Deutschland* ran aground on Kentish Knock in a blizzard. The ship began to take on water and the order to abandon ship was given, help arrived two days later and 135 of the 213 passengers and crew were rescued. Growing public pressure led to the launch of the first lifeboat the following year.

Caister lifeboat, with its long history, is significantly the only English lifeboat independent of the RNLI. It was decided to close the remaining station in the 1960s during an RNLI reorganisation. At this time the station held the record for the most lives saved of all UK stations. Following a public outcry an independent station was retained.

There are lifeboat stations also at Hunstanton, Wells, Sheringham, Cromer and Happisburgh.

Values And Perceptions

Overall maritime safety features are considered both invaluable and locally characteristic of this area, although those located wholly offshore will only be known to small sectors of the community.

The coastal landscape is dotted with daymarks and lighthouses which are now seen as particularly iconic. For example, the Naze tower is an integral part of the scenery on the North Essex coastline, having looked over the sea here for nearly 300 years. Similarly the Orfordness lighthouse has been standing since 1792 and still functions as a guide to mariners.

Lifeboat houses are a common site along this heavily traversed coastline and the lifeboat service was partly developed in this area. The RNLI motto 'Never turn back' was devised after a disaster at Caister in 1901. The lifeboat was launched on the night of the 13th of November to save a vessel in distress on the Barber Sands but capsized and washed back onto the beach, killing nine of the twelve crew. During the inquest coxswain James Haylett when asked if the crew were returning having given up pointed out that the crew would never give up if a ship was in distress. This was translated by the press as "Caister men never turn back" later to be adopted as 'Never turn back' (http://en.wikipedia.org/wiki/Royal_National_Lifeboat_Institution).

Research, Amenity And Education

There is scope for research into the historical elements of maritime safety in the region, particularly the coastal buildings such as the original lifeboat houses and lost lighthouses and navigation marks.

However there is already local interest in the subject due to the historically close relationship of the local communities with the sea. Many local history groups have researched this character type. As such much information is available for education purposes, including the local maritime museums which have displays relating to maritime safety and occasionally obsolete vessels. For example the Alfred Corry museum in Southwold houses the Southwold lifeboat of the same name which was operational between 1893 and 1918 and has been restored to its former glory. Other amenities include the lighthouses, some of which are open to the public, either throughout much of the year or one day annually.

Condition And Forces For Change

Changes in navigation methods, particularly the use of satellite navigation systems, have clearly changed the way in which mariners navigate in the sea and consequently how daymarks and lighthouses are used. This has led to Trinity House suggesting the abandonment of some lighthouses, often resulting in objections that in the event of failure of new systems the older methods can always be relied upon. Objections also arise from the potential loss of an iconic local landmark. Happisburgh was decommissioned as a Trinity House lighthouse in a process that started in 1987. However, it has been maintained privately as a working lighthouse since 1990.

Safety services and features such as safety areas offshore are also becoming more important and more common with the development of larger ports and harbours such as those in development or newly developed at Great Yarmouth, Harwich and Felixstowe.

Economic and political forces will also always bring about change. Recently there has been suggestion of closing the large coastguard station at Great Yarmouth and moving it to Cambridge, causing much local consternation.

Rarity And Vulnerability

As a result of changes to navigation discussed above some elements of the maritime safety system have now become almost obsolete due to more economical alternatives. Most notably this includes lightvessels, only one of which now exists in the region on the Sunk.

In terms of the built environment erosion is also playing its part with the Naze tower ultimately at risk if cliff erosion in the area continues. More urgently the Orfordness lighthouse is likely to be lost within 5 years.

Overall the area has a long history of maritime safety features which is at risk of being forgotten if not fully recorded.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION ACTIVITY

Introduction: Defining/Distinguishing Attributes

Navigation activity plays an important role in the region's life and economy, reflecting the presence of a series of large and significant ports. In the region this includes King's Lynn, Great Yarmouth and Lowestoft and Harwich and Felixstowe, as well as the northern approach to the Thames Estuary. In addition a number of small harbours exist along the coast which are now extensively used by smaller craft including Southwold, Orford and Walton.

King's Lynn is a sea port and a market town, connected to the River Ouse. In the 14th century it was one of the most important ports in England, and until the 17th century was associated with the Hanseatic trade. After the 17th century is importance fell, though it was considered to be an important port nonetheless. Access to the port from the sea was along the Lynn Channel.

Great Yarmouth now combines the established river port with a large deep water outer harbour which opened in February 2010. At present the main activity in and out of the port is connected with the energy industry but commercial interests are increasing. Lowestoft remains an important fishing base for the region despite the downturn in the fishing industry. Also of importance in the region is the large area under the jurisdiction of the Great Yarmouth Port Operations. Both ports have their own harbour pools and administrative areas including small craft facilities, pilot boarding areas and an unrestricted anchorage between Cockle Bay and Scratby.

However the majority of navigation activity takes place in the vicinity of Harwich, the landscape of which forms the finest natural harbour between the Humber and the Thames, and is located at the confluence of the Stour and Orwell estuaries. Here both Harwich and Felixstowe possess international ports. Harwich International Port is one of the UK's leading multi-purpose freight and passenger ports handling freight and passenger traffic to and from Scandinavia and the Low Countries **(**http://www.harwich.co.uk**).** The Port of Felixstowe is the largest container port in the UK and one of the largest in Europe.

As such the traffic using this area is continuous and dense. A recent survey commissioned by the Marine and Coastguard Agency (MCA) showed that over a period of 28 days 1443 merchant vessels, 193 ferries, and 101 tankers transited Harwich Haven, either entering or departing the port, or passing through on other routes (MCA/Safetec 2002).

Harwich Harbour occupies an area of c. 6 km² and is controlled by a wider agency known as Harwich Harbour Authority (HHA), the jurisdiction of which covers the ports of Felixstowe and Ipswich and has far reaching impacts into the offshore area.

This is particularly notable in the area around 'the Sunk' which acts as a crossroads for shipping with constant streams of commercial traffic. The area contains a large precautionary area, a series of anchorages for deep water vessels and smaller craft, pilot boarding areas and traffic separation schemes. A series of two way deep water routes and recommended routes steer vessels in and out of the haven and the Thames Estuary.

Traffic from Felixstowe travels extensively to Holland, Belgium and Germany as well as further afield to the Middle East, and nationally, to Teeside. Established ferry routes run from Harwich to Ejsberg in Denmark and to Holland. In addition traffic transits the area from northern ports such as Edinburgh and the Humber. Shipping follows the coastal route around

the whole East Anglian coastline and includes vessels such as cargo and bulk ships, ferries, gas carriers and tankers.

On a smaller scale numerous small craft facilities and anchorages are based on the major rivers and estuaries in the region, which are themselves important navigation routes. These include the Stour, Orwell, Deben, Walton Backwaters, the Alde/Ore and the Blyth as well as the Broads complex. Leisure sailing is particularly important around the areas of the Broads, Walton Backwaters and the Alde/Ore.

Many of these smaller waterways were once dependent on ferry crossings, however most are now defunct. Notable exceptions to this include the ferry across the Blyth between Southwold and Walberswick which is the oldest surviving rowed ferry in the eastern counties (Edwards 1991, 103). In addition a chain ferry runs across the River Yare at Reedham in Norfolk, the only river crossing between Norwich and Great Yarmouth.

Historical Processes; Components, Features And Variability

This region has been a hub of navigation activity for millennia. Further afield boat remains are known to date from the Mesolithic (e.g. the Pesse logboat in the Netherlands and numerous examples in Denmark). In this region a logboat was discovered in Walton in 1936 in a similar area to Neolithic finds. No remains of the boat survives but it is possible that this represented use of the coastline at an early date (Sturt *et al.* 2009, 46).

Evidence for long distance trade between England and the continent dates back to at least the Bronze Age and Bronze Age boat remains have been discovered in Dover (Clark 2004) and the Humber to the north (Wright 1990). However, so far no certain prehistoric boat remains have been found in East Anglia. Although in the Fens there have been several, but these are associated with the region East Yorkshire to The Wash.

The earliest confirmed evidence of navigation in the region dates to the Roman period as illustrated by the presence of shore forts at Walton (now lost), Burgh Castle and Caister. It is likely that ports existed at Felixstowe as evidenced by a possible Roman approach road (Good and Plouviez 2007, 69) and Dunwich, which would have been located at the mouth of a large estuary. In addition 13 amphorae were recently found in a garden in Aldeburgh which appear to have been a deliberate deposit of traded containers (Good and Plouviez 2007, 54). River travel would also have been important and the discovery of a series of complete Roman pots in the water at Iken on the River Alde may have represented a possible shipwreck or quay dating to this period (Good and Plouviez 2007, 54).

Following the withdrawal of the Roman military East Anglia was settled by Germanic peoples crossing from the Continent. East Anglia became an important maritime focus during the Anglo-Saxon period with a major port at Ipswich and numerous beach landing places all along the coastline. The rivers would again have been crucial during this period for inland navigation.

Evidence for Anglo-Saxon navigation comprises a number of boat remains. Coastally this includes a logboat found off the coast at Covehithe dated to the Middle Saxon period (AD775-892). This may have been eroded from one of the Broads in the area but its origin is unknown.

Perhaps the most famous evidence of Anglo-Saxon navigational activity is the ship burial at Sutton Hoo, located close to the River Deben. The ghost of the clinker-built ship was found in a burial mound dating to the 7th century. Although no body remained, the individual had clearly been placed in a specially made burial chamber within the ship, surrounded by a wealth of high status goods including a ceremonial helmet, shield and sword. There has been

a suggestion that this was the burial of King Raedwald, ruler of East Anglia at this time. The burial was located just above the River Deben and the mound and those surrounding it were visible from the estuary. It is likely that the ship would have been dragged up to the burial place from the river. A similar boat burial thought to have been of 6th century date was also found at Snape on the River Alde.

Continuing contacts with the European mainland are indicated by the numerous Viking finds in East Anglia, with much of the area under Danish rule in the 10th - 11th centuries. A piece of a large vessel dating to the 10th - 12th centuries was found on Easton Bavents beach, possibly from an offshore sandbank.

By the medieval period East Anglian ports had begun to enjoy a degree of eminence (Malster 1969, 3). This was partly due to the cloth industry which grew up in the region, enjoying its heyday in the 13th and 14th centuries (see Processing industry). The ports were used to export wool from the region, but also from the Midlands. The prominence was also to do with the associations that the east coast of England had with the Hanseatic League between the 14th to 17th centuries.

The region's ports traded across Europe from France to the Baltic and the Mediterranean in return for timber and furs, French wines and luxury goods (Wren 1976, 19). The ports were also important to the fishing industry during the medieval period, with hundreds of vessels fishing the local waters as well as undertaking long distance journeys to Iceland (see Fishing).

Rivers were significant routes with Ipswich situated at the heart of the great wool producing area at the head of the Orwell (Wren 1976, 132). Norwich exchanged huge amounts of imports and exports via Great Yarmouth along the River Yare. Manningtree, located on the southern bank of the Stour, was significant as a port from the early 13th century when it appears to have been deliberately planted as such. Smaller centres existed at Snape on the River Alde, Mistley on the Stour, Pin Mill on the south bank of the Orwell and Blythburgh on the Blyth.

This period of extensive trade activity came to an end from the 14th century onwards due to a series of political, economic and natural disasters including silting up of harbours and the Black Death. International navigation routes were effectively closed as a result of continental wars for much of the 16th and 17th centuries and the increased threat of piracy. In addition, the chief focus of the cloth industry moved to northern England in the 18th century and the fishing industry went into decline due to Dutch competition.

Overall ports and trade networks in the region became increasingly localised and coastal routes came to the fore. Smaller river ports such as Slaughden and Walton remained busy exporting agricultural produce, malt, bricks and fertiliser. Imports were dominated by coal from northern England following these coastal routes.

The emergence of the railways from the mid-19th century saw further changes in access to the sea, and the effect on navigation. New routes developed including packet routes to London and paddle steamers for passengers, although these routes remained coastal.

WWI and WWII put an end to much of this activity due to the dangers of going to sea. However sea trade in the region has continually soared since the end of WWII (Wren 1976, 148) leading to the rise of the haven ports and navigation routes we see today.

Values And Perceptions

Navigation activity has always been important to the East Anglian region economy and coastal character. For centuries communities have made their living from their proximity to

the North Sea and its connecting routes, linking East Anglia to other parts of Britain and to the continent. Navigation activities are deeply ingrained in the psyche of the local communities.

On a smaller scale the once ubiquitous ferries across the rivers and estuaries linked local settlements. This is illustrated by the remaining ferries such as the Reedham chain ferry which was once the only connection between Great Yarmouth and Norwich and the ferry across the Blyth from Southwold to Walberswick which is still managed and maintained for the fishing industry.

Research, Amenity And Education

There have been a number of studies into navigation routes as maritime archaeology has established itself as a discipline. One such was the 'England's Shipping' project funded by the ALSF and undertaken by Wessex Archaeology (2007). This project used GIS to map shipping movements recorded in historical archives, creating a resource central to the understanding of this Character Type during the historical period and the development of present patterns of navigation.

The scale and variety of navigation activities in the region's economy and human geography make them valuable for a range of educational purposes. Many aspects of this Character Type are already represented in many of the region's local museums.

Significantly some of the older forms of activity such as the ferries discussed above continue to function as a valued local amenity and also as tourist attractions.

Condition And Forces For Change

Navigation activity in this region is currently booming for a number of reasons. Offshore industry is active in this region, and this included aggregates dredging and construction and maintenance of energy installations. In addition, the existing ports are expanding with increasing demand, including the addition of an outer harbour at Great Yarmouth, the Felixstowe South expansion and Bathside Bay developments, as well as the London Gateway project to the south.

A recent survey commissioned by the Maritime and Coastguard Agency (MCA) identified part of the area as a zone of concern in terms of volume of traffic and room for emergency manoeuvring (MCA/Safetec 2002). The convergence of a number of shipping routes, in addition to the presence of vessels boarding or landing pilots and vessels anchored in the Sunk deepwater anchorage was problematic (MCA/Safetec 2002). Contributing to this problem are the restrictions on navigation of military practice areas and from the increasing effects of wind farms. New traffic routing measures have been put in place.

Rarity And Vulnerability

Navigation activity in the region is, and always has been, constantly changing and reflects varying levels of trade and wider economic activity, both in the region and nationally. As highlighted by the 'Demonstrating the Method' HSC project (Seazone and Maritime Archaeology Ltd 2009), wrecks can also provide an indication of past routes and activities. This is indicated by a large numbers of recorded wrecks adjacent to the coastline and clustering around large ports and harbours throughout England. This clearly relates to coastal trade during the post medieval period and possibly earlier.

The region does contain some rare forms of navigation activity, including (as discussed above) it's rowed and chain ferries.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION FEATURE

Introduction: Defining/Distinguishing Attributes

There are numerous navigation channels in the inshore areas of the region, reflecting considerable external trade links and the high volume of shipping. In several parts of the region, estuaries contain navigation channels that are occasionally dredged to maintain access from the sea. Estuaries and channels at several locations along the region's coast are often related to Navigation hazards such as sandbanks and wrecks. As such often navigation channels are marked with buoyage so as to steer traffic (see Maritime safety).

Figure 15. Crossing River Great Ouse which is connected to the sea by the Lynn channel or cut.

Extensive areas of shoals, and sandbanks, stretching from King's Lynn, to Winterton Ness to Benacre Ness, restrict access to the ports of King's Lynn, Great Yarmouth and Lowestoft. These approach channels are often dredged and maintained, and the routes to and from the navigation channels are locally known as 'the Roads'.

For example, the approach to King's Lynn is via the Lynn Cut that connects the River Great Ouse to the sea. Further to the north-west is the Old Lynn Channel.

There were also navigation channels connecting Brancaster and another at Burnham, Wells and at Blakeney. Old disused channels were located at Brancaster and Cley.

From the north, south and east, Great Yarmouth can be approached using a number of 'roads' and channels, one of which is fraught with dangers due to frequent depth changes and only recommended to craft familiar with the area. A number of disused channels in the area include Hewett Channel and Corton Channel, now redundant due to depth changes. Lowestoft is also approached from the north using Holm Channel or Yarmouth Road and Corton and Lowestoft North Roads and from the south using Pakefield Road and Lowestoft South. To the east the Stanford Channel gives access to this area.

Further south along the Suffolk coastline, approaching Southwold harbour is tricky, and the Blyth is only navigable at the mouth; an old railway bridge 1.5 km inland prevents boats sailing any further. This suggests the Blyth had already largely or completely gone out of use for navigation when the railway bridge was built.

The Hollesley Bay and Sledway Channels (10-20 m deep) provide the approach to the Alde/Ore, Butley and Deben estuaries near Orford. The rivers are navigable to varying degrees. The Alde/Ore/Butley are used by a moderate amount of river traffic, mostly small pleasure cruisers. The Deben is also not heavily used but is navigable for small craft all the way to Woodbridge where there is a small marina and 19th to 20th century wharfage. The estuary comes within the jurisdiction of Harwich Haven Authority and consequently is subject to a number of precautionary zones.

A series of approach channels are located around the Harwich Haven area. Further offshore these include Sledway and Shipway. The latter is a channel constrained by Shipwash to the east and Bawdsey Bank to the west, which leads into open sea to the north and east of Shipwash and is part of the palaeochannel of the Stour. It is mainly used by ferries, although it is also a potential exit route for deep draught vessels avoiding the southern approach to the Harwich Deep Water Channel. The area to the east of Shipwash is much more heavily used as the main route from Black Deep and consequently the Thames Estuary. Recent surveys showed that around 9,942 vessels per annum transited the Shipway channel, to or from the Harwich Haven ports, most then bearing east (UKHO2006, TE2A).

From Shipway traffic is funnelled into the Harwich Deep Water Channel through which all large vessels approach Harwich, Felixstowe and Ipswich. The Deep Water Channel is dredged to a uniform 14.5 m and a variety of vessel types are known to use the channel intensively including ferries, bulk and cargo ships, gas carriers and tankers. A survey at the southern end of Shipwash, showed that 16,862 vessels per annum transited the area (UKHO2006, TE3). A smaller approach channel, the Medusa Channel is a wide shallow (c. 2.4 m deep) channel avoided by larger shipping.

The Stour and Orwell estuaries converge in Harwich Harbour. Both take considerable volumes of traffic and are subject to regular dredging and management schemes. The Orwell is navigable for 15 km to Ipswich and the Stour is accessible to Manningtree for small craft.

To the very south of the area a number of channels lead in and out of Walton Backwaters and the Thames Estuary. These are also part of a series of channels and sandbanks parallel with the shore which are infamous for their treacherous nature. The Wallet channel lies parallel with, and approximately 2.5 km from the shore and is bordered to the east by Gunfleet Sands. The East Swin or 'King's Channel' is heavily used to approach both the Port of London and the Crouch Estuary in Essex. It runs parallel to Gunfleet Sands and is bordered by Sunk Sand and Sunk Head to the south-east. The channel is restricted to vessels with less than a 6 m draft and typical users include ferries, cargo ships and tankers (Jones et al 2002). The channel

is particularly used by yachts entering the Crouch estuary when the Wallet becomes difficult to navigate.

Black Deep is the main deep water route into the Port of London from the north-east. Passage through Black Deep is normally restricted to vessels with a draught of over 6 m and has a minimum depth of 14 m.

Historical Processes; Components, Features And Variability

Pre-18th century accounts or maps of offshore navigation features are rare. However the coastline in this region has been important for international and national trade for centuries (see 'Navigation Activity, and, Ports and Docks'). In early periods mariners would have to be familiar with the navigation features in order to safely navigate in and out of the ports. Prior to widescale mapping such knowledge was learned and remembered, or applied by shipping taking on pilots who knew the region's waters intimately.

The only securely known early navigation channels in this region are therefore the rivers which took waterborne traffic inland. This may be marked by the discovery of a series of complete Roman pots in the water at Iken on the River Alde: these could have represented a possible shipwreck or quay dating to this period (Good and Plouviez 2007, 54).

The navigational importance of the channels in the Anglo Saxon period is clearly represented by the presence of the ship burials at Snape on the Alde and Sutton Hoo on the Deben (see Navigation Activity). In addition Ipswich, at the head of the Orwell, was a significant trading harbour in the Roman period and went on to become the country's busiest port in the Anglo-Saxon era (Wheatley 1990, 59).

During the high medieval period when the coastal ports were prospering the inland ports were also significant. These included Ipswich which was situated at the heart of the great wool producing area, at the head of a sheltered and easily navigable estuary (Wren 1976, 132). Norwich conducted considerable trade via Great Yarmouth along the River Yare. Manningtree, located on the southern bank of the Stour, almost at the head of the tides, was significant as a port from the early 13th century when it appears to have been deliberately planted as such (Essex County Council nd). The port developed a successful local trade and went on to become very prosperous in the 16th century. Smaller centres existed at Snape on the River Alde, Mistley on the Stour, Pin Mill on the south bank of the Orwell and Blythburgh on the Blyth.

These remained important channels into the post medieval period when industry thrived with centres for Malting at Snape and coprolite at Waldringfield.

Offshore, our knowledge of navigation features 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.

The dynamism of the region's navigational hazards is also reflected in the development of lighthouses along the coast. For example the Harwich High and Low lighthouses built in 1818, became redundant in 1863 due to the changing course of the channel into the port. At this time the cast iron Dovercourt lighthouses were constructed, also becoming obsolete in 1917. Similarly a small lighthouse was built in the grounds of Pakefield Hall in 1832 to steer ships through the Barnard and Newcome sandbanks. The sandbanks had moved so much that

another lighthouse was built in Kessingland in 1850 and Pakefield was obsolete by 1864 (www.suffolktourist.guide.com).

The navigation features in this region which appear to have been given greatest consideration were the channels leading into Harwich Haven and the port of London in the south of the area. This zone has always seen a high volume of traffic and is hazardous as a result of the series of parallel sandbanks which constrain the channels. 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 East Swin or Kings Channel, Wallet and Shipway have long been known as significant shipping channels and are recorded on the Admiralty chart of 1855, with Sledway recorded in 1905. The importance of the Wallet channel is demonstrated by the placement of a gunboat in 1803 to protect the trading ships using it. The heavy use of the channels is illustrated by the known shipwrecks within the area. Many of the named examples were mined or torpedoed and include vessels on coastal routes such as the *Kankakee*, bound for London from Newcastle. Additionally, some of the ships were on longer routes including the *Terukuni Maru*, travelling from Tokyo to London and the *Stad Maastricht*, from London to the USA.

One of the lesser channels, the Medusa Channel, has an interesting history. The feature was named after the *Medusa*, a third rate frigate which served as Nelson's flagship in August 1801. Nelson had been given command of naval forces between Beachy Head and Orfordness, fearing a French invasion. The *Medusa* was moored off Harwich on the 10th of August, prevented from sailing by easterly winds. Nelson was keen to set sail but none of the pilots would agree to take charge. Consequently Nelson forced a local maritime surveyor into piloting the vessel. The daring voyage out to the Swin led to the naming of the area.

The Lynn Cut was part of an improvement to gain access to the port of King's Lynn, probably in the 15th century that was connected with diverting the River Nene to create a sea-navigation into the Fens. The Cut was made across River Great Ouse so as to compensate for difficulties with the movement of sediment that meant that the river was prone to silting. Various suggestions were made, and legal wrangles, but the Cut was finally opened in 1821.

Values And Perceptions

The navigation features discussed above are crucial to those using waterborne traffic this area. They have traditionally been particularly significant to mariners attempting to navigate the treacherous waters around the Thames Estuary. However, the channels are probably little known to the general public other than defining areas where shipping is regularly an element of the visual coastal landscape.

The exception to this may be the river channels which have been used for centuries and are still important to the area. The Stour and Orwell in the south of the region remain particularly heavily used by merchant shipping, however all the rivers are important for recreational traffic.

Research, Amenity And Education

Research into navigation features contributes much to our knowledge of the history of the use of sea and estuaries in this region. This is particularly significant with relation to the dynamic character of the seabed and in particular the sandbanks in this region. A thorough study of historic maps and charts may indicate when channels were used and when they became redundant. This could contribute to the Mapping Navigational Hazards as areas of Maritime Archaeological Potential undertaken in 2007, which developed an approach to model where navigational hazards may exist. This could have a cumulative benefit for the study of the

maritime landscape as a whole in terms of the use of daymarks, lighthouses etc. Records of past channel-dredging activity could similarly add to our understanding.

The navigation features are amenities to shipping by their definition but are also useful to non-professional sea users such as leisure sailors, but the resulting concentrations of shipping off particular stretches of the coastline also contribute to the distinctive sense of place pertaining to those areas.

Navigation features are also clear evidence in the seascape for the history of trade, shipping and military use of the seascape in this region.

Condition And Forces For Change

As outlined above the character of navigation features has changed over the centuries as a result of the dynamic seabed and coast in this region. This is set to continue, with dramatic changes as a result of increasing sea-level rise and increasing storminess including release of sediment from erosion of the coastline.

In addition the region is undergoing significant development including extension of the ports of Harwich, Felixstowe and Great Yarmouth. This may result in the dredging of new channels or changes in the existing regimes. This may also arise from the London Gateway Project - redevelopment of the former Shell Haven Refinery on the north side of the Thames Estuary, enhancing the volume of shipping traffic in the approach to the Thames.

Rarity And Vulnerability

Navigation features are frequently lost or rendered redundant as a result of changes to the region's environments. However, in recent years the position of channels has been meticulously recorded on Admiralty charts and should continue to be so.

Maintenance dredging can alter both the character of these features and the seabed in which they lie. This may have effects on surviving palaeoenvironmental deposits in areas where palaeochannels are used as navigation channels as in the area around Harwich Haven.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION HAZARD

Introduction: Defining/Distinguishing Attributes

The region has always been notorious for its navigation hazards. Offshore sandbanks lie parallel with the shoreline in the far north and south of the area. Hazards also include outcrops of cemented volcanic ash contained within the London Clay, areas of water turbulence, numerous wrecks and other maritime obstructions.

The offshore area has varying depth ranges, from drying areas up to c. 30-40 m deep. However, depths are not uniform and areas of deeper and shallower water exist throughout. The tidal range across the area is quite low at under 1m to 4m at Mean Spring Tide.

Figure 16. Reflection on the sand banks and navigation hazard at the edge of the Lynn channel, King's Lynn.

In the region there is an area of volatile sandbanks. These sandbanks, particularly off the Norfolk coast, are prone to movement, and have been extensively marked in the past by lightvessels and in more recent times with buoyage. However, these are also areas with good fishing grounds. Closer to shore, there are many shoals and flats, especially in the approach to King's Lynn and the North Norfolk smaller harbours. Sandbanks also overlie the buried valley of the River Yare, which includes the Scroby Sands, Corton Sands and Holm Sands,

Middle and South Cross Sands and Caister Shoal. As a result the navigation channels on the entry to Great Yarmouth are constantly changing. To the immediate south the smaller banks of Lowestoft, Newcome Sand and Barnard have historically complicated the entry to Lowestoft harbour leading to a succession of lighthouses in the area (see Navigation Activity).

Further south along the Suffolk coastline four small features run parallel to the shore between Dunwich and Aldeburgh; Dunwich and Sizewell Banks are constantly shifting, Aldeburgh Ridge and Aldeburgh Napes are slightly further east. Aldeburgh Ridge is marked by a light buoy, although incidents of grounding still occur, as recorded by the Aldeburgh lifeboat (http://aldeburghlifeboat.org.uk).

A series of treacherous navigational hazards are located in the approach to the Alde/Ore/Butley estuary. These include the parallel banks of Whiting Bank, Bawdsey Bank/Kettle Bottom and Shipwash which constrain the channels approaching the estuary (Hollesley Bay, Sledway, Shipway). In addition 'Flagstone', a small ridge of cemented volcanic ash within the London Clay, lies within this area, rising to 7-10 m deep. The depth over Bawdsey Bank is generally 5 - 10 m though a raised area in the centre of the feature can be shallow enough to dry. In addition two dangerous shipwrecks are located just off Bawdsey Bank. Over Shipwash depths decrease from 10 m to drying. This is compounded by an area of sandwaves to the north at the entrance to Shipway, up to 5.8 m high, found to be shoaling and migrating north-north-east at a rate of 20 m per year. A further area of sandwaves to the south, around South Ship Head and to the east of Shipwash are as much as 7 m high and migrating in the same direction at a rate of 40 m per year (UKHO2006, TE2A). The danger of the area is illustrated by an incident in 1999 when a ferry travelling east of Shipwash was swamped by a wave which broke over the sandbank. One life was lost in the incident (www.marinelog.com)

Banks known as Cutler and the Knolls are located just to the south of this on the approach to the Deben estuary. Cutler sandbank is 2-5 m deep and is composed of an elongated train of sandwaves, making it hazardous for large vessels. The knolls are a series of small highly dynamic shingle banks which are located at the mouth of the Deben.

The entry to Harwich Haven and the ports of Harwich and Felixstowe is also constrained by a series of hazards. These are a combination of shoals (e.g. Cork Knolls, Platters, Cork Sand, Rough Shoals) and outcropping cemented volcanic ash contained in the London Clay (eg Felixstowe Ledge, Wadgate Ledge, Cork Ledge, Stone Banks and Naze Ledge). Many of the features are marked with buoys to aid navigation. An area known as Halliday Rock Flats which has a depth of 0 - 2 m is specifically used as a recreation area for power craft. Rough shoals still supports the Rough Shoals Tower, placed in WWII and now occupied as an independent state. This is also a navigation hazard in its own right.

To the east these features are backed by a large area of sandwaves known as the Sunk which is a large caution area. The Sunk is within an area of heavy shipping located at the top of the Harwich Deep Water Channel. The sandwaves are up to 7 m high and both symmetrical and asymmetrical in form (UKHO2006 TE5A). These features are slowly migrating in a south-westerly direction.

The most substantial and significant series of hazards is located off the North Essex coast and comprises several pairings of sandbank and channel which form a series of treacherous navigational features and hazards in one of the major approaches to the Thames. Inshore a series of small features include Priory Spit, Collier and Tripod. The major sandbanks are known as Gunfleet Sand, Sunk Sand/Sunk Head, Long Sand/Long Sand Head and Kentish

Knock. These border the Wallet, East Swin, Black Deep and Knock Deep channels (see Navigation Feature). The possibility of grounding on either side of the East Swin is a well-known hazard.

These banks are well known for their shipwrecking potential with water depths varying from 0 to 5.5 m. Recent surveys have shown that Long Sand is steadily migrating south-east whilst Long Sand Head is extending in a north-east direction in what may be interconnected processes (UKHO2006 TE6A). Areas of the bank are covered with megaripples and sandwaves which can be hazardous for shipping. Further offshore four narrower features also add to the dangers of this area. These include the Outer and Inner Gabbard, 36.5 km and 46.5 km from the coast in the Felixstowe area. Depth over the Inner Gabbard is reduced to 5-15 m, and 2-20 m on the Outer Gabbard. The Galloper is located c. 50 km offshore and the depth over the bank decreases to as little as 2 m. 'North Falls' incorporates the areas known as Four Mile Knolls or North Falls Head and North Falls Tail with depths of 5-20 m over the feature.

There are several areas of water turbulence associated with these features which are avoided by shipping. These are located across the sandbanks off the North Norfolk coast, and flanking Great Yarmouth including Scroby Sands and Caister Shoal. Further south water turbulence is found off Aldeburgh Napes, Whiting Bank, Bawdsey Bank and the head of Shipwash, the Inner Gabbard and Long Sand. The latter acts as a break between the Dover tide to the south and the North Sea tide to the north east. As a result water levels can be different on either side of the bank at any time (D'Olier 2002).

As a consequence of the treacherous character of the seascape in the region there are a large number of wrecks in the area; over 2000 in the southern part of the region. These range in date from at least 1320 (the wreck of *La Trinite*) to 2005 (the *Persistent Whisper*). However most of the dated vessels (c. 700) are 20th century in date. Wrecks notably cluster around the shoreline, the sandbanks off Great Yarmouth and in the south of the area around Harwich and into the Orwell estuary. Around 600 of the known wrecks are considered dangerous.

The vessels range from small fishing vessels to WWII destroyers and submarines, as well as aircraft (Sturt et al 2009, 52). Their origins and routes also vary from local fishing voyages to international traders. Coastal voyages are represented by vessels such as the *Friargate* which was carrying 225 tons of Loam from London to Middlesborough and the *Sheaf Field* which hit a German laid mine while carrying coal from the Tyne to London. International traders include the *Ingstad* which was carrying coal from the Tyne, bound for Nantes, the *Terukuni Maru*, travelling from Tokyo to London and the *Stad Maastricht*, from London to the USA. A series of Thames Barges were also deliberately scuppered by the National Rivers Authority in Hamford Water to protect Horsey Island from coastal erosion.

The Dunwich Bank wreck (see below), with a 100m exclusion zone around it, is designated under the Protection of Wrecks Act 1973 due to its historical and archaeological importance.

Other man-made obstructions which can be navigational hazards include the remains of the Sunk Head Maunsell Tower which was blown up to avoid occupation (see Military Defence and Fortification).

Historical Processes; Components, Features And Variability

Sandbanks have acted as significant navigation hazards in this area for centuries. These were formed through various different natural processes which still affect their morphology. Most are the product of reworking of fluvially deposited sediments, erosion of cliffs and exposure of Lower London Clays. For example, it has been postulated that Gunfleet Sands was formed

as a headland or banner bank when the Naze headland extended much further eastwards (D'Olier 2002).

The features have not always had their current form and have altered in relation to different factors. These include sediment deposition, for example Barnard Shoal may take sediment from Benacre Ness or vice versa. The Knolls in the mouth of the Deben are highly dynamic features which are generally accreting. In 1868 Dunwich and Sizewell Banks were clearly distinct from one another; by 1949 they had merged. In contrast a number of these features appear to have been stable for up to 350 years including Whiting Bank and Bawdsey Bank and the minor banks such as Aldeburgh Napes.

Our knowledge and understanding of the natural hazards in the area will also have varied over time, although local mariners will have been more aware than others.

In terms of historical records 'Ganfletsond' was named in an official document in 1320 and was named for the Gan Fleet, the old name for the Holland Brook which divided Great Holland and Little Holland (Jarvis 1990). 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 as obsolete charts were regarded as dangerous, presenting a potential navigational hazard (ibid). The admiralty chart of 1855 shows Long Sand, Whiting Bank, Kentish Knock, Bawdsey Bank, North Falls, the Inner and Outer Gabbard and the Galloper.

In recent years the sandbanks have been used for other purposes including for anchoring pirate radio stations and placement of sea defences such as the Rough Shoals and Sunk Towers.

The proximity of navigational features and strong currents in the area has often resulted in the loss of vessels. It is certain that his area was being traversed in the Roman period and probably before this. The ever-changing hazards have therefore claimed ships of all dates, although the earliest known example in this area is the wreck of La Trinite, an English or Scottish cargo vessel which stranded on the Gunfleet Sand in 1320.

As the region was an important trading and fishing centre in the medieval period it is likely that a number of medieval vessels lie beneath the waves, although few have been identified. The majority of known wrecks are post medieval in date. The recorded losses on sandbanks illustrate the variety of transport that has used the adjacent channels. Many were known to be involved in coastal trading between London, East Anglia and the North as well as internationally, showing that the area was important for different routes.

One of the most famous wrecks in the area was the Deutschland which ran aground on Kentish Knock carrying immigrants to America in 1875. The ship foundered during a blizzard and most of the passengers and crew died of exposure before help arrived.

The North Sea in this area has also claimed a number of military ships, either through battle at sea or those lost during transportation, or from mines. The Ipswich Journal of January 16th 1742 records that "Yesterday morning his Majesty's Sloop the Otter, Capt Gordon, was lost on Sizewell Bank, the captain and 36 others were drowned, only 18 escaped." (http://www.foxearth.org.uk/1740-1745IpswichJournal.html). Other wrecks of note include the Colchester, a 4th rate fighting ship lost on Kentish Knock in 1744 and HMS Arethusa (built 1912) lost on the Cutler Bank in 1916. The was the name ship of her class of light cruisers and was the flotilla leader for the Harwich destroyers. She fought at the battles of

Heligoland Bight (1914) and Dogger Bank (1915) before she struck a mine in 1916 and drifted ashore (http://en.wikipedia.org/).

The only protected wreck in the area is the Dunwich Bank wreck discovered in 1993, the exact identity of which is unknown. It is believed to be a 16th or 17th century armed merchant vessel or possibly a rare example of an early military transport vessel. It currently survives as a scatter of bronze and iron guns and iron concretions either fully exposed or partially buried, centred on a small mound, and another discreet group nearby. This site is unique in being the only known site in the UK with bronze guns still in situ, suggesting that no contemporary salvage took place. A cannon recovered from the site is thought to be of a type produced by Remigy de Halut of the Spanish Netherlands between 1536 and 1556, whose name is also visible on two of the guns that remain on the seabed, both dated to 1554. So whilst post-dating 1554, the possible longevity of the weapons gives a date for the wreck of within 100 years of 1556 (http://www.english-heritage.org.uk/daysout/maritime-heritage/map/dunwick-bank/).

Values And Perceptions

Navigation hazards are often prominent in the consciousness of coastal communities as a result of the loss of lives they can cause. In this region 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.

The fact that all the sandbanks in the area are named and that these are well-known locally illustrates their significance in people's perceptions. These features are also known for other reasons including the presence of battles such as Kentish Knock, named after the sandbank. More recently the area was famous for the pirate radios which broadcast from outside territorial waters in the 1960s-1980s; Kentish Knock was the first home of Radio Caroline.

Shipwrecks also provoke strong feeling among the maritime community and within the general public. The enormous loss of life after the tragedy of the *Deutschland* led to the stationing of a lifeboat at Harwich in 1876 (Jarvis 1990, 53). The incident is recorded in a poem by Gerard Manley Hopkins, written in the year of the disaster.

Research, Amenity And Education

The shipwreck assemblage within the region has considerable research potential due to its range of dates and types. Those wrecks for which we have details can tell us the origins and routes taken and, in the case of well-preserved vessels, the details of shipbuilding. Overall this would enhance our understanding of the region's maritime links in the UK and abroad.

Wrecks are also valuable for a number of other reasons. For example they have ecological value, effectively creating an artificial reef for more unusual ecosystems which can be studied. In the same way wrecks can be a useful resource for fishermen. In this region lobster potting in particular is known to take place on wreck sites offshore. For many of the same reasons wrecks attract divers who are keen to view wildlife as well as things of historical interest.

Condition And Forces For Change

The navigation hazards of the East Anglian region are in variable condition. Due to natural processes sandbanks are often in constant flux anyway. This may be aggravated in the future by climate change resulting indirectly from human activity, in particular sea level rise and

increased storminess. In addition this dynamism is also affected more directly by human activities such as harbour and channel dredging and increased development in the coastal zone.

The condition of the wrecks also varies depending on location, age and material. These may also be affected by increasing storminess and changes in the sedimentary regime. Wrecks are also significantly affected by trawling which can destroy structures and spread material.

Offshore development can be detrimental or destructive to shipwrecks, however work carried out in advance of development can locate previously unknown wrecks through survey or lead to protection of certain sites. Survey as, for example, carried out in conjunction with the Protection of Wrecks Act 1973, can also give us updates on the condition of wrecks.

Rarity And Vulnerability

Sandbanks are often dynamic, as outlined above, and can have a significant effect on the eroding coastline. Sandbanks can act as barriers from waves and can be sediment sources or sinks. As climate changes all these processes are subject to change in response.

From a heritage specialist's perspective the wreck resource of the region is very significant yet constantly at risk of erosion, disintegration and destruction. Some of the wrecks are incredibly rare survivals of their type and this is recognised by the protection afforded to the Dunwich Bank wreck. As a Protected Wreck it is regularly surveyed and its condition reported, building up a continuously updated record using the new information recovered.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: PORTS AND DOCKS

CHARACTER TYPE: PORTS AND DOCKS

Introduction: Defining/Distinguishing Attributes

The ports of East Anglia have given the region huge importance and wealth in periods when commercial or military interests have focused on the continent (Wheatley 1990, 56). A number of large ports currently located in the area are crucial to the UK economy, most notably Felixstowe and Harwich in the south of the region, but also King's Lynn, Great Yarmouth and to a lesser extent Lowestoft in the north east. Smaller ports, mainly focused on fishing, remain all along the coastline such as Wells in North Norfolk, Orford and Felixstowe Ferry in Suffolk.

Figure 17. King's Lynn's old warehouses and Custom House at Purfleet Quay (part of the historic waterfront).

The considerable ports of Felixstowe and Harwich are located within the finest natural harbour between the Humber and the Thames, at the confluence of the Stour and Orwell estuaries. This has had considerable influence on the success of the ports. The Port of Felixstowe is the largest container port in the UK and one of the largest in Europe (ranked eighth in 2008). It has a number of terminals which handle goods including containers, bulk

solids, grain, bulk liquids, forest products and Ro-Ro (roll on-rolloff) cargoes. The total quay length at Trinity container terminal is 2354 m with depths between 11.6 and 15 m.

Expansion of Felixstowe port began in 2008 with commencement of the Felixstowe South project. The scheme involves the conversion of the area previously used by PandO North Sea Ferries Limited, plus the largely redundant Dock Basin and Landguard Terminal, into a new deep-water container terminal (www.portoffelixstowe.co.uk). The first stage of the development began trial use in early 2011.

Harwich International Port (formerly known as Parkeston Quay) is one of the UK's leading multi-purpose freight and passenger ports handling freight and passenger traffic to and from Scandinavia and the Low Countries (www.harwich.co.uk). As such the traffic using this area is continuous and dense. Depths along the quay range from 7.5 to 9.5 m and the Harwich Haven Channel is the deepest approach to any UK container port at 14.5 m deep. Proposals have been made for massive expansion of the port at Bathside Bay to create a state of the art international container terminal. This would make Harwich one of the largest ports in the UK.

King's Lynn was once a prosperous port in the region, but due to problems in access, and in the type of goods that are being traded today, it importance is much less. However, in recent years it has undergone renovation, and the port receives and stories goods for distribution by road and rail. There is quays and harbour facilities.

The port of Great Yarmouth comprises an older river facility which can accommodate vessels up to 125 m long with 6 m draft and a new deep-water outer harbour, which became operational in 2010. The latter can accommodate vessels over 200 m long with 10 m draft. The port has c. 3000 m of commercial quays on the River Yare and c. 1000 m of quay in the outer harbour. Traditionally the port has been a centre for North Sea natural gas and has now expanded to handle other freight.

Lowestoft also has some facilities to handle cargo although on a smaller scale and like Great Yarmouth acts as a centre for the offshore energy industry. In recent years Lowestoft, like many of the regions ports, has expanded to accommodate offshore wind farm traffic.

The influence of these enormous ports extends into the marine zone. Harwich harbour is controlled by a wider agency known as Harwich Harbour Authority (HHA), the jurisdiction of which covers the ports of Felixstowe and Ipswich and has far reaching impacts into the offshore area. The northern half of the region falls within the jurisdiction of Great Yarmouth Port Operations. As a significant shipping zone the offshore area is subject to the regulatory systems of these authorities and a number of cautionary restrictions including proximity to high-speed craft, and submarine cables.

Historical Processes; Components, Features And Variability

It is likely that the earliest ports in the East Anglian region were Roman, probably situated on the rivers which provided routes inland. Ipswich, at the head of the Orwell was known to be a significant trading harbour at this time. Other likely locations for ports include Dunwich, situated on a large estuary within a natural harbour formed by the mouths of the Rivers Blyth and Dunwich; the town went on to become a large port in the Anglo-Saxon and medieval periods. A probable Roman port existed at Felixstowe as evidenced by the apparent approach via Roman road (Good and Plouviez 2007, 69). Other finds indicative of ports includes the discovery of 13 amphorae in a garden in Aldeburgh, possibly a deliberate deposit of traded containers (ibid, 54). A possible shipwreck or quay in the Alde was indicated by discovery of complete pots in the water at Iken. The Roman focus on the Alde is shown by the distribution

of red hills (salt working sites) and settlement evidence from Barbers Point (see Meredith 2007).

During the Anglo-Saxon and medieval periods the ports of East Anglia became the most important ports in the British Isles (Wren 1976, 13). Saxon ports were known to have existed at Ipswich, Dunwich, Southwold and Beccles, with many more potentially lost to the sea through coastal erosion. Dunwich and Southwold were both recorded in the Domesday Book of 1086 as thriving ports and Beccles was known for selling herring (Countryside Agency 1999, 49). Ipswich became the country's busiest port in the Anglo-Saxon era (Wheatley 1990, 59). The settlement was known as Gipeswic and centred around the quay. The town had become important by the10th century AD; situated at the heart of a great wool producing area at the head of a sheltered and easily navigable estuary (Wren 1976, 132).

The East Anglian coast was punctuated by numerous minor and major ports in the medieval period (Williamson 2006, 24) and these ports enjoyed a degree of eminence (Malster 1969, 3). The area was attractive as a result of its proximity to the continent, its long beaches and sheltered estuaries in contrast to the treacherous shoals around the Thames estuary. It was far cheaper in the medieval period to move cargoes by water than by road and the area also boasted abundant fish stocks (Williamson 2005).

The ports on the Norfolk coast included King's Lynn (http://www.british-history.ac.uk/report.aspx?compid=78494). In the 11th century the Bishop of Norwich attached to the church St. Margaret's a small priory and a marketplace. The Bishop's foundation may have been motivated by a wish to capitalize on the growth of trade using The Wash, perhaps trying to make Lynn the focus for that trade. The northern and southern bounds of his new town were two tidal fleets that were wide enough to be navigable and had been the sites of salting operations in earlier periods; they were later known as Purfleet and Millfleet, respectively. They provided an added advantage to Lynn as a site attracting trade, since the fleets offered a sheltered anchorage for ships carrying visiting merchants. The weekly market, each Saturday, was held on the water's edge, and was described as a 'sand market', and an annual three-day fair, beginning on St. Margaret's day, was authorized. In 1101 the Bishop transferred St. Margaret's to the jurisdiction of the monastic priory of Norwich cathedral. A public quay called the Bishop's Staith was built at the point where Purfleet entered the river. From the 14th century, King's Lynn was one of the trading ports for the Hanseatic League, trading goods from afar a field as the Baltic. This continued until the League's demise in the 17th century, when King's Lynn's economy declined. The port was revitalized with the connection of the railway in the mid-19th century.

Other places along the Norfolk coast that had more important pasts in terms of economic terms than they do today, includes Brancaster, Blakeney, Cley, and Wells. For instance, Cley was once one of the busiest ports in England, where many locally and regionally sources goods were exported or imported. The Flemish gables in the town are a possibly indicator that there was trade with the Low Countries. However, these settlements are still trading in local goods, especially locally caught fish and shellfish.

There were important medieval ports on the Suffolk coastline and included Dunwich, Ipswich, Aldeburgh and Southwold among others. However numerous settlements also had landing places for boats such as Blythburgh and Walberswick. Small trading centres and hards existed along the length of the estuaries. The 13th century documents of Butley priory describe the Kessingland, Benacre, Dunwich and Minsmere rivers as open to the sea and used as havens (Williamson 2005, 135). Many settlements in these areas had markets by the 13th and 14th centuries.

The ports gained importance as centres for trade, shipbuilding and fishing (Countryside Agency 1999, 59). The main exports of the medieval ports were wool from the growing textile industry and grain from the agricultural hinterland. Imports included fish, timber and furs from Iceland and the Baltic, French wines and luxury goods from Northern Europe and the Mediterranean (Wren 1976, 19).

The wool and textile industry was crucial to the development of the East Anglian ports. Wool was processed on a large scale as early as the 13th century but expanded massively over the 14th and 15th centuries, with the Stour valley as the principal manufacturing district (Williamson 2006, 64-65). Later this expanded to other textiles as many immigrant workers moved in from the Low Countries. This success manifested itself in the built environment in the region and most notably the soaring Perpendicular 'wool churches' such as that at Blythburgh. These often remain as indicators of the presence of thriving medieval ports where these have long since disappeared.

Dunwich was East Anglia's premier port in the Norman period (Wheatley 1990, Blair 1990). The Domesday Book recorded in 1086 that the settlement had three churches and a population of 3000 but that land was already being lost to the sea, by the 13th century this had increased to eight parish churches, five friaries, a town wall and a market place (Williamson 2006, 115). In 1286 a storm swept much of the town into the sea, and partially silted up the harbour. This led to a decline in trade and maintenance of sea defences was abandoned. In 1326 a second storm completely cut the harbour off from the sea and by 1350 more than 400 houses, shops, churches and windmills had been destroyed (Williamson 2006, 115). The port was economically ruined. Local diver and historian Stuart Bacon has been diving the submerged site for many years and has discovered a number of churches illustrating the prosperity of the town, as well as possible remains of a shipbuilding industry.

Ipswich prospered from the 10th to 14th century as a result of the wool industry in the nearby the Stour and Gipping valleys (Wren 1976, 133). It received its first charter in 1199 and the town's official seal dating from 1200 is the earliest known depiction of a ship with a modern rudder instead of traditional steering oar (Wheatley 1990, 69). In 1404 Ipswich became a staple port. This meant that the port was designated by the King as a legal port for the export of wool. An influx of Flemish weavers gradually changed the focus from wool to cloth by the 15th and 16th centuries and Hanseatic warehouses (belonging to the Hanseatic League, an economic alliance of trading cities) had appeared in Ipswich by the mid-14th century. The zenith of Ipswich as a port was c. 1500 when it was known as the shipyard of London, constructing vessels up to 100 tons (Wren 1976, 134).

Norwich was the third largest city in England by 1066 and was a major port, trading with Scandinavia and the Rhineland from the Saxon period (Williamson 2006, 109). It was ultimately eclipsed by Great Yarmouth which was more accessible to the North Sea but small trade continued between the two ports.

Southwold, recorded as a thriving port in the Domesday Book, witnessed the construction of new quays, berths and slipways in the 16th century to handle the trade in wool (Edwards 1991, 104). Nearby Walberswick was also a port in the Medieval period and was used by the Icelandic fishing fleets in the Tudor period (Wheatley 1990). Orford was founded as a port by Henry II in the 1160s, lying near the mouth of a sheltered haven.

Excavation at Quay Pavilion in Harwich has revealed a masonry-walled quay structure, watergate and water-stairs dating at least to the 14th century illustrating the growth of a medieval port. In the 15th century a series of timber quay fronts were erected in front of the masonry quay face. The Kings custom house was constructed above the original quay line

and some evidence was found for a pair of pivoting timber cranes on the water's edge (Essex County Council 1991b).

A new town quay was built at Harwich c 1550 and by 1577 the port had seven private quays and the town quay. Excavations show that by 1625 the quay had been much modified and extended out into the harbour. Churchwardens' accounts from 1550-1600 record a regular source of income from tolls on herrings, wheat, rye, salt and coal landed at Harwich. A treadmill crane constructed in 1667 still stands in Harwich.

The town of Manningtree, located on the southern bank of the Stour, almost at the head of the tides, was significant as a port from the early 13th century and received its market charter in 1238. At this time the town appears to have been deliberately planted as a port, presumably by the lord of the manor (Essex County Council 1991a). The port developed a successful local trade including shipping provisions to the fleet at Harwich, and fish to Colchester (*ibid*). Manningtree went on to become very prosperous in the 16th century, as evidenced by its surviving built environment. The Tudor port was known as Manytre and the majority of its wealth came from the cloth trade. The twin town of Mistley was a settlement trading in timber, fish and salt in 1070, it decayed in the 14th century due to the rise of Manningtree (Wren 1976).

Great Yarmouth also grew as a seaport after the Norman Conquest, trading with Scandinavia and the Baltic and eclipsing Norwich as Norfolk's main port. Its heyday of exporting grain, wool and cloth as well as herring was the 13th and 14th centuries. By the 14th century three quarters of all Worsted (a traditional cloth of Norfolk origin) exports passed through its port, usually via wherry from Norwich.

Smaller ports are likely to have existed all along the coast and estuaries at this time. A quay was known to exist at Snape Bridge in 1155 serving the wool trade and priory. This acted as a small trading centre until the late 18th century. Sizewell had a market from the 13th century and probably remained as a small port into the 16th century (Edwards 1991, 93). A recent inter-tidal survey conducted by Suffolk County Council found the remains of quays, hulks, jetties, sluices, hards, post groups and alignments in all the Suffolk estuaries indicative of these smaller ports and docks (Everett 2007).

The loss of most of these thriving ports was a combination of a series of political, economic and natural disasters between 1300 and 1600 which ultimately brought about the collapse and decay of virtually all international trade in the region. As outlined above much of the port of Dunwich had been lost to the encroaching sea by the 14th century. The processes of increased storminess and erosion released large deposits of sediment which then drifted along the coast causing siltation and blockage of harbours. The entrance to Dunwich harbour was blocked by a shingle bank in the 14th century. Later entrances were dug to the north but the port was finally closed by damming of the Dunwich River at Walberswick in 1700.

In the 16th century the flourishing port at Aldeburgh, which had itself benefited from the fall of Dunwich, declined as a result of increasing ship size and silting of the river and the port was moved south to Slaughden. Similarly the prosperity of Walberswick was brought to an end when the sea breached the spit which protected the harbour. The present harbour was constructed by cutting through the shingle in 1590 (Edwards 1991, 100). Accumulation of mudflats and saltmarsh at Orford ensured the town was marooned some distance inland and approach from the sea became longer and more difficult (Williamson 2005, 136). Blythburgh also suffered from the deposition of a spit across the river mouth by the 16th century.

This natural process was compounded by the advent of the Black Death which led to a sharp decrease in population, the continental wars of the 16th and 17th century and the increased

threat of piracy. Focus also shifted as exploration of North America became prominent, the cloth industry became mechanised and moved to Yorkshire and local fishing fleets were badly affected by competition from the Netherlands. The Hearth Tax of 1674 showed that coastal settlements in the region had become impoverished with low populations (ibid, 19).

Just as the lost prosperity is highlighted by the wool churches of Lowestoft, Covehithe, Kessingland, Blythburgh and Southwold, the decline of the ports is illustrated by Walberswick and Covehithe churches which are now in ruins. Walberswick church was said to once have been as impressive as Blythburgh and Southwold but after the decline of the port it was abandoned and a smaller one built within (Edwards 1991, 103).

Despite this disastrous decline in fortunes some of the ports survived, taking advantage of the more localised trade which remained. The ports of Southwold, Aldeburgh (Slaughden), Woodbridge, Ipswich, Felixstowe and Great Yarmouth particularly flourished, although trade continued elsewhere (Williamson 2005, 136). Coastal trade was important to the area, including exports such as cloth, malt, corn and bricks, and imports including coal and coke from the north east (Edwards 1991, 100; Williamson 2005, 137). Coasters ran south to London and north to Northumberland and beyond (Williamson 2006, 24). The long rivers meant that goods could be easily moved inland on smaller craft, principally keels and wherries (Williamson 2005, 137).

The ports regained some importance after the 'Agrarian Revolution', particularly in the 18th century when the agricultural hinterland was buoyant (Williamson 2005, 137) and East Anglia became the bread basket for the increasing population of the industrialised north.

Some of the larger ports created their own distinctive markets. For example Ipswich became a major centre for emigration to New England between 1611 and 1634 and Great Yarmouth thrived on the herring industry until the early 20th century. Lowestoft prospered following the connection of the Waveney River to the sea via Lake Lothing in the 19th century. This provided a new route which avoided Great Yarmouth with a sheltered harbour for Lowestoft.

Slaughden remained a busy harbour until the 19th century initially handling typical cargoes but latterly operating passenger services to Ipswich and London exporting fertiliser from the industry which has grown up through coprolite extraction. Slaughden was said to be a large quay with fish houses and warehouses in 1679 and coal yards and saltings in 1840 (Good and Plouviez 2007, 57).

The river ports notably thrived. In the 19th century the western area of Walton Backwaters was a centre for busy coastal trade. This is represented by Beaumont Quay which was constructed in 1832 at the head of a cut, taking advantage of a straight, deep channel. The land was owned by Guys Hospital who used the stone of the demolished London Bridge to build the quay. A lime kiln, constructed shortly after the quay survives and has been recommended for scheduling as an ancient monument (www.essexcc.gov.uk). An old Thames sailing barge 'The Rose,' launched on 1880, also remains in situ at the quay.

The port at Snape on the River Alde was rebuilt in stone in 1800 and a maltings and corn warehouses constructed in 1840-50. It became a busy port as a result of the maltings, but also exported sugar beet and coprolite.

Manningtree on the Stour was also a major centre of the Essex malt trade in the 19th century and Mistley was re-developed as a potential port and spa town in the 1780s with a thriving coastal coal and corn trade.

Butterman's Bay near Pin Mill on the Orwell was so called due to its role in the dairy trade with the Channel Isles. Trade also included sailing ships, riggers and steamers with grain,

timber and fertiliser from as far as South America and the West Indies. Goods were taken by barges to the Ipswich Docks (Edwards 1991, 18).

During this time smuggling became widespread in the region and throughout the 18th century Sizewell gap was used to bring contraband ashore. At Woolverstone on the River Orwell a house facing the river was used as a signal and a cat was placed in its window to signify all was under control ashore (Hay and Hay 1972). This area of the river is still known as Cathouse Point.

Erosion and silting of the harbours remained a significant problem for the ports and a second period of decline occurred. The port at Slaughden had eroded completely by 1930. In contrast improvements to Southwold harbour in 1749 and 1752 could not prevent the build-up of shingle banks across the harbour mouth which had been worsened by land reclamation (Williamson 2005, 138-139). This also affected Blythburgh, the approach to which had become blocked. The River Blyth Navigation Act was passed in 1757 to make the river navigable to Halesworth, however the last seagoing ship reached Blythburgh bridge in 1870 before the estuary completely silted up.

By 1800 Ipswich harbour was almost choked with silt (Wheatley 1990, 69). In 1805 an act was obtained to improve the port, and trade recovered after 50 years of dredging and dock building, although Ipswich became increasingly non-maritime.

A number of other ambitious schemes were put forward in the 19th century to combat the problems of siltation including creating new harbours at Aldeburgh and the mouth of the Orwell, however most did not come to fruition. The decline was also influenced by the rise of the railway network. As terrestrial routes improved investing money in port works became less attractive (Williamson 2005, 140).

In contrast although the coming of the railways completed the decay of smaller ports, it further enhanced those with rail connections (Wren 1976, 23). This particularly benefited Ipswich, Felixstowe and Harwich, which remain the largest ports in the area.

The emergence of the railways from 1846 brought new industry to the docks at Ipswich including packet routes to London and paddle steamers for passengers to Harwich on every tide (Wren 1976, 141). Trade has continually soared since WW2 (ibid 148) and the docks are currently undergoing a period of regeneration for commercial and residential needs.

Felixstowe port was founded by Colonel George Tomline who began the Felixstowe Railway and Pier Company in 1875. In 1879 the company title was changed to the 'Felixstowe Railway and Dock Company', and powers were given to construct a dock, warehouses and rail sidings. Later in the same year, the company title was again changed, to the 'Felixstowe Dock and Railway Company', as it is today (www.portoffelixstowe.co.uk). Sailing barges brought grain and goods and schooners took grain, malt and flour and small pleasure steamers travelled to Shotley and Harwich.

The port was taken over by the navy in World War II and in the 1950s the harbour was dredged and a new quay built. In 1964 the Oil jetty was constructed and in 1966 work began on the Landguard Container Terminal, developing the port into the international hub of today. Construction of container ships and the development of Ro-Ro ferries were both pioneered at Felixstowe.

The Continental Pier was constructed at Harwich in 1866 at the western end of the quay, and rebuilt in concrete in 1950s; it is now called Trinity Pier. Commercial activity was sustained throughout the 19th century with various quays, a landing stage and a dry dock constructed. Passenger transport became important in Harwich from mid-19th century

By 1872, shipping trade had increased so much that the Great Eastern Railway obtained permission to reclaim land a mile to the west of Harwich, and build a new quay. This was opened in 1883 and named Parkeston Quay. The port had its own railway station, and a hotel was built between the northern platform and the quay. Ferries were moved from the town dock to Parkeston Quay after World War II and Harwich International Port began to flourish.

Values And Perceptions

The southern ports of Harwich and Felixstowe dominate sea-use in this region and bring income and employment to the local communities. They are perceived as industrial hubs, dominating any previous character they had as recreational areas or naval bases.

The smaller ports or previous ports are proud of their heritage and many try to sustain their character as ports through retaining small fishing fleets or area of trade, docks and warehouses. Some have adapted to modern use such as centres for offshore industry including Great Yarmouth and Lowestoft. In some cases aspects of the ports histories are important including the herring industry at Great Yarmouth and the smuggling activities along the estuaries.

Many ports have become tourist destinations, retaining their maritime character without any industrial or trade element. Disused docks are now used as maritime heritage attractions such as Harwich town docks and the historic docks at Great Yarmouth.

Research, Amenity And Education

The ports of Felixstowe and Harwich, and to a lesser extent the other smaller ports along the coastline in the regon, are essential to the UK's transport infrastructure and economy which is heavily dependent on international trade. They are also vital to the local economy, providing employment and income on a large scale. The ports of Great Yarmouth and Lowestoft have become crucial to the offshore energy industry.

Some research into the archaeology of ports and docks has been conducted within the region, most notably at Harwich where series of quays have been traced back to the medieval period. The Suffolk RCZAS has also shown the value of inter-tidal and estuarine survey to locating the potential locations for pre-medieval ports. Over the years summaries of the ports of East Anglia have been created, however there would be value in updating these studies with recent discoveries.

There is certainly scope for an educational approach to the ports and docks of East Anglia which are examples of politics, economy and climate change in action. These could be used as case studies in schools and in further education.

Condition And Forces For Change

The ports and docks in the East Anglian region have been subject to varying processes throughout their history as outlined above. As a result a number of thriving ports still exist in the region which are nationally important. In contrast many ports have fallen into disuse and disrepair.

Climate change and erosion remain very real threats to the ports and docks of the coastline and very little of the once important port of Dunwich remains. Where historic dock structures may remain these processes may be harmful.

Those ports which remain are still subject to factors of economy and politics and have to adapt to prosper as illustrated by the use of Great Yarmouth and Lowestoft by the offshore

energy industry. The increased importance of European relations often means higher volumes of trade for the larger ports.

As a result many of the ports are embarking on large development projects. The proposed Bathside Bay development at Harwich would result in massive expansion of the port and its facilities but is dependent on other factors. Successful expansions are underway at Felixstowe and completed at Great Yarmouth.

Rarity And Vulnerability

The ports and docks of this region have always been vulnerable to external factors such as silting of harbours and international relations. This remains the case today, particularly with regard to the problems of erosion and deposition seen along this coastline. These can cause significant siltation which requires significant financial input to rectify.

Any archaeological remains of docks in area of erosion are at risk as the processes are expected to worsen as sea levels rise and storminess increases.

Ports are not rare in the region, however many smaller ports are being lost as a result of the decline of the fishing industry and this type of small port is at risk.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: RECREATION

CHARACTER TYPE: RECREATION

Introduction: Defining/Distinguishing Attributes

Recreation and seaside entertainment are very significant to the East Anglian coastal area. A string of holiday resorts bring many visitors and resulting income to the region every year. These vary from the large colourful resorts in the area known as Flegg (a former island) which encompasses Great Yarmouth, Caister and Hemsby and those on the Essex 'Sunshine Coast' including Clacton-on-Sea, Walton on the Naze, Holland on Sea and Jaywick. Here 20th century leisure and tourism related facilities exert great influence (Country side Agency 40) including sandy beaches, piers and amusement arcades, golf courses, seafront gardens, watersports and air shows, set in a background of distinctive seaside architecture. The piers at Clacton, Walton, Southwold and Felixstowe are particularly notable.

A string of holiday parks comprising static caravans and chalets are present around these areas to accommodate the seasonal tourists. These are particularly prolific in the Flegg area, from Newport as far south as Benacre with a further cluster from Frinton to Jaywick.

Figure 18. The small coastal village of Burnham Overy Staithe, a place for recreation.

Smaller, more tranquil resorts include the small villages and towns of North Norfolk (e.g. Holkham, Brancaster, Blakeney, Burnham) and Suffolk (e.g. Aldeburgh, Orford, Southwold and Thorpeness). Aldeburgh is a popular upmarket seaside resort and small fishing village which is famous for highbrow events such as the annual Aldeburgh Music festival held at Snape Maltings. The latter is a dedicated tourist centre and concert hall. Similarly Southwold has a reputation as a very well-to-do seaside town and is frequented by large numbers of tourists every year. It is famous today for the Adnams brewery, once equally famous as the Sole Bay brewery. The area is popular with tourists looking for a quiet retreat with attractive views over sea or estuary.

These resorts tend to act as centres for wildlife and countryside enthusiasts. The North Norfolk coastal path and Suffolk Coast and Heaths Path run along the lengths of coastline classified as 'heritage coasts' due to their special scenic and environmental value. The Naze area is also internationally renowned for its wildlife and includes the Naze public open space, containing the John Weston nature reserve. The Suffolk estuaries are an important wildlife and recreation resource, protected areas for walking, bird watching and wildfowling. Similarly the whole Broads area is a recreational haven, attracting ramblers, artists, anglers, birdwatchers and those looking for boating holidays.

Attractions include Havergate Island, an RSPB sanctuary in the River Ore famed for its avocets, Holland Haven Country Park which has status as an SSSI. This comprises unspoilt grazing marshes with footpaths, cliff-top walks, access to beaches and bird watching for visitors.

Golf courses are a common site along the East Anglian coast with a series of 13 courses from Hunstanton in the north through to Clacton in the south. These are often placed between holiday resorts in areas where recreational space remains, such as Great Yarmouth/Caister and Clacton/Jaywick.

A number of beaches along the coast are recognised for good water quality and have Blue Flags including Felixstowe South, Clacton-on-Sea and Dovercourt Bay. Water temperatures for bathing range from 4 to 14 ºC. Beaches are composed of sand or shingle or a mixture of both, all of which are used for recreation.

The offshore area accommodates a number of recreational activities including swimming and watersports, diving, fishing and sailing. These are popular bathing waters with designated watersports zones as well as primary sailing routes.

Sailing is extremely important to the region, with numerous sailing and yacht clubs and marinas situated along the coastline. Most sailing activity in this area is concentrated in the estuaries. Orford is a haven for sailors who can navigate the treacherous entry to the Alde/Ore estuary at the southern end of the Orfordness spit (Countryside agency, 59). A number of Royal Yacht Association tertiary routes converge just to the west of Orford Haven, heading out along the coast in both directions and out to sea. The Hollesley Bay offshore area acts as a feeder area in and out of Orford Haven.

The River Deben is navigable for more than 10.5 miles from the estuary mouth to Wilford Bridge. Its significance to the sailing community is evident in the town of Woodbridge at the head of the estuary and the hamlet of Waldringfield on the southern bank. The Orwell is one of the most popular sailing centres outside the south coast with 3000 boats based in its waters, six sailing clubs and five marinas, including Ipswich, Levington Creekand Woolverstone. The Naze area is very popular for recreational sailing and a number of marinas have been constructed within Walton Backwaters.

Recreational fishing takes place onshore and on private boats in the marine zone. Sea fishing is popular off most of the regions beaches such as Felixstowe which is particularly popular, and piers including Clacton and Walton. Recreational sea fishing is also popular in the estuaries, occasionally resulting in disputes between commercial and recreational fishermen (ESFJC). Recreational fishing boats leave from ports and beaches such as Orford and Aldeburgh and are known to visit the areas around the offshore sandbanks. Catch includes whiting, cod, sole, bass, garfish and mullet (leader-lines).

Recreational diving takes place off the East Anglian coast despite the dense sediment in the water. Boats are launched from Southwold, Felixstowe Ferry, Harwich and Levington Marina in particular, generally heading 10-30 miles offshore. Dive areas are known at Aldeburgh and around the sandbanks such as Kentish Knock and the Gabbard.

Other offshore activities include windsurfing, particularly at Jaywick. Canoeing, sail-boarding and water-skiing occur on estuaries. Halliday Rock Flats which have a depth of 0 m - 2 m are specifically used as a recreation area for power craft.

Historical Processes; Components, Features And Variability

The emergence of East Anglia's seaside recreation began in the late 18th century when wealthier members of society were beginning to appreciate the healthy air and relaxation of the seaside (Williamson 2005, 141). A number of fashionable 'watering places' evolved along the coast including Cromer, Sheringham, Great Yarmouth and Walton (Williamson 2006, 119). These were generally used for summer residences. One of the earliest attempts to create such an attraction was Richard Rigby's planned transformation of Mistley on the Stour estuary in the 1770s, however the venture was never completed. This process was accelerated by the arrival of the railways in the mid- to late 19th century, coinciding with higher levels of disposable income among the burgeoning middle class (Williamson 2006, 124). As a result a number of 'holiday resorts' were purposely created by wealthy individuals or businesses including Hunstanton on the North Norfolk coast which was a venture of the Lestrange family in 1846. Existing watering places were quickly transformed into these recreational hubs (ibid, 125) and large-scale tourism began. White's directory of Essex described Harwich in 1848 as "much frequented in summer as a bathing-place, with three bathing machines on the beach and a commodious suite of baths"

Thorpeness in Suffolk is a good example of this deliberate placement, a creation of local landowner Glencairn Stuart Ogilvie in the early 20th century. Ogilvie dammed the sea creating a 25 ha lake from the natural meare and built a holiday village around it complete with mock Tudor houses and a Bavarian street, golf course and unusual buildings. These include the 'House in the Clouds' a water tower disguised (and since converted into) a house perched on top of a weather boarded tower.

Resorts such as Southwold and Felixstowe were more organic in their development. The railway arrived in Southwold in 1879 and as a narrow-gauge line run by an independent company became a tourist attraction in its own right (Williamson 2005, 142). A number of hotels and piers were constructed at the turn of the century and new docks in Felixstowe. In 1902 the Felixstowe and Walton Improvement Act allowed the council to acquire land along the seafront and construct a seawall with two miles of promenade.

This area of the Suffolk coast known as the Sandlings also attracted tourists for other reasons. The area was seen as lonely, remote and melancholy, characterised by its decline from medieval greatness as exemplified by the ruined Perpendicular churches and the elemental force of the sea (Williamson 2005, 24). Resorts in this area generally remained small and remote from major centres of population and still have a strong appeal for this reason (ibid,

144). The Broads area did not participate in the enormous growth of coastal tourism in the 19th century. In 1878 small yachts were available to hire from John Loynes and in 1908 Harry Lake created an agency for yachting holidays. The area truly took off in the early 20th century, becoming a popular holiday destination in the 1950s and1960s (Countryside Agency, 47).

Piers were a major feature of the advent of large a scale tourism and seaside recreation. Walton pier is one of the earliest, built in the 1830s and is now part of the Frinton and Walton Conservation area. Aldeburgh became an accidental tourist spot in the 1860s after a rail line was established to serve engineering works at Leiston and the fishing fleet at Aldeburgh. In the 1870s work began on a pier although this was never finished and eventually demolished. Southwold pier was constructed in 1900 by the Coast Development Company. It carried a small pavilion but was principally a place to land passengers brought by steamers form London (Williamson 2005, 142).

Felixstowe pier was built in 1905 and was at one time the second longest in the country at three quarters of a mile, until much of its length was demolished during the Second World War to prevent it being used as a landing point for enemy troops. The damage was never repaired and the pier was neglected until the late 1990s, when it was deemed unsafe and closed to the public.

The annual Aldeburgh Music festival was established in 1948 with the help of Benjamin Britten who had settled in Aldeburgh. This expanded considerably in the 1960s when part of Snape Maltings was converted to a concert hall. The festival has been held there ever since.

The area was once home to the pirate radio station Radio Caroline, begun in 1964 anchored on Kentish Knock. The station was forced to move in 1967 when the territorial waters boundary was shifted from 3 to 12 miles.

Values And Perceptions

Recreation and seaside entertainment are crucial to the coastal region in East Anglia, particularly from an economic perspective. Resorts such as Great Yarmouth and Clacton are perceived as centres for seaside entertainment, traditionally attracting families from urban areas. However the presence of large, loud coastal resorts is not seen favourably by all residents who consider them unattractive, bringing traffic and noise to the region on a regular basis.

In contrast some areas of the coast are seen as wild regions in which to retreat to avoid the crowds. The infrastructure in these areas tends to be less developed, discouraging some holiday makers.

This contrast is perhaps exemplified by the Scallop, a controversial sculpture standing on Aldeburgh beach which is dedicated to Benjamin Britten who used to walk along the beach. The monument is in the shape of a scallop shell standing 4 m high with the inscription “Ihear those voices that will not be drowned” taken from Britten’s Peter Grimes. It was created from stainless steel by local artist Maggi Hambling. Many find the sculpture inappropriate for the setting of the town and it continues to be regularly vandalised.

Research, Amenity And Education

The region has undoubtedly benefitted from the advent of large scale tourism which brings financial rewards. In addition the construction of recreational facilities has benefitted the residents who are able to utilise these facilities for much or all of the year. Recreational areas

such as clean and managed leisure beaches or coastal paths can significantly improve the lifestyles of those who live nearby.

The recreational tourist industry in East Anglia has developed over a century and is generally well understood. In many cases it is well used for education with towns such as Great Yarmouth priding themselves on the history of their tourist industries as exemplified in local museums.

Research into tourism and recreation on a regional scale may better inform developments and management plans which aim to sustain the regions environment or build on its current facilities. It may also inform local communities of the advantages and disadvantages of tourism.

Condition And Forces For Change

Recreation on the East Anglian coastline is a characteristic of the area and provides a stable income and employment. The tourist industry is well established and sustains itself, although the larger resorts have seen a decline in recent years as cheap foreign holidays become more accessible and popular. Overall the attraction of this coastline goes beyond the stereotypical resort and will therefore always encourage visitors.

Large areas of the coast and Broads are protected under designations such as SSSIs and heritage coast which does not allow for major change. However there is increasing pressure for development in the area which may impact upon its historic character.

Additionally anticipated climate change could have a large effect on the region's recreation as land is lost to the sea and the weather changes, affecting peoples' activities.

Rarity And Vulnerability

The recreation character type as a whole is not rare, with coastal recreation popular all around the English coastline. However the region contains a varied set of recreational characteristics which may be somewhat more unique such as the bleak appeal of the estuaries for walkers and wildlife enthusiasts. These characteristics may be at risk from development if it is allowed to take place in certain areas.

The tranquillity of the area is important to the local community and perceived to be at risk. The Suffolk Coast and Heaths management plan specifically highlights the need to manage and sustain tranquillity and initiatives such as 'Deben Watch' have been established, encouraging people to report crimes, collisions and irresponsible behaviour on the river.

A number of areas have been designated for their environmental potential but have become important recreation features, such as Hamford Water where wildlife trips are becoming popular. Such areas develop through human management creating rare landscapes.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: SETTLEMENT

CHARACTER TYPE: SETTLEMENT

Introduction: Defining/Distinguishing Attributes

The coastal settlement of the East Anglian region is one of varying character, combining traditional fishing villages such as Felixstowe Ferry, tranquil rural retreats like Orford, bustling tourist destinations (Great Yarmouth, Clacton) and the industrial centres of Harwich and Felixstowe.

The majority of the settlement within the region is significant for recreation and tourism in a number of ways. Distinct areas of the coastline are dominated by larger coastal resorts including Cromer, Great Yarmouth and Lowestoft and Walton/Clacton/Jaywick. Holiday destinations in the region include the towns of Clacton and Great Yarmouth, as well as Hunstanton. Characteristic features of these towns are piers, promenades, seafront gardens, amusements, watersports and annual air shows.

Figure 19. The promenade at Hunstanton.

More non-commercial coastal settlements include towns and villages such as Southwold, Walberswick, Aldeburgh, Orford and Frinton and those along the North Norfolk coast such as Sheringham, Burnham Market, Blakeney, and Wells, which are smaller towns with markets and commercial outlets that cater for traditional holidaying, as well as fishing

beaches, beach huts and coastal walks. Other destinations such as King's Lynn offer other amenities. And other settlements are small local villages that were probably fishing villages, but today often have seasonal occupants such as Happisburgh. In another example, Frinton is perceived as being conservative, known for its interesting Victorian and art deco buildings with no traditional seaside activities and no public house until 2000. Aldeburgh, hosts an annual internationally renowned music festival.

A number of less tourist-orientated settlements alongside the numerous large estuaries have acquired a character particularly attributable to their maritime location such as the towns of Manningtree and Mistley on the Stour and smaller settlements such as Pin Mill on the Orwell.

The towns of Felixstowe, Harwich and Ipswich, incorporating their respective ports on the Stour and Orwell in the south of the region, form its industrial maritime hub. Felixstowe is also based along a strip of shingle beach with recreation facilities and Harwich offers passenger travel to the continent.

With the exception of the city of Norwich which itself retains some maritime character, the main centres of population in the region remain coastal or port locations with a population of c. 130,000 in Ipswich. As a result of its location at the head of the estuary, Ipswich is the regional centre for Suffolk and has traditionally brought wealth to the region. Lowestoft, Great Yarmouth and Clacton also form significant urban areas.

Historical Processes; Components, Features And Variability

The earliest evidence of settlement in the coastal region comes from Happisburgh, but also Clacton and Dovercourt which are significant early Palaeolithic sites. Mesolithic tools have been found on Dovercourt beach and in the Orwell and Stour estuaries which would have been 'hotspots' for Mesolithic occupation, often based on rich estuarine resources (see Flemming 2002).

Neolithic and Bronze Age activity in the area from Jaywick to Harwich associated with the 'Lyonesse surface' (see Palaeolandscape) may be indicative of some specialised coastal settlements (Wilkinson and Murphy 1995, 104) and included finds of paddles. A number of ring ditches and barrow cemeteries have been located along the banks of the estuaries in the south of the region, particularly the Stour. The proximity of the waterways, their resources and possible ritual status indicate the area may have been a prime location for Prehistoric activity. The region has more 'Beaker period' settlements than any other in England (Williamson 2006, 31) including a series of roundhouses at Sutton Hoo. A late Bronze Age settlement has also been located at Gisleham in Suffolk. Remnants of activity were excavated at Holme, where evidence of the 'woodhenge' was found. Local inhabitants must have been settled nearby.

Manningtree is said to be the home of the Manni tribe who greeted Julius Caesar in 55BCand an enclosed Iron Age settlement has been found in Mistley. Around the Deben valley field walking indicates Iron Age settlements were scattered at intervals of c. 700 m and 1 km (Martin 1993; 1999; Williamson 2005, 11). Surviving Roman archaeology mainly comprises maritime activity including salt processing in the form of 'Red Hills' (see processing industry), coastal defences such as Burgh Castle and possible ports; the latter including Felixstowe and Ipswich. However, field walking has suggested a density of 1-1.5 settlement sites per m² (Williamson 2006, 36) including some settlement of coastal marshlands. The Roman period saw the development of the first true towns including Caistor St Edmund near Norwich (Williamson 2006, 37). Brancaster is reputedly the site of a Roman fort that was incorporated into the defensive network during the Saxon period.

The region became more important in the Anglo-Saxon period as a result of its position adjacent to the North Sea and many Saxon towns were located at or close to limits of navigation, such as Norwich and Ipswich. These functioned as entrepots or 'wics', controlling long distance exchange and in some cases production. Control of these locations equated to political power and the development of the kingdom of East Anglia.

Small fishing villages are known to have existed all along the coast at this time including Aldeburgh (whose 16th century Moot Hall has roots in the Anglo-Saxon period), Dunwich, Great Yarmouth, Walton and Clacton. Sizewell was an Anglo-Saxon settlement meaning 'Sisa's well' (Edwards 1991, 93). An area of the coast, made up of the settlements of Walton, Kirby and Thorpe known as the Soken was owned by the chapter of St Paul's cathedral and granted special privileges and powers.

Anglo Saxon maritime exploitation of the area is evidenced by the remains of two fish traps located during the RCZAS in Holbrook Bay on the northern bank of the Stour estuary (Everett 2007). Cemeteries have also been excavated around the Suffolk estuaries, often overlooking the rivers and in the cases of Snape and Sutton Hoo famously containing ships. The ship burial at Sutton Hoo which contained a number of high status burial goods including a helmet, silver bowls and spoons, a purse, shoulder clasps and golden buckle is assumed by many to be the burial place of Anglo-Saxon King Raedwald. The mound would have been visible rising above the Deben estuary, an important route inland at the time of its construction.

Ipswich (Gipeswic) was an extensive settlement by the mid-8th century and a major pottery production centre – a result of potters from the Netherlands settling here c 700. By the10th century AD, the town had become significant; situated at the heart of the great wool producing area at the head of a sheltered and easily navigable estuary (Wren 1976, 132). Ipswich became the country's busiest port in the Anglo-Saxon era (Wheatley 1990, 59). The Anglo-Saxon Chronicle records that the town was sacked in 991 and 1000AD and heavy fines levied on the inhabitants (Wren 1976, 132).

Harwich also began to gain significance at this time, offering the only safe anchorage between the Thames and the Humber. The first reference to Harwich was in the Anglo-Saxon chronicles, which record a battle fought between King Alfred and the Danes in 885. The name Harwich comes from 'here wic', or wic of the army, indicating a settlement probably existed in the Saxon period. Blythburgh and Rendlesham were also important Saxon centres, the latter described by Bede as a royal vill.

As a result of its position on the North Sea, Viking, and in particular Danish, influence extended beyond the military as the region became part of the Danelaw in the 9th century. A few Scandinavian place names remain, especially around Great Yarmouth e.g. Hemsby, Scratby, Herringby and the term 'beck' after the Old Danish 'bekr' is still used to describe a stream in Norfolk. Numerous finds of Scandinavian metalwork from the 9th to 11th century suggest extensive settlement. It is possible that Danish settlement may have provided the impetus for the development of Norwich which still possesses many Scandinavian street names and churches dedicated to Scandinavian saints such as St Olave (Margeson 1997, 27).

East Anglia as a whole remained populous and economically prosperous in the medieval period (Williamson 2006, 11). North Norfolk and coastal Suffolk possessed particularly fertile soil and carried abnormally large populations in the early medieval period (Williamson 2006, 23). In 1066 Norwich was the third largest city in England after London and York and was a major port trading with Scandinavia and the Rhineland until eclipsed by Great Yarmouth (Williamson 2006, 108-109). King's Lynn was became a centre in the region when

its market was established in the 11th century by the Bishop of Norwich, probably wanting to exploit the access to sea trade through The Wash embayment.

The Domesday Book of 1086 records a number of thriving coastal settlements making a living from the North Sea, including Felixstowe, Dunwich, Dovercourt and Southwold. Dunwich was said to have 3000 inhabitants, eight parish churches and two market places in the medieval period, forming the largest town in East Anglia. Extensive finds scatters at nearby Covehithe also confirm the substantial size and status of the settlement in the Medieval period (Good and Plouviez 2007).

Harwich obtained real significance in the 13th century when the town was developed as an economic venture by Roger Bigod, fourth Earl of Norfolk, in direct competition with the port of Ipswich. The town received its charter in 1238 and was granted a weekly market in 1253. By the14th century Harwich had become an assembly point for ships summoned by the king in times of war and by the 15th century had a flourishing ship-building industry (http://www.harwich.net/histbrf.htm).

Similarly Manningtree on the southern bank of the Stour was significant as a port from the early 13th century and received its market charter in 1238. The town also appears to have been deliberately planted as a port, presumably by the lord of the manor (Essex County Council 1999). The twin town of Mistley was a settlement trading in timber, fish and salt in 1070, it decayed in the 14th century due to the rise of Manningtree (Wren 1976).

A number of these thriving settlements were all but destroyed by a series of catastrophic events and processes during the medieval period including storms, harbour siltation, the Black Death and political and economic changes. Most of Dunwich and parts of Covehithe and Aldeburgh were lost to the sea by the 15th century.

Overall the Industrial Revolution passed East Anglia by, partly due to the lack of water power needed to power factories (Williamson 2006, 17). However, some coastal and estuarine settlement retained its good fortune or found significance in the post medieval period. The zenith of maritime Ipswich was c 1500 when the port was known as the shipyard of London (Wren 1976, 134). At one time the shipyards extended six miles downstream to Pin Mill (ibid). Trading centres and hards also existed along the length of the Orwell estuary. By 1800 Ipswich harbour was almost choked with silt (Wheatley 1990, 69). Added to the increasing dominance of Great Yarmouth, Ipswich increasingly became non-maritime (Wren 1976, 141).

Woodbridge was known for building merchant ships and men of war for the navy from 1500 to 1850 (Wren 1976, 189) and area enjoyed coastal and continental trade until the railway opened in the 19th century. Further down the Deben estuary Waldringfield was an industrial centre for coprolite in the 1700s (see extraction industry).

During the 16th and 17th centuries Harwich gained significance as a town as a result of successive wars with France, Spain and Holland. A naval dockyard was constructed and Henry VIII based his navy in Harwich. Cod fishing and the coal trade also became prominent and Harwich mariners led expeditions to Jamestown and New England including Christopher Jones who captained the Mayflower in 1620. Elizabeth I was said to have commented that Harwich was a “pretty little town and wants nothing” (Wheatley 1990, 57). Maritime links include tales of Nelson and Lady Hamilton who were said to frequent the Three Cups public house (Hay and Hay 1972). White’s directory of Essex records that 3829 souls lived in Harwich in 1841.

Settlements such as Southwold and Walberswick remained thriving fishing and trading ports until trade was killed by the First World War and ultimately the harbours silted up. The

prosperity of the region, particularly relating to the wool and cloth trade (see processing industry) is shown by its soaring perpendicular churches (Williamson 2006) such as that at Blythburgh.

Manningtree became very prosperous in the 16th century, as evidenced by its surviving built environment; the majority of its wealth came from the cloth trade and its docks. Manningtree was also a major centre of the Essex malt trade in the 19th century. Today many Georgian facades in the town conceal a number of Tudor houses, weavers' cottages and coaching inns. As a result the small market town contains elements of both a sea port and industrial town (Essex County Council 1999).

Farming has moulded the region's landscape over several centuries (Williamson 2006, 20) and much coastal settlement remained as farmland and small hamlets next to the sea until the 19th and 20th centuries when seaside recreation became popular. Large swathes of land were then purchased by wealthy individuals to create coastal resorts, aided by the construction of railways to previously inaccessible areas. This began as early as the 1780s when Mistley was re-developed as a potential spa town by Richard Rigby. The Mistley Towers remain as a monument to this development, all that now remain of a once grand church.

It has been argued that Clacton, Walton and Frinton owe their existence entirely to the railways (Williamson 2006, 125). The land in this area was bought by railway entrepreneur Peter Bruff in the 1860s, creating the resorts by the 1880s. Walton pier was built at this time to accommodate steam ships from London and Ipswich. Felixstowe developed a flourishing tourist industry during the late 19th century, facilitated by the opening of the railway station in 1877. It became particularly fashionable following a visit by the German royal family. Additionally smaller settlements such as Southwold were converted into well-to-do seaside resorts, fed by the introduction of the railway in 1879. The introduction of the railways further boosted these settlements by providing building materials for dock construction, as well as freight and passengers to encourage trade.

Some of the more unusual settlements in the region include Thorpeness and Jaywick. The former is effectively an Edwardian folly (Moore and Bamber 1995, 239); a large tidal delta in 1908, Glencairn Stuart Ogilvie dammed the sea entrance creating the present day meare, around which a Mock Tudor holiday village was constructed. Jaywick was constructed as a holiday resort for Londoners in 1928 by Frank Stedman. The houses were often poorly constructed and intended for short term holiday use. However, many people moved in and stayed, the result of which is that the resort still stands and contains some of the poorest housing in Europe (www.jaywick.net). It is the subject of on-going regeneration plans, with proposals to demolish some areas.

The seaside heyday was cut short by WWII and tourism never returned in such a large volume, further affected in recent years by the popularity of foreign holidays. In contrast some settlements continued to thrive as ports, most notably Harwich and Felixstowe which soared after World War Two and are currently undergoing a period of regeneration for commercial and residential needs. While others have somewhat declined such as King's Lynn.

Values And Perceptions

The majority of settlements in the East Anglian coastal region are known for their small size and population density, their essentially rural nature and tranquillity. The exceptions to this are the larger urban and more industrial centres such as Norwich, Ipswich and Lowestoft.

For many the settlements in this region are a retreat for periods of leisure and holidays. The larger tourist centres have particular associations with Londoners whereas the smaller towns and villages have acquired upmarket reputations, often attracting the wealthy.

The settlements are often still intimately associated with the sea and maritime activities. These include the declining fishing industry, as well as other offshore industries and activities such as the association between Great Yarmouth and Lowestoft with offshore energy.

Research, Amenity And Education

Settlements are extremely important landscape features in this region, often demonstrating considerable time-depth and significantly contributing to the perceived character. Many of East Anglia's coastal settlements have varied histories which are often under-researched, although this is changing with the advent of town character assessments and similar projects. There is potential for considerable historical and archaeological research including educational projects. For example, many of the settlements discussed above have historical features and landscapes which could be used to create walks and trails.

Settlements are also key items associated with tourism and the industry in the region, bringing in considerable capitol, particularly in the summer months. In some cases this depends on the retention of historic characteristics such as traditional fishing fleets, in others links to infrastructure bringing freight and passengers.

Condition And Forces For Change

Settlements undergo constant change as populations and socio-economic factors fluctuate. Many of the East Anglian coastal settlements have however retained historic features such as town plans and architecture dating as far back as the Saxon period in the case of Ipswich. As a result of the lack of good building stone, flint buildings are ubiquitous and characteristic of the region, often with significant time depth and in good condition.

The position of East Anglia on the North Sea coast has led to significant influences on settlement from the continent throughout history. These can still be seen in landscapes such as the area surrounding Southwold and Walberswick which is rich in brick-built Dutch gables and pantiles indicative of influence from the Low Countries. There is currently major pressure for development along this coastline. This applies to housing, particularly problematic in present day Lowestoft which has direct road and rail links to the south, in contrast to many of the smaller coastal ports (Good and Plouviez 2007, 35). In addition industrial development such as the Felixstowe South and Bathside Bay developments may herald significant changes in the settlement landscape. This may include impacts on the heritage and seaside character of the area.

Rarity And Vulnerability

The character of many East Anglian settlements under coastal influence is unique to this region. Many settlements possess considerable time-depth and are intricately linked to the North Sea.

The character of the settlements is at constant risk from development and over-exploitation of the coast. However the infrastructure in the region remains patchy, allowing smaller settlements to remain rural and preserve this character. The development of the major ports may see distinct changes to the larger settlements; however there is a significant local interest in retaining character.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: UNIMPROVED GRAZING

CHARACTER TYPE: COASTAL ROUGH GROUND

Introduction: Defining/Distinguishing Attributes

Coastal rough ground, incorporating rough grassland, scrub and heathland, is located along stretches of the coastline within the region. This type of landscape is the product of thousands of years of human activity.

A significant area of coastal rough ground in East Anglia falls within the region known as the 'Sandlings' present along the Suffolk coast between Southwold and Ipswich. This is defined by its acidic soil and particular cultural uses, most notably livestock grazing. Large areas of heath are present in the Sandlings region and these are characterised by the relatively limited number of species present and domination by heather (known as ling in East Anglia). Where natural tree growth occurs these are dominated by elm due to the exposed coastal location (Williamson 2006).

Figure 20. Winterton on Sea sand dunes and coastal rough ground.

Other stretches of coastal rough ground are located close to Winterton, and patches along the coast from Winterton to Blakeney. Other smaller areas of coastal rough ground occur within

the study area, most notably rough grassland around the Great Oakley/ Hamford Water area and scrub on the Landguard peninsula.

Historical Processes; Components, Features And Variability

Coastal rough ground in this region is usually represented by areas which would naturally be under tree-cover.

Heathland in particular is formed on areas of sandy soil. These 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 (Williamson 2006). This subsequently allows the development of the characteristic under scrub vegetation dominated by heather and inhibits woodland regeneration.

It is likely that much of the Sandlings area was cleared of trees by late Prehistory (Williamson 2006, 53) and used for cultivation and most significantly intensive grazing. Pollen evidence from excavations at Sutton Hoo indicate extensive clearances in the Bronze Age and evidence for podzolisation in the Iron Age (Williamson 2006, 175). Although, place-name evidence suggests that areas of woodland may still have existed in the area into the Anglo-Saxon period (Williamson 2006) the Sandlings would have been an area of almost unbroken heath throughout much of this period.

Traditionally the heathland was used for intensive grazing, maintaining its character by not allowing natural processes to convert the land back into woodland. Sheep are more suited to this type of landscape than cattle and dominated the Sandlings from at least the medieval period up to the 20th century with over 1000 recorded on Friston Hall Estate in the 1690s (Williamson 2005, 56). In particular the process of 'folding', where sheep were grazed on the heath during the day and folded into arable fields to manure at night, was extensively practised in this region.

Other processes and practises which shaped the landscape in this area include the harvesting of the natural vegetation for fuel, thatch and animal husbandry, and warrening (rabbit farming). It is traditionally thought that rabbits were introduced to Britain after the Norman Conquest but this view has recently been challenged by recent archaeological evidence, most notably (in this region) from an excavation at Lynford (Norfolk) which found evidence for butchered rabbits in early Roman layers suggesting that they may have been present or introduced as early as or even as part of the Roman conquest. Exploitation of rabbits was certainly well underway by the medieval period and evidence for their management, in particular large artificial warrens (pillow mounds) often survives in open heathland areas (Williamson 2005, 59).

Heathland would therefore have appeared more managed in the medieval and post medieval periods (Williamson 2005, 60). The current landscape was ultimately a product of a number of processes which changed this system of land use. Initially cattle were favoured over sheep due to declining prices and changes in agriculture generally. Most significantly 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.

Today what is left of the heath in this area is still grazed but also forms an important natural resource in the area.

Values And Perceptions

Coastal rough ground is important in the region for a number of reasons. The heathland in particular is viewed as a valuable asset in terms of its beauty and its importance to wildlife. As such, an entire region covering 403 square kilometres is known as the 'Suffolk Coast and Heaths'. In 2010 the area celebrated its 40th anniversary as an Area of Outstanding Natural Beauty (AONB) – chosen for the distinctiveness and quality of its 'natural' environment. The area has three long distance walkways including a 'Sandlings path' through the heathland. The Winterton area is a National Nature Reserve (NNR), and a part of the Norfolk Coast AONB.

Coastal rough ground as a whole has value to the local community as a recreation area adjacent to the sea. For example the area around Landguard peninsula is also used for walking and enhances the landscape around the Landguard Fort Scheduled Monument. Undeveloped land in the coastal zone is increasingly valued for this purpose.

Research, Amenity And Education

The coastal rough ground in this region is vital for understanding past human land use. The landscape itself is a product of a specific type of human activity as described above. The Sandlings is one of only a few remaining areas of ancient heathland whose very presence represents a way of life that has all but disappeared (http://www.forestry.gov.uk/england-heathland).

The landscape type is also important in terms of its potential for research and education with regards to its ecological system and wildlife.

The Sandlings region is particularly important for coastal access and the tourism which sustains the area, attracting visitors from throughout the British Isles and abroad. In particular, this is an important area for walkers and for wildlife watching. There is potential for man's impact on this landscape type to be further emphasised within this tourist industry.

Condition And Forces For Change

In the last century change has occurred through increased cultivation of traditionally grazed land and wide-scale establishment of conifer plantations, as well as pressure for development along the coast, including the construction of military facilities such as airfields. As such much heathland in particular has disappeared.

This is compounded by the natural processes which tend to act on unmanaged heathland. The process of clearance described can be subject to reverse if landscapes lose their traditional grazing regime and the heath once more starts to turn to and thence to woodland where the vegetation will stabilise. Nevertheless this regressive process can often be hindered in coastal heathlands by sea spray and across all areas of heathland by previous podalisation.

In contrast a number of forces are now working towards increased protection of coastal rough ground and reversing the decline of heathland. This includes the UNConvention on Biodiversity (1992) which led to the 1994 UK Biodiversity Action Plan in which lowland heathlands were identified as a priority habitat with targets set for their conservation and recreation. Many heaths were given statutory protection at this time. In this region this process is mainly represented by the Suffolk Biodiversity Action Plan.

Rarity And Vulnerability

There is little ancient heathland surviving in England (see http://www.forestry.gov.uk/england-heathland). Therefore these areas of the East Anglian coast are important and are recognised as such by its designation as NNR, as AONB and

Heritage Coast. Dunwich heath in particular supports rare localised plant and invertebrate communities.

The Landguard peninsular, incorporating the areas of scrub, is also designated a Site of Special Scientific Interest (SSSI) on account of the number and quality of shingle-dwelling plant species and its importance as a land-fall site for migrating birds.

Whilst coastal rough ground has been at risk in recent years this risk has now receded with recognition that this is an important landscape type and much is now being done to reverse its decline and maintain its character.

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EAST ANGLIA REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: WOODLAND

CHARACTER TYPE: WOODLAND

Introduction: Defining/Distinguishing Attributes

The majority of the woodland in the East Anglian coastal region is located within the 'Sandlings' area in Suffolk and is a mixture of coniferous and broadleaf trees. This is often the remnants of traditionally managed woodland. Overall there is 3110 ha of woodland in the Suffolk Coast and Heaths AONB, mostly contained in the three major plantations of Dunwich Forest, Tunstall Wood and Rendlesham Wood. These are closely associated with the heathland and birch scrub characteristic of the area.

A significant woodland plantation also remains around Benacre Broad, benefitting from the protection that the site is afforded. To the south, in the area of Covehithe Easton Wood is being destroyed by coastal erosion and slowly dying.

The Broads region boasts 3000 ha of carr woodland and scrub, the natural vegetation of fenland. Mature carr is particularly highly valued and is left unmanaged (www.broads-authority.gov.uk). In addition deciduous woodland, copses and plantations can be found in the upper reaches of the River Bure.

Figure 21. Woodland at Holkham, behind the dunes.

Other small but significant areas of woodland include a string of coniferous woodland situated around certain areas of the North Norfolk Coast such as Holkham and the Sheringham/Cromer area. In the south of the region the Stour Wood is situated on the banks of the River Stour near Wrabness and is an important part of the nature reserve there.

Ancient woodland is not common in the coastal area although the privately owned woodland at Staverton Park is one of the most important surviving areas of wood pasture in England (Williamson 2005, 106). This comprises c 200 acres of close-set medieval oak pollards, huge hollies, rowan and birch (Countryside Agency 1999, 56). Ancient woodland also survives at Iken, Reydon, Sudbourne and Sutton.

Historical Processes; Components, Features And Variability

East Anglia as a whole grew vast quantities of wild oak as a result of its clay soils. It is unclear at what date the region was deforested although this was probably a gradual process with occasional reversions (Williamson 2005, 12). Environmental evidence from Sutton Hoo indicates that some oak and hazel woodland was accessible in the early Bronze Age.

Following the clearance of the wildwood managed woodland became abundant in the area but was more common in the south and west, removed from the coastal areas. Medieval woods were intensively managed and most were coppiced every few years to produce straight timbers. Wood pastures were also common, in these areas trees were generally pollarded and livestock were grazed.

The Domesday Book recorded that Aldringham in Suffolk had woodland sufficient for 500 swine, Staverton for 30 and Snape on the River Alde for six (Williamson 2005, 53). However, field names recorded in medieval documents indicate further woodland clearance. It is possible that Staverton Park may have been a Saxon hunting ground (Williamson 2005, 107). It was owned by the Bigod family until 1306 when it reverted to the crown and was granted to the Earl of Norfolk. In 1529 it was sold to Butley Priority for £240 and in the 17th century it belonged to the Wantisden Estate.

By far the most common type of woodland in the area is post medieval plantation, originally dominated by oak with ash and beech. A few were established before 1700 and managed in a traditional manner by coppicing such as Holly Grove in Benacre and Whitmore Wood in Rendlesham (Williamson 2005, 109). However most were established by large estates during the 18th and 19th centuries and were not coppiced; trees were planted, thinned and harvested or left to grow. These were mainly created as game cover for pheasant shooting which had become popular in the 19th century, or to beautify the landscape (Williamson 2005, 109). The presence of post medieval plantations is often indicated by place names like ‘covert’, ‘belt’, ‘broom’ or ‘plantation’, or association with an individual.

In 1921 the Forestry Commission was created as a consequence of a severe timber shortage following World War I. At this time many of these plantations were comprehensively replanted with conifers. In addition the Commission created many more new conifer plantations on marginal land such as heathland which would not sustain hardwoods. It is this process which established Rendlesham, Tunstall and Dunwich forests between 1920 and 1938, resulting in the creation of 4905 acres of woodland.

Values And Perceptions

The woodland in this region is highly valued for a number of reasons. In particular, woodlands are viewed as peaceful and tranquil places which attract those wanting to get away from the tourist hubs.

From an environmental point of view the woods are considered to be important enough to protect through designation. In particular both Rendlesham and Tunstall forests are designated SSSIs and SPAs. Plantations have been viewed with some distaste, having replaced the 'natural' environment. However this is not a common place perception and most people are keen to keep the coniferous woods.

Research, Amenity And Education

Considerable research has been conducted into the region's woodland. However there may be potential for a larger study which encompasses the evidence that is available. There is also significant potential for surveys within woodland to help identify new historic features.

Woodland is frequently used by both the local community and seasonal tourists. Activities such as walking, cycling and wildlife watching are popular and Tunstall wood also hosts a twice yearly motorcycle event. Everyday activities such as walking and running are also accommodated. Access to some woodland could be improved, particularly that on private estates such as Staverton Park.

Woodland could potentially be used as an educational case study for a number of reasons. Its development is a study in sustainability applicable to modern day life; it is also interesting from an ecological point of view and as a tourist destination.

Condition And Forces For Change

There are small areas of ancient woodland still in existence within the larger swathes of plantations which are generally traditionally managed. The younger plantations are generally in good condition and are still in some cases managed for timber.

Much emphasis has been placed on conservation of woodland in recent years which may result in their protection. Some schemes in the East Anglian area include a process of 'rewilding' in the Suffolk Coast and Heaths AONB. This is a long term plan to recreate and regenerate the natural landscape which existed prior to the conifer plantations (http://www.forestry.gov.uk/). The recent government announcement to consider selling many areas of woodland means the future of woodland is uncertain in the future.

Rarity And Vulnerability

Areas of ancient woodland are certainly rare, both in the region and nationally. However the younger plantations are a common feature of the landscape.

Most woodland is sustainably managed and protected where necessary; therefore it is not particularly vulnerable. However the proposed reversion of areas of plantation may mean that this sub type is at risk in certain regions. Future political plans for woodland may also put them at risk, although it is unclear exactly how at present.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COASTAL INFRASTRUCTURE

CHARACTER TYPE: FLOOD AND EROSION DEFENCE

Introduction: Defining/Distinguishing Attributes

The coastline in the East Yorkshire to The Wash region has been particularly susceptible to coastal erosion and flooding. This susceptibility is reflected in the large number of sea defences that were built and remain along the coast. This includes stretches along the East Yorkshire coastline, Lincolnshire, and in The Wash area. The Humber has a few areas of flood and erosion defence that has resulted in areas of land reclamation.

The soft rocks and deposits which make up the coastline have been easily eroded by wave action, and long shore drift has resulted in the movement of sediment, creating differential processes of deposition and removal. Sea level rise, increased storminess and wave heights have led to widespread erosion and flooding in areas at different times (e.g. The North Sea Flood in 1953 and 1962), as well as a slow attrition of the coast, in close proximity to areas of deposition.

Figure 22. Old Sea Wall transformed into a road. North Coates, Lincolnshire (Oscar Aldred).

There is evidence for flood and erosion defences in the region that have been constructed since the medieval period, referenced in the National Records of the Historic Environment Resource (NRHE) and the regional HERs. Large areas of former wetland and tidal marsh have been drained using flood and sea defences, such as in the Fens, and in the Humber

valley. The establishment of sea and flood defences have had multiple effects: protecting areas of coastline, including settlement further inshore, as well as creating opportunities to drain land through its reclamation. Flood and erosion defences are therefore important to the region's character. Furthermore, coastlines are also a part of on-going discussion over how to adapt to the effects that will be brought on by rises in sea level, such as increased coastal flooding, attrition and deposition of sediment.

Many parts of the region's coastline are protected by some form of erosion or flood defences. In some areas these are substantial constructions, such as stone or concrete. Many older defences were made from earthen banks. Almost the entire coastline of Lincolnshire is protected by sea walls of some kind. In other places defences are in the form of maintained shingle banks, in other places earth banks, that protect inland areas as well as landward areas close to tidal channels and rivers, and estuaries. The area from Mablethorpe to Skegness has a fixed seawall built in the 20th century (Brigham and Jobling 2011). Fixed sea walls have assisted in producing areas of reclaimed land, which is a common feature along the coast, especially the north Lincolnshire area and close to The Wash. Only a few of the beaches are further protected by breakwaters and series of groynes, extending into the sea, such as at Humberstone Fitties, Chapel St Leonards, and Ingoldmells. More recent seawalls for flooding protection in the region are located around major urban areas such as Grimbsy, Hull, and Skegness.

In other locations along the coastline, unmodified topographic features also act as flood and erosion defences, such as sand dunes and shingle ridges. For example, parts of Spurn Head protect areas of land behind the spit, to the west. Sand dunes and ridges along parts of the Lincolnshire coast also protect the land behind, especially from North Somercotes to Mablethorpe. While natural features have been culturally modified. Many of the sea defences are reaching the end of their lifespan and their on-going maintenance and renewal is likely to be costly. For example, there are plans to reinforce the flood defences associated with the Grimsby harbour, protecting c. 14,000 properties (http://www.environment-agency.gov.uk/news/145669.aspx). As a result, there may be increased investment in the construction of barriers to protect particular parts of the coastline in the region, while carrying out 'managed realignment' and non-intervention schemes in others. Such decisions will be guided by flood and coastal defence policies for local areas, allowing management and investment to protect key populated or wildlife sites in the region.

Historical Processes; Components, Features And Variability

The East Yorkshire to The Wash region has been susceptible to flood and erosion processes for many hundreds of years. For example, the so called 'Roman bank' that continues northwards from the neighbouring East Anglian region is probably an early medieval sea defence built into, and incorporating, the Roman salt production and mounds called salterns (Ransley and Sturt 2013, 116). Historically, like the East Anglia region, the East Yorkshire to The Wash region's coastline has suffered greatly from erosion and longshore drift. Many villages have been lost to the sea. For example, Ravenser Odd was a town built on the sandbanks that are part of Spurn Head, perhaps to take advantage of good access to the sea for trading and for fishing (http://en.wikipedia.org/wiki/Ravenser_Odd; Sheppard 1912). During the medieval period, the 'town' of Ravenser Odd was an important centre, although in the 14th century the force of storms started its demise. By the end of the 14th century the town was abandoned, perhaps many of its inhabitants settling in Hull. Other settlements along this region's coastline met similar fates. The projected loss of coastal land since Roman times is suggested to have been around 2-3 miles (see Settlement).

The use of Roman salterns as base points for the construction of early medieval sea banks also resulted in several kilometres of land being reclaimed in The Wash area; a process also evident in many places along the East Yorkshire to The Wash coastline. Indications of the 'Roman bank' can be seen at Saltfleetby, Mablethorpe, Sandilands, Chapel St Leonards to Gibraltar Point. There are also numerous references to 'Sea Bank' close to Cleethorpes, south of Grimsby, and southwards toward The Wash. The result of constructing flood and coastal defences has meant that much former coastal areas are comprised of reclaimed land.

Construction of flood and erosion defences was intricately related to both salterns (salt production) and to land reclamation which occurred in this area until the post medieval period (see Reclaimed Land). Flood and erosion defences were used to control the impact of rising sea levels changes, associated with high tides and storms, but were also used to quicken the rates in which an area of former wetland or inter-tidal land could be reclaimed. There are several examples in the region where multiple sea banks have been used as a part of a progressive land reclamation process. This can be seen in the Humber and The Wash areas. For example, Sunk Island, was a sandbar that formed in the River Humber c. 1560. By 1660 it was subjected to flooding at high tide, and during the 19th century the 'Island' was entirely reclaimed through drainage. In the late 20th century, the embankment fronting the Humber (Welwick Bank) was raised to a height of 3.3 m above mean high water. In another example, at Wainfleet Sand there have been at least 4 different phases of land reclamation which can be observed from the sea banks. What is more, in some places, such as Mablethorpe, Ingoldmells, Huttoft and Skegness, clay extraction pits have been found that were possibly associated with repairing these features (Jobling and Brigham 2010b). A process of land reclamation started during the 17th to 19th centuries on the landward side of many of the sea banks, although it is possible that along some stretches of the coastline, this was happening earlier.

In the modern period, as infrastructures developed and where the coastline has receded, many of the flood defences have been re-used as roads. In some examples railway tracks as well as military defences during WWII (e.g. Freiston, Lincolnshire) were constructed on earlier flood and sea walls. Vast changes were made to flood and erosion defences after the North Sea flood of 1953. The flood affected the whole of the eastern coast of England, and was the result of a high spring tide, an intense low pressure heading down the North Sea, and hurricane force winds. A huge wave was pushed onto the eastern side of England, creating a high tide up to 2.5 m higher than usual. In 1953 there were no flood warning systems and a poor communications network, as a result of which 307 people lost their lives in Britain and 30,000 homes were evacuated.

Values And Perceptions

For those people and communities living close to flood and erosion defences, they are highly valued and are a distinctive part of the local (and regional) seascape character. A number of organisations and groups have been set up to try and improve the coastal defences. However, it is the Environment Agency's (EA) responsibility to maintain the defences, and to listen to the concerns that stakeholders and local communities might have. Various policies have underpinned the work by EA, to ensure that these concerns are assessed; such as Shoreline Management Plans (SMP). However, occasionally sea defences are seen as inappropriate to their surrounding landscape, which means that vulnerable stretches of coast still remain at risk. And perhaps due to not being repaired, flood and sea defences may also be at risk. This is a problem in the East Yorkshire to The Wash region. Beyond what already exists in many places, it is generally considered to be too expensive or even unnecessary to construct or enhance defences. Predicted sea level rise and higher storm surges will increase the risk of

coastal erosion and flooding so that existing unrepaired sea defences will continue to be destroyed, and as a result the seascape character of the region will change irrespective of the measures taken to halt sea inundation. Traditionally coastal protection schemes have defended the coastline with 'hold the line' policies and 'hard' defences such as walls and groynes.

'Managed realignment' which involves the breaching of hard defences when they reach the end of their lives and allowing the coastline to move inland is a possible outcome of the demise of sea defences in some areas. The main objective is to create more inter-tidal habitats to provide a range of benefits, including buffering wave energy and reducing hard defence costs. This policy relates to several EU Directives which require the loss of inter-tidal habitats to be compensated for by creating new ones. These habitats could decline due to 'coastal squeeze' between rising sea levels and sea defences or roads, and unregulated land-use change. Coastal squeeze increases the wave energy reaching sea walls and causes maintenance costs to rise. Use of 'managed realignment' techniques to create these benefits is still however, an experimental technique with uncertain outcomes and timetables for delivery and decisions on its use would need case by case economic, cultural and environmental consideration. (http://www.parliament.uk/documents/post/postpn342.pdf).

The onset of change has led to a number of reactions. Those from local communities directly affected by non-intervention or slow intervention can be quite vociferous. Others are more subtle, though are no less potent, for example Neil White's photographs of the Holderness coast http://www.neilawhite.com/lostvillages.html.

Research, Amenity And Education

There is potential for research into the region's flood and erosion defences. Some of these research areas are identified in the Maritime archaeological research agenda for England (Ransley and Sturt 2013). There is certainly scope to study the evolution of flood and sea defences, and English Heritage has already started that process in its *Introduction to Heritage Assets* (English Heritage 2011), and its compilation of RCZAS and NMP projects. However, greater knowledge about flood and sea defences is needed. Furthermore, support for further research would create an intellectual space for continued research on the issues of humanity's relationship with the sea that would form the platform for education and understanding, and establishing amenities for recreation. Thus, a more informed understanding of the development of defensive structures may also be useful in obtaining information on a different type of narratives possible to discuss the past sea- and landscapes. Furthermore, knowing more about flood and sea defences when they are breached, means that new knowledge can help to contextualise, compare and assess the historical processes of coastal management and reclamation, as well as possibly the production of salt. In addition, when development takes place, the land surfaces underneath them may reveal much information about past coastal change.

Condition And Forces For Change

The condition of flood and erosion defences along the coastline and estuaries varies from place to place. Some places have evidence for several different phases of sea defences (e.g. (Wainfleetby and Friskney in The Wash). Other places have seen recent development in defences which have improved their effectiveness and contributed strongly to the landscape character in their area (e.g. in the Humber). The main force of change for this character type is climate change, the resulting rising in sea levels, land tilting (isostatic change from past glacial pressure) and increased storminess. This will put extra pressure on the coastline and existing defensive structures. For example, the rates of change since the Norman period

estimate that as much as 2 miles may have been lost from the Lincolnshire coast (de Boer 1964). This is being combated where possible by changes in policy and schemes to improve coastal defence by EA and DEFRA, especially the Shoreline Management Plans (SMP). These consider the current state of the shoreline, predicted changes and possible solutions. For instance, the government has allocated resources to develop parts of the coastal areas of the region, and it has also allocated £11 million to local authorities to come up with innovative ideas for coastal change. East Riding of Yorkshire County Council received £1,205,609 and Lincolnshire County Council received £810,000 for pathfinder projects (DEFRA 2012, 199-210, 133-153).

Rarity And Vulnerability

Flood and erosion defences are a characteristic feature across this region both in terms of combating changes as a result of past and present climates, but also in creating the conditions for land reclamation. However, flood and coastal defences are an undervalued heritage asset. They have been essential to the development of the landscape character of the Lincolnshire Marshes and The Wash embayment. Furthermore, because large areas of reclaimed land are no longer under direct active management, this has led to them being designated for their biodiversity or geological interest. Therefore, while they are undervalued as heritage assets, through their relationship with other types of sites, flood and erosion defences are often well provisioned for protection.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

CHARACTER TYPE: TELECOMMUNICATIONS

Introduction: Defining/Distinguishing Attributes

There are no telecommunication cables that make landfall along this region's coastline, though there are several that pass through its offshore waters. These connect the UK with the Norway and the Netherlands, although other routes also operate. The telecommunication cables are principally associated with NORSEA COMS (NORTHSEASCOMS +4781573770) (Kingfisher Cable Awareness NSCentral 2013). The NORSEA COMS connects the UK to Norway between Lowestoft and Kårstø.

There are also a few disused cables in place that clip the offshore region. This includes the STRATOS (BT +448457555999) cable (Kingfisher Cable Awareness NSCentral 2013) from Sheringham to what appear to be hydrocarbon installations.

Historical Processes; Components, Features And Variability

Installation of NORTHSEA COMS started in 1998 and the cable was ready for service in 1999. The cable has an initial capacity of a STM-16 system of 2.5 Gbit/s. Later, the cable included a 16x10 Gbit/s wavelength-division multiplexing system. The cable contains 24 optical fibres (http://en.wikipedia.org/wiki/NorSea_Com_1).

Most recently the cables have carried data communications traffic, enhanced by the development of fibre optic cables in the 1980s. All modern cables use this technology (http://en.wikipedia.org/wiki/Submarine_communications_cable). Modern cables have been installed in the region from the 1990s onwards with PANGEA the latest in 2000. Recently cables have been buried beneath the seabed in order to protect them from external threats.

Values And Perceptions

Submarine telecommunications cables are mostly undetected in the marine environment. However they are a highly reliable form of transferring information and are critical to our present-day life. They can be perceived as obstacles to certain sea users such as fishermen and dredgers and awareness charts are now produced. In addition fortnightly news bulletins list areas of cable that are exposed from the seabed with GPS coordinates that may potentially be snagging hazards for fishing nets and trawls (http://www.seafish.org/fishermen/kingfisher).

Research, Amenity And Education

Submarine telecommunications cables are an essential amenity, connecting England and the UK as a whole to the European continent and beyond. There are a number of amateur enthusiasts who log the history of marine telecommunications although this is still a relatively obscure sphere of research (e.g. http://www.atlantic-cable.com/CableCos/NorthernLine/). There is potential for a larger scale study.

The laying of new cables as well as the removal of old ones facilitates research as it provides opportunity for a cursory investigation of the seafloor and subsea floor. For instance, this would mainly be in the form of desk based assessments of geophysical survey and other historic data. However, the removal and laying of cables may unearth previously unknown deposits or remains.

Condition And Forces For Change

Increased demand for communications in our modern day life has led to the placement of numerous telecommunications cables in the offshore zone. These have to be replaced and maintained regularly with the progress of technology.

The laying of cables and the associated disturbance of the seabed can disturb the existing historic environment and can be viewed as disrupting the character of the landscape/seascape. However, their presence has become a contributing part of the seascape in this region.

Rarity And Vulnerability

Telecommunications cables are a rare feature in the region's seascape, although further development of technology may ultimately lead to the removal of cable. This is particularly pertinent given the rise of wireless telecommunication.

Submarine telecommunications cables have been vulnerable to various processes over their history. Most significantly cables can be broken by trawling and anchoring of boats at sea. They can also be affected by natural occurrences such as earthquakes and undersea avalanches, as well as animal activity including shark bites. As a result cables are now buried in the seabed, although some of these activities, such as trawling can penetrate their cover.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: COMMUNICATIONS

CHARACTER TYPE: TRANSPORT

Introduction: Defining/Distinguishing Attributes

Transport plays a vital role in the economy and everyday life of the region. This takes several forms: canals, roads, tramways and railways, as well as related infrastructures such as bridges and airfields. Canals are related to the drainage and reclamation of former wetland in the region, but are relatively sparse, although there is a concentration in The Wash area. The road network on the whole is typical of coastal areas: a communication for local people, as well as bringing tourists and other forms of economic benefit to the region. Access can be poor and is not well developed. There are a few tramways in the region that were linked and associated with the well-developed railway network. However, rationalization and changes in transportation technology meant that many railway lines were taken out of service. Parts of the network have been incorporated into new recreational uses, such as footpaths or cycleways, or have been used for as the foundation for new road transportation constructions. The iconic featire of Transport character is the Humber Bridge. The bridge represents an important example of the power that new transportation infrastructure has in shaping and energising regional development. There are no seascape related airfields – Humberside airfield is c. 9 km from the Humber – though there are several military ones.

Figure 23. Humber Bridge (Oscar Aldred).

Historical Processes; Components, Features And Variability

The predominant means of transport in this region varies depending on where one is located. In The Wash area and the Humber region has been water based. Land transportation has also been important though, particularly for the movement of commodities between production areas and markets, especially transporting fish from the ports of Grimsby and Boston. Furthermore, livestock have traditionally been easier to move by land rather than by water.

The contemporary road network in the region is based on the Roman road network. The main Roman road was Ermine Street that connected York and Lincoln with London. However, the route of the road avoids the coastal area, although it possibly crossed the Humber between Winteringham to Brough. An alternative route goes around the Humber estuary (http://simple.wikipedia.org/wiki/Ermine_Street). Coastal areas are connected to the Roman road network only at particular junctures, for example, the road from Lincoln to Burgh Le Marsh, and the road from Winteringham to Caistor on Wold. Examining the Roman road system, many contemporary roads have a similar north-south, east-west directionality, suggesting that there may have been many lesser roads that were originally Roman or earlier in origin that continued to be used into the medieval period. However, little is known about the Lincolnshire coast during the Roman period, although a transportation network is likely to have been connected to extensive coastal salterns around Ingoldmells and along the Lincolnshire coastline and The Wash. There is some evidence for a Roman road at South Ferriby, for example (Carey 1998).

The so called 'Roman bank', also mirrors the north-south alignment, although this was associated with the coastal defence and salterns, rather than the road network *per se*. There are also several Roman canals associated with the wetland areas within The Wash embayment. Described by William Stukeley as a canal, Car Dyke was constructed by the Romans in the 2nd century AD; although some parts were probably enhanced during the 17th century (Simmons 1979). The human-made water course probably acted as a drain and as a navigation route for cargo across the western edge of the Fens (Hallam 1970). Another waterway, the Bourne-Morton canal, was associated with a Roman settlement and field system, dating from the 1st century to 3rd AD (Trimble 1993). Another waterway, Fossdyke, is thought also to be Roman in its original construction, and linked the coastal area close to Boston via the Witham to Lincoln, joining up with River Trent north-west of Lincoln (Cumberlidge 2009, 120-1).

The medieval transportation system is generally understood to be a dilapidated version of the Roman network (Stenton 1936; Hindle 1973; Edwards 1987) based on the direct evidence from the Gough map which shows a good correlation between the Roman network and the route network being used in the 14th century. However, the existence of numerous waterways – rivers rather than canals - suggests that the inland transportation of goods by water, connecting land and sea, was just as prevalent if not more so than the road network (after Edwards 1987, 116-21). In particular, the East Yorkshire to The Wash region had many navigable rivers, making it a major feature of the historic character of the region. The Wash and Humber areas especially, and much of the Lincolnshire area especially, although the Wolds and Marshes close to the coastline, were less networked into the whole system. However, with these regional differences aside, the medieval transportation system should be considered as an integrated whole, consisting of both terrestrial and water networks providing access to inland areas and to the sea. At various places, the two systems met. For example, numerous ferries bridged the Humber estuary; Barton to Hessle, Barrow to Hull, North Ferriby to South Ferriby, Winteringham to Brough, and Faxfleet to Whitton.

Intensive canal building took place during the 18th century, but was related to the earlier draining of the Fens. The canals were associated with several rivers that connected The Wash

to the inland areas, and can be considered to have been part of an improvement that facilitated the movement of goods between coastal areas and inland. The waterways developed in stages, but the increase in the number of navigable waterways from the 17th century onwards was dramatic (Edwards and Hindle 1991). The coinciding reclamation of the Fens also resulted in an increased connectivity between the coast and areas inland, allowing markets to thrive, such as Boston and King's Lynn, but also those areas such as Grimsby and Hull that became increasingly connected to both the road and waterway network.

The first railways were constructed in the region during the 19th century. Many of the major ports and other major towns in the region were placed on railway lines by the mid-19th century. Like the Roman roads before them, the opening up of the landscape affected the character of the landscape, the economic structure, distribution of people, and how the landscape itself was organized. These changes included more intensive production of livestock and the transportation of goods. Railways also led to greater urban expansion in hubs, and they also stimulated the coastal holiday industry. During this period of railway expansion, the Lincolnshire coast at places such as Skegness became nationally important tourist destinations. This also led to the development of alternative transportation systems, such as the narrow gauge, steam driven, tramline that connected Alford with Sutton-on-the-Sea (http://en.wikipedia.org/wiki/Alford_and_Sutton_Tramway). The short-life of the tramline, which ran from 1883-1889, was in part due to the construction of a competing railway that branched off from the East Lincolnshire Line and that eventually superseded it: Willoughby and Sutton Railway which was built in 1888. However, by the 1960s this railway line and many others in the region, were part of branch-line closures.

The Humber Bridge, spanning the Humber estuary, was opened in 1981, although original plans were drawn up in the 1930s (http://en.wikipedia.org/wiki/Humber_Bridge). The Humber Bridge provides an important transport link for industry and carries approximately 120,000 vehicles per week, connecting either side of estuary, between Hull and New Holland.

Values And Perceptions

The sense of isolation and remoteness engendered by the relatively poor coastal road network is valued by some local communities and some tourists. However, because of the poor and limited accessibility, there is a dwindling economy to the coastal areas. The large-scale, positive effect of the transportation infrastructure was experienced during the late 19th to early 20th century because of the development of the railways that enabled the coastal tourist resorts in the region to flourish. Coastal resorts such as Skegness along the Lincolnshire coast, continue to be valued today as destinations for holiday and recreation. This is made possible by the transportation network, and the facilities such as the Humber Bridge for example. As well as providing a valuable service in bridging the north to the midlands, the bridge is a key landmark and is one of the most identifiable, and identifying, features of the region's contemporary landscape.

Research, Amenity And Education

The transport links, including road, rail, waterways and canals have obvious utility for the local population and have been vital to the region's economy, trade and industry. They also bring tourism into the area. There is no current research into the transportation network from an archaeological perspective, but it would benefit from a more integrated approach in terms of its association with landscape development and with exploring coastal connections. Transport hubs and heritage resources such as transport museums can play an important role in disseminating information and education about the region. In more recent times from the early 20th century, routes and some of the features along old railway lines were used to

provide access from inland areas to the coast. Several railways were turned into footpaths, cycleways, as well as the routes being turned into roads.

Condition And Forces For Change

Development pressure within the study area, along with the continued importance of road and rail for the local economy will continue to transform this character type. However, active waterways in the form of the recreational use of the canal system, has meant that there has been some loss of their original character. In particular, there has been a loss of associated ancillary structures such as boat yards and warehousing that would have accompanied canals and waterways. Forces for change seem to be related to changes in use because infrastructures have been replaced by new ones, or that the type of transportation has changed. Economic cuts to the railway network in the 1960s led to changes in use, and it is likely that economic forces will continue to be at the centre of change for this character type in the region.

Rarity And Vulnerability

There are few, if any, recreational re-uses of railways in the region. Many old and abandoned railway branch lines are vulnerable as they are neglected, susceptible to natural processes such as erosion. Canals although fairly common may also be subject to neglect, or infilling by natural processes, if they are not being used, or maintained. Early roads may be at risk from erosion and agriculture, as well as from more recent development.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (INTER-TIDAL)

Introduction: Defining/Distinguishing Attributes

The inter-tidal areas of this region are nationally and internationally significant, containing many rare species of wildlife. Many of areas are protected through designation. The inter-tidal areas as a group are varied in their character, comprising zones of saltmarsh, sand and mudflats, as well as sandy and shingle foreshore. In the addition, the region also contains the estuarine inter-tidal zone in the Humber. Within the region's inter-tidal there are four parts identifiable: The Wash, the Lincolnshire coast, the Humber, and Holderness. Within each area there are a number of distinguishing features.

Saltmarshes are found in several places in the region, most notably along the Lincolnshire coastline, such as at Donna Nook, and in The Wash embayment, close to the Welland Outfall. These areas also tend to coincide with military practice areas. Sand flats are also found throughout the region although good examples are located along the Lincolnshire coastline, from Gibraltar Point northwards to the mouth of the Humber. Sandy and shingle foreshores are also more commonly found north of Gibraltar Point. Mudflats are characteristic feature of the inter-tidal areas south of Gibraltar Point to The Wash embayment and edge of the Fens, as well as in the Humber. In The Wash there are extensive sandy foreshores and mudflats that form small islands and navigation hazards at low tide; for example, at Breast Sands and Peter Black Sand.

Figure 24. The inter-tidal beach area at Anderby Creek (Oscar Aldred).

Historical Processes; Components, Features And Variability

The nature and location of the landscape features included within this character type arise from the daily action and interaction of natural cycles of coastal and tidal action, in conjunction with human processes that have long affected the land types from the construction of features such as sea defences and the gradual improvement of landscapes; a process that continues into the present day. The underlying geology is a significant contributory factor to the landscape character of this region, as well as others, and the character of the inter-tidal area. For example, the Jurassic and Cretaceous rocks are contained across much of region. These are tilted gently to the east and their variable softness and hardness means they are susceptible to erosion, affecting the region's seascape character (http://www.naturalengland.org.uk/ourwork/conservation/geodiversity/default.aspx). The Humber, by contrast is a flat and low-lying area, with some small areas of higher land on both sides where the chalk ridge, that forms the Yorkshire Wolds to the north and the Lincolnshire Wolds to the south, cuts across the estuary. The large body of open water in the estuary has a high suspended sediment loads that feeds a dynamic and rapidly changing system of accreting and eroding inter-tidal and sub-tidal land types (Humber Estuary Countryside Character description). The Lincolnshire Coast and Marshes are underlain by Cretaceous chalk, with later Quaternary sand, gravel and clay deposits laid down following glacial action. Glacial tills are deposited across the Middle Marsh. Marine alluvium characterises the Outmarsh, created by higher sea levels following the last Ice Age. Areas of dune sand and marine shingle are located at Gibraltar Point and North Somercotes, both of which are important for wildlife (Lincolnshire Coast and Marshes Countryside Character Area Description).

There are two areas of active spits, moving through a combination of erosion and deposition. Holderness, and specifically Spurn Point, is a 5 km long sand and shingle spit, with dynamic mudflats and sand dunes constantly responding to coastal processes. It comprises sandy beaches on the east side, which are exposed to the action of the North Sea, while on the sheltered west side sediment has been deposited, and extensive mudflats and saltmarshes have developed. The form of the Spurn peninsula responds constantly to wave action and the deposition of sediments brought down from the Holderness coast, and tends to move westwards over time.

The estuaries and consequently the majority of inter-tidal deposits are also subject to extensive processes of change, all of which are related to dynamic coastal process.

Saltmarsh and inter-tidal mud/sandflats are found in sheltered tidal zones. Saltmarsh develops on soft sediments which are only inundated by the highest tides allowing the establishment of salt tolerant vegetation.

Development and survival of inter-tidal flats is partially dependent on human management of the estuaries and inland land uses. In the medieval and post medieval periods vast amounts of saltmarsh were converted to grazing land. The grazing land was a product of the construction of sea defences in-between areas of salterns that were subsequently drained, which led to large-scale reclamation. In more recent years the construction and maintenance of flood and erosion defences, partially to protect reclaimed land, has influenced the development and loss of inter-tidal flats and saltmarsh.

The archaeological features along the coastline of this region, specifically in the inter-tidal zone show a variety of different kinds and periods. There is archaeology all along the coastline, much of which is in danger of being destroyed. For example, along the East Riding and north Lincolnshire coast to Donna Nook, a Neolithic barrow and possible henge were found east of the flood bank on Easington beach, revealed by tidal action (Brigham *et al.* 2008, 123; Selkirk 2006). There are also numerous examples of medieval settlements being

taken by the sea (cf. Sheppard 1912) that have potentially survived in a greatly denuded form (Brigham *et al.* 2008, 197-8). There is also evidence of WWII Monuments being destroyed or situated in a precarious state in or close to, the inter-tidal area. The stretch from Donna Nook to Gibraltar Point (Jobling and Brigham 2010) is prone to erosion, although there are also areas of accretion, such as Skegness and Mablethorpe, which create a buffer. However, rising sea levels will put pressure on the sites in the inter-tidal zone, many of which are classified by the RCZAS as medieval remains associated with coastal settlements and activities such as fishing. The archaeology along the inter-tidal stretch from Gibraltar Point to The Wash is characterised by WWII defensive structures, and some other sites from the Roman period onwards (Buglass and Brigham 2007). Much of this coastline has been reclaimed in more recent times and so represents a distinctively different inter-tidal zone from that further north, say in the Humber area. However, along the whole stretch of coastline there is great potential for well-preserved buried prehistoric landscapes, with features dating from the Mesolithic to the Bronze Age, as suggested by the submerged forests at Grimsby, Mablethorpe, Sutton-on-Sea, Skegness, and potentially in The Wash embayment (Buglass and Brigham 2007, 68).

Values And Perceptions

Inter-tidal landscapes are valued for their ecological biodiversity and many areas have been given protected status as habitats for wildfowl, wading birds and other wildlife. For example, Tetney Marsh Nature Reserve, and Gibraltar Point National Nature Reserve In addition, and partly as a result of this, the inter-tidal features often become recreational and tourist attractions, especially areas with sandy foreshores, such as around the tourist destinations of Ingoldmells, Mablethorpe and Skegness. Inter-tidal areas are often Military practices areas, such as the Donna Nook area, and Gat Sand in The Wash.

In recent years the inter-tidal areas of the region have undergone systematic assessment of its heritage assets as a part of the RCZAS [rpjects, raising the specifically perceived value to the archaeological community and for the local authorities associated with them.

Research, Amenity And Education

This character type has enormous research value and educational potential. This applies to both the ecological and archaeological aspects. In particular, habitats such as vegetated shingle and inter-tidal flats attract unusual species of flora and fauna and can provide sanctuary for important bird populations.

In archaeological and historical terms the value of inter-tidal areas has recently been highlighted. Firstly the inter-tidal zone is likely to be a ‘hotspot’ for the presence of palaeolandscape components, connecting it to the Doggerland in the southern North Sea basin. This is particularly applicable to the investigation of Mesolithic landscapes. There is a high potential for finding sites around the inter-tidal areas, where shorelines were constant for hundreds or thousands of years. This is because food sources close to the open water and shores at this time would have resulted in corresponding settlement sites that are adjacent to wetlands and estuaries (Flemming 2002). This is also because the waterlogged condition of many inter-tidal deposits such as mudflats and saltmarsh encourages the survival of organic material such as wood, thereby increasing the likelihood of finding structures not found inland. Other features likely to be present in the inter-tidal zone include industrial remains such as saltworking sites, oyster cultivation pits and military structures. Sites may also become enveloped into the inter-tidal zone because of coastal changes.

Condition And Forces For Change

Inter-tidal sub-types are often dynamic areas of landscape as a result of their position in a zone which is subject to tidal inundation. There are a series of forces for change of these features, both natural and man-made. As such material is eroded from some areas of the open coast and deposited in others. This dual action is prevalent along the coastline, and can be sharply contrasted at each end. The Holderness coastline, facing the North Sea, has endured much coastal erosion, whereas The Wash is increasing in its land area. Spurn Head is a confluence in that it is both being denuded by coastal action, and accreted from sediment flowing along Humber; it therefore has a dynamic seascape. However, more positive forces for change have become significant in recent years revealing new sites, and providing greater resources for actions that preserve inter-tidal deposits and prevent erosion in a number of areas along this stretch of coast. This has been recognised by the fact that several areas in the region have been designated and given protected status.

Rarity And Vulnerability

Many of the inter-tidal areas in the region are recognised as rare or significant leading to their designation. As a result, many areas of the inter-tidal areas along the coastline are monitored and assessed on a regular basis, helping with the preservation and management of change within them. In the region there are several internationally designated areas: Humber Estuary (Ramsar, SPA, SAC); Spurn Point (NNR); Gibraltar Point (Ramsar, SPA) Dunes and Gibraltar Point (SAC); Saltfleetby – Theddlethorpe (SAC); The Wash (Ramsar, SPA, SAC, NNR); as well as several SSSIs. Furthermore, several Military practices areas are located along the coastline in the region, such as in The Wash embayment, Donna Nook and Saltfleetby.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (LANDWARD)

Introduction: Defining/Distinguishing Attributes

The landward part, proximal to the foreshore often comprise cliffs, dunes or shingle ridges, as well as saline lagoons and salt marsh and wetlands, punctuated by numerous watercourses.

There are several areas of cliff associated with the region. These are located in the northern part of the region at Withernsea and How Hill. Withernsea consists of unconsolidated till – boulder clay - that was deposited by glaciers during the ice age. The cliffs at Kilnsea - How Hill – are similar in their composition to those at Withernsea. There are four areas where there are sand dunes: Gibraltar Point, Donna Nook, Mablethorpe, and Cleethorpes. These have led to special designation. There are numerous water bodies, watercourses and wetlands in the region. Many of these are saline in composition, and several lagoons have formed or been created through the construction of flood and sea defences. For example, in the The Wash area, and Lincolnshire Marshes close to Skegness, as well as parts of the Humber estuary. These areas also have wetlands that have been reclaimed, and although they are still actively drained they can also be partially wet.

Figure 25. Dunes with houses built on top of them at Anderby Creek (Oscar Aldred).

Historical Processes; Components, Features And Variability

The landward cultural topography within the region is a product of both natural and human processes throughout history. The land is shaped both by the underlying geology, chiefly the

product of glaciations, but also through human endeavour, especially the construction of flood and sea defences that have created new environments.

In the coastal area the geology is mostly chalk from the Upper Cretaceous period which continues inland to the Lincolnshire Wolds. The chalk has been affected by successive glaciation episodes, the Devensian being the most recent where the ice sheet reached the lower slopes of the Wolds. As the ice sheet melted and retreated, eroded material suspended in the ice was deposited as till – principally boulder clay. This material was then covered by a succession of marine transgressions and has finally been subjected to extensive reclamation by alluvial material. The topography is one of low-lying land (mostly between 3–5m OD), which extends beyond the study area inland towards the Fens, where it slopes down. Sand dunes are a younger product of weathering and their form depends on location as well as drift geology.

The cliffs and sand dunes have changed their form dramatically as a result of processes of erosion and accretion along the coastline. In general, coastal erosion is an on-going problem in the region. The erosion of the cliffs is a result of weathering, and material washes from the base of the cliffs tend to be deposited. Spurn Point, however, is normally an area of accretion, although it is periodically breached, particularly during easterly storms. However, whilst the Point has at times virtually vanished, it is continually being re-established further westwards as the coast at Kilnsea retreats.

The inter-tidal estuary of the River Humber between Spurn Point and Sunk Island consists of an area of shifting patterns of erosion and deposition of alluvium and sand. The area between Grimsby and Donna Nook is also principally an area of accretion, although there is some movement of sediments and periodic erosion of the beach in the Cleethorpes area. The Wash is an area of accretion, mainly from the outwash of sediment coming from the watercourses emerging from the Fens. A lagoon at Easington, called Beacon Lagoon, is separated from the sea by a bar, which is a mobile body of sand and gravel, which is part of a barrier beach.

Human activity in this character type is the result of a delicate interaction between eroded coastal land and its accretion. Each provides opportunities but also a destructive force which influences different human agencies. For example, along the cliffs of Withernsea, numerous WWII sites are being destroyed, and settlements are being lost to the erosion of the coastal land. Sheppard (1912) has documented the extent of loss north of the Humber, along the Yorkshire coast. Many of these settlements were fishing villages, including the medieval port of Ravenser Odd, were taken by the sea during the later medieval period. Such an affect as this would have had a profound impact on the economy of the region, and its people.

The processes which have shaped some of the watercourses, their enhancement and continued use through time are intricately related to ports and commercial transport as well as inter-tidal deposits. Wetlands also tend to be associated with reclaimed areas that continue to be flooded due to their proximity to the sea or to tidal watercourses in which wetland areas are used to alleviate the event of flooding.

Values And Perceptions

There are several recreation and protection areas supported as designated RSPB areas of international significance. These intersect with Cultural topography (landward) types, such as: Frampton Marsh; Freiston Shore; Tetney Marsh; Black Toft Sands (in the Humber estuary). The wildlife in turn attracts enthusiasts who frequent the area.

While this character type is often understood as being ‘natural’ and ‘unchanged’, it is also associated with a cultural process which values the aesthetic qualities attributed to these types

of seascapes. Recreation activities dominate, especially as they are often in areas that tend to be relatively difficult to access, that have no industry.

From an historical and archaeological point of view the wetlands are associated with caches of environmental resources. Furthermore, watercourses were used for the transportation of goods and people between different parts of the country. In the East Yorkshire to The Wash region there was a well-used and developed inland water route system (see Transport) that connected the coast to inland areas. Furthermore, the cliffs were also important from a much longer view into the past, but are appreciated today because they are repositories for fossils and have evidence of possible human habitation (see the Palaeolandscape component).

Research, Amenity And Education

This character type has huge potential for research and education for the study of geology, biodiversity and history. The landscape attracts rare wildlife and flora which can be studied in its natural environment. This has been outlined above in terms of wetlands in particular, however the cliffs provide rare nesting habitat for birds such as sand martins and unusual plant colonies are found in both cliffs and sand dunes (English Nature 1997). The RSPB in particular have well-established education strategies (http://www.rspb.org.uk/ourwork/policy/education/england/lfs.aspx).

The cliffs along Withernsea and Kilnsea are valuable areas for paleontological research because of the land and sea fossils that are exposed within the cliff face. The potential educational importance of the cliffs for increasing public understanding for finds is recognised by Natural England. These kinds of seascapes are also recognised in research agendas such as in the research framework for maritime archaeology and Palaeolithic research (Ransley and Sturt 2013).

Condition And Forces For Change

One of the greatest factors of change for this character type is the effect of marine process such as erosion and accretion, as mentioned above. The average rate of cliff recession at Spurn Point is 1 to 2 metres per year. As a result of erosion some of the cliffs and sand dunes in the area are in a poor condition and many of the water bodies are threatened (http://www.bgs.ac.uk/research/climatechange/environment/coastal/coastalErosion.html).

This effect is being monitored by the scheme of Shoreline Management Plans (SMPs). These are large-scale assessment of the risks associated with coastal processes which aim to reduce these risks to people and the developed, historic and natural environments (http://www.environment-agency.gov.uk). In the region there are two SMPs: Flamborough Head to Gibraltar Point SMP3; and Gibraltar Point to Old Hunstanton SMP4.

Forces for change include the effects of sea level rise and climate change, but also more culturally engendered agents such as boat wash and pollution along the waterways, but also in the Humber estuary. The silt released from the banks collects within the channels which have to be dredged, and increases the mobility of sediment down the estuary towards its mouth. Increasing pressure for development on the coast is also a force for change in areas of landward cultural topography.

Rarity And Vulnerability

Many of the sub-types included within this character type are rare to some degree. Sand dunes are sporadic along the coastline, although significant in terms of the wildlife that they sustain, such as Gibraltar Point (NNR). The Withernsea and Kilnsea cliffs although a

common sub type around the country, are particularly notable in this region for the fossil remains which they contain.

The wetlands and water bodies within the region are particularly significant, especially in the areas along the northern strip of The Wash embayment and into the Fens around Boston and the Welland Outfall channel. Saline lagoons, such as at Beacon Lagoon, are internationally important (a primary habitat under the EU Habitats Directive) due to the small size of the existing resource which support specialist and rare invertebrates.

Many of the elements discussed within this character type are currently at risk. The majority of threats facing these sub types are related to sea level rise, in particular erosion. This threatens cliffs, sand dunes, wetlands and saline lagoons alike.

Cliff erosion is variable as discussed above but in some areas has been devastating. Many of the settlements in the area have long histories, but those close to the coast with adjacent cliffs are prone to erosion and complete loss. This is especially evident along the East Riding of Yorkshire coastline, in which 26 settlements listed in Domesday no longer exist but have been eroded by the approximately 2 miles loss of land since the Norman period. It is predicted that as the global climate changes sea level will rise further and storminess will increase leading to a consequent increase in erosion rates, leaving the cliffs, sand dunes and wetlands of this region vulnerable.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (MARINE)

Introduction: Defining/Distinguishing Attributes

The marine cultural topography in the area is linked to the substrate and drift geology of the region. The area is dominated largely consistent areas of homogenous cover of underlying geology. For example there is a chalk area in the area north of a mudstone and tuff strip which roughly corresponds to a palaeo-channel. South of the mudstone and tuff strip is a mudstone, sandstone and tuff area. The superficial geology comprises sand, gravel with pockets of mud. There are a variety of small and large-scale bedforms, including sandbanks, sub-marine dunes and sand patches. These bedforms can be dangerous for mariners if not avoided. Deposits can vary widely, particularly in the Humber estuary and The Wash.

Historical Processes; Components, Features And Variability

The marine cultural topography of the region is largely a product of natural processes, although there are some cultural links with them in terms of how they are perceived and used as a type. The seabed has been (and is) shaped by the interaction of underlying geology and marine erosion and deposition processes. However, the survival of these features is dependent on both natural and human processes. For example, there has been increased human activity in these areas from aggregate extraction and offshore developments such as hydrocarbon extraction, and more recently the development of offshore wind farms. To a lesser extent, although relatively significant across the region, are fishing practices which will disturb cultural topography features because of bottom trawling. This is especially over sandbanks which tend also to be good fishing grounds.

There is a growing body of evidence for submerged palaeolandscapes that have been acquired because of marine industrial processes such as aggregate dredging and trawling. Research in dredging area 240, for example, was catalysed by the 2008 discovery of 75 Palaeolithic artefacts including hand axes, flakes and cores and bones including woolly mammoth, bison and reindeer in stockpiles of gravel (*North Sea Prehistory Research and Management Framework* (NSPRMF) 2009). Mesolithic artefacts have also been dredged up offshore, including numerous artefacts from Brown Bank and Dogger Bank (see Palaeolandscape component). Subsequent to the Mesolithic/Neolithic transition (i.e. from c. 6000BP) the area was inundated and therefore unoccupied.

Values And Perceptions

The biodiversity of the marine cultural topography, especially where it relates to fish stocks forms a component of the highly valued fishing heritage of the region. The high diversity of substrates, including fine and coarse sands and variation in degree of exposure has created a higher degree of biodiversity, particularly around The Wash and in the area called Silver Pit (the area immediately south of Dogger Bank). The Marine cultural topography also has high archaeological potential, and can contribute to our understanding of past landscape use, as demonstrated by the NSPRMF and the North Sea Palaeolandscapes Project by Birmingham University (Gaffney *et al.* 2007).

Marine features are not likely to feature in the general psyche of those onshore. However they are extremely important to sea users, and as points of reference which are marked on sea

charts. Furthermore, these areas can be dangerous particularly when netting snags on sandbanks or other features.

Research, Amenity And Education

The research, amenity and educative value of the resource include academic research, as well as public education and enjoyment. Research potential includes areas of maritime archaeological potential, defined as areas where high potential for shipwreck losses coincide with areas of high preservation potential. Palaeo-valleys such as the Humber estuary, which contains peat shelves with a high degree of archaeological potential (Van de Noort and Fletcher 2000), are also areas with high research potential. Techniques that are used to reconstruct submerged and buried landscapes, such as geophysical, geomorphological and sedimentological investigation of offshore river systems, allow areas of archaeological potential to be better understood. This contributes to the emerging field of submerged prehistoric archaeology.

Amenity and educative value also include geological and oceanographic perspectives, as well as the study of how marine industries such as aggregate extraction interact with the natural environment.

Condition And Forces For Change

The major forces for change of this character type tend to be 'natural' processes such as sediment deposition and current. The activities of animal species such as fish and birds may also affect the environment, but have comparatively little impact compared to 'natural' processes. It is also likely that these processes, particularly rising sea levels and climate change are partly created by humans. However, geological features are also added to and under pressure from offshore development activities. Conditions and forces for change also include industrial processes such as trawling (commercial fishing), dredging for aggregates, hydrocarbon development, along with the transport of raw materials and consumer goods. The dredging of channels for large ships and military activities, which are also important for maintaining access, also have a large impact on the local marine environments.

Rarity And Vulnerability

The marine cultural topography is under pressure natural and culturally induced processes such as erosion, sea-level rise and global warming. Ecosystems are under pressure from human activities such as trawling and offshore developments (wind farms, aggregate extraction). These activities as well as the movement of water and sediments could damage the prehistoric and historic features.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: CULTURAL TOPOGRAPHY

CHARACTER TYPE: CULTURAL TOPOGRAPHY (PALAEOLANDSCAPE COMPONENT)

Introduction: Defining/Distinguishing Attributes

The palaeolandscape component is found within the East Yorkshire to The Wash region as palaeochannels and prehistoric land surfaces, in the inshore/offshore marine area (http://archaeologydataservice.ac.uk/archives/view/nspp_eh_2011/). Such features date from the Lower Palaeolithic through to the Neolithic in places, spanning a time period of c. 950,000 years. Elements of palaeolandscape occur in coastal land, inter-tidal and marine zones as a result of the complex series of processes. In brief, the occupation of the region, and more generally what we now know as the British Isles, began in a period when Britain was still part of the European mainland and the North Sea was dry land (Reid 1913; Coles and Coles 1998; Coles 2000; Gaffney *et al.* 2007). As a result the entire region - onshore and offshore - has the potential to contain prehistoric remains and landscapes. Much of the area is continuously submerged, for instance the North Sea. Some areas are periodically exposedby natural processes such as in inter-tidal areas where there are stratified deposits beneath sand flats. Actions such as dredging, trawling and hydrocarbon development can also reveal the presence of a palaeolandscape in the marine area.

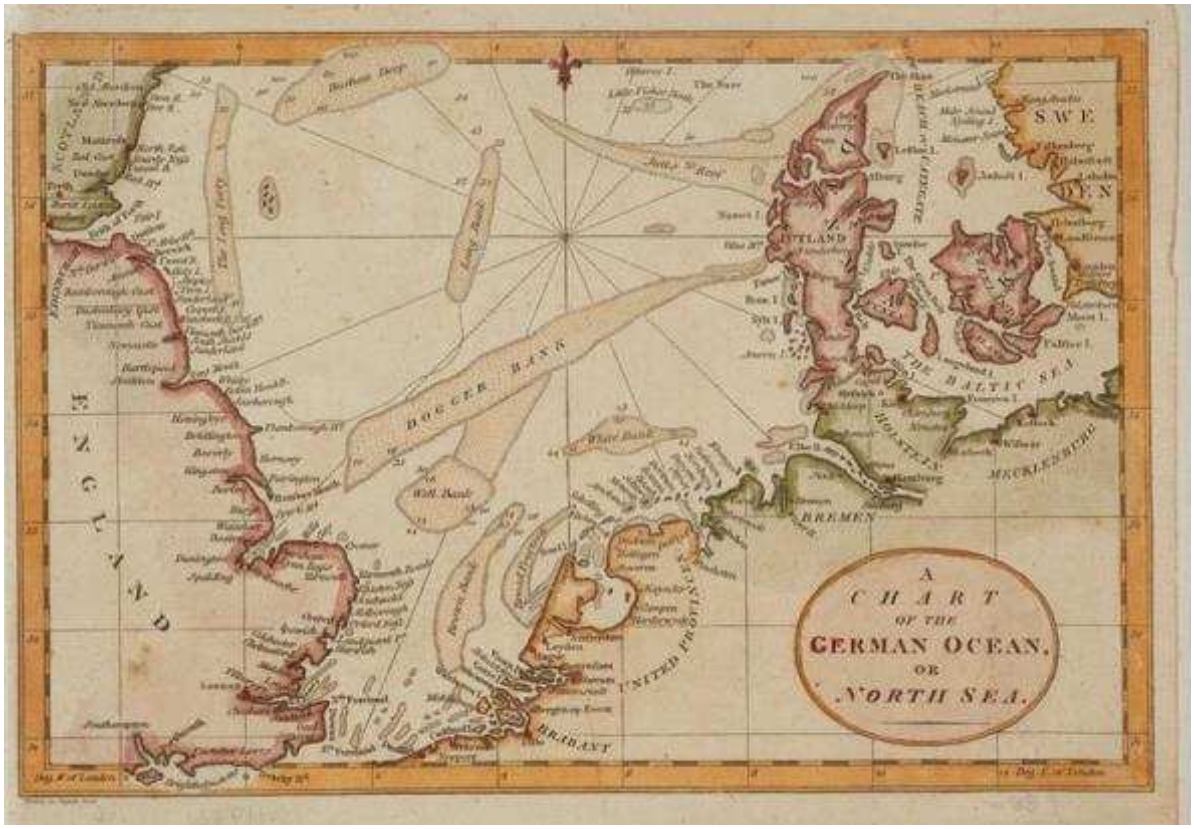

Figure 26. Chart of North Sea/German Ocean showing cultural topography – Dogger. Published London c. 1790.

http://alteagallery.com. Accessed 15/7/2013.

In addition to these known deposits there is considerable potential for further palaeolandscape components within the region and a series of 'hotspots' have been identified by Flemming (2002, 7). These include the fossilised river valleys and cliff coasts discussed above, as well as estuaries, wetlands, mudflats, and peat deposits, found all along the coastline of this region. These hotspots are particularly relevant to Mesolithic landscapes and some work has been conducted already – albeit in a limited form – within the area most affected and exposed; for example Dogger Bank (Gaffney *et al.* 2007).

Historical Processes; Components, Features And Variability

The presence of submerged and buried palaeolandscapes in offshore and coastal areas of East Anglia is the result of a complex series of past sea level changes and subsequent palaeo-geographic variations. This is intricately connected to the cycles of glacial and interglacial which characterised the period from the earliest known occupation of Britain through to the present.

Although the earliest known occupation of Britain is represented by discoveries at Happisburgh, Norfolk, and Pakefield, Suffolk, in the East Anglian region, there are several potential sites within the East Yorkshire to The Wash region. The cliffs at Withernsea and Kilnsea have the potential to reveal new information about the Lower Palaeolithic, as does the Humber, at places such as at Easington. Other areas include the coastline that has submerged forests such as Grimsby, Mablethorpe, Sutton-on-Sea, Skegness, and potentially in The Wash embayment (Buglass and Brigham 2007, 68; (Ransley and Sturt 2013, 20-2). The finds at the sites in the East Anglian region push back the proposed earliest known date of human occupation in Britain, and consequently in Northwest Europe, some 200,000 years to 700,000 BP (Wessex Archaeology 2008b, 2). Latest excavation reports suggest that the date may be pushed even further back to c. 950,000BP (http://www.ahobproject.org/Happisburgh.php). At this time the southern North Sea was infilled by a massive delta created by sediment from several major rivers (Gibbard 1995) when Britain was a peninsula. The exposures comprised extensive series of fluvial and related sediments that extend beneath the North Sea. For example, those places in the sea that have been referred to by fishermen (cf. Albert Close's Fishman Chart): Silver Pit (an extensive channel); Sand Hole; Inner Dowsing; Outer Dowsing; Sole pit; Well Hole; Markham's Channel.

The series of glacial and interglacial periods which followed resulted in periodic abandonment and re-occupation of Britain. This was partly a result of the extreme cold and partly of the enormous changes which accompanied the climatic upheaval. The melting and freezing cycles resulted in sometime large and rapid fluctuations in sea level resulting in varying exposure of land in what is now the North Sea basin. The release and storage of water in glaciers (glacio-eustasy) was further complicated by the rise and fall of the earth's surface with the weight and release of the ice sheets (isostasy), leading to complex geological changes.

By the time of the Last Glacial Maximum (LGM; c. 20,000 BP) an ice sheet extended across the British Isles as far south as Norfolk, resulting in large-scale exposure of the continental shelf. As the ice sheet melted the study area underwent a long period of sea-level rise, steady at first but leading to a rapid rise from c. 15,000 BP.

Overall, the transformation of the North Sea area was complicated during this period. Research indicates that areas of the southern North Sea, especially Dogger Bank (Coles 1998), was exposed and inhabitable at different times, reaching a situation similar to the current day by 6000 BP (Shennan *et al.* 2000). As a result of the preference for estuarine and marine locations during the Mesolithic suggests a high potential for submerged landscapes of

this period beneath the current sea bed and around the present coastline. This is also supported by finds from fishing on the Dogger and Brown Banks, as well as the recent work off Great Yarmouth (Wessex Archaeology 2008a). The former would have been islands, periodically cut off from the mainland but rich in resources at various times in the Mesolithic. Following this period of transgression and maritime exploitation, prehistoric settlements generally moved away from the coastline, seeking inland areas.

In spite of this, Mesolithic implements have been recovered offshore; numerous artefacts have been dredged up by fishermen north of the region, particularly around Dogger Bank, as well as other areas outside the region such as Brown Bank and Eurogeul. Mesolithic sites were often adjacent to wetlands and estuaries. There is a high potential for archaeological sites around the coastlines and rivers. The coastline was at its present line by around 8000 BP. Although it has been subject to gradual coastal erosion, the potential for prehistoric remains as far back as the Mesolithic in this zone is high.

Values And Perceptions

At present the public perception of submerged landscapes in the region is minimal and little value is placed on this remarkable resource from a wider perspective, although some relevant work was carried out by Natural England in their 'Undersea Landscapes' campaign of 2008-9. This is currently changing due to growing interest in submerged landscapes fuelled by the media and popular culture.

There is also a developing interest in palaeolandscapes within certain sectors. 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. This is reflected in publications such as Wessex Archaeology's 'Dredged Up from the Past' Newsletter which reports on the finds from the reporting protocol, and in the need for better strategy and direction on palaeolandscape research (e.g. Flemming 2002; *North Sea Prehistory Research and Management Framework* (NSPRMF) 2009; Ransley and Sturt 2013, 10-49).

Submerged landscapes are becoming ever more recognised and valued within the archaeological community. However, despite this concerning submerged terrestrial landscapes, this mainly remains the preserve of maritime archaeologists and a handful of prehistoric specialists. The wealth of the evidence within this region is however well recognised within this community, and it is anticipated that results of on-going work will help to raise the profile of this valuable resource.

Research, Amenity And Education

The palaeolandscapes of the southern North Sea may be crucial to our understanding of human development and periods of prehistory for which we have little evidence. Buried as well as submerged landscapes have a high potential for making strong contributions to our knowledge as a result of being protected from erosion or human intervention.

Historically, submerged landscapes have had a low profile within the wider population and the archaeological community. However, their possible extents and significance have increasingly been recognised and work has begun to address this. Nationally important projects and publications include Southampton University's 'Reassessment of the Archaeological Potential of Continental Shelves' (Dix *et al.* 2004) and Birmingham University's 'North Sea Palaeolandscape Project,' (Gaffney *et al.* 2007) are now being extended to other areas. The North Sea Palaeolandscape Project has mapped extensive

features from geophysics and borehole data, producing its own characterisation of the topography under the sea floor. These features include areas of depression, interpreted as lakes, channels and 'island' clusters at 10,000 BP. These activities and the importance of understanding the submerged landscapes from new technologies make this one of the key research activities in understanding the early Holocene/Mesolithic period (Ransley and Sturt 2013, 42-3).

Such geophysical and geotechnical methods have been established as excellent techniques to investigate this resource which is often inaccessible, although they can be expensive. However, a great deal of work still needs to be undertaken in this field: accurate maps of past shoreline locations and a definitive reconstruction of past sea level change and palaeo-geography are not currently available. The reasons for this are numerous, complicated by the fact that it is difficult to obtain complimentary sea level curves. The lack of knowledge about past land surfaces also means that modern bathymetry has to be used in reconstructions, despite many pitfalls and potential flaws in attempts to relate marine bathymetry to past topography. It is anticipated that on-going work will help to rectify this situation.

The potential data which may be obtained through further research is likely to be of national and international significance, both for the archaeological community and the wider population. Detailed reconstructions may help us to understand our past and provide an excellent multi-purpose educational tool.

Condition And Forces For Change

The overall condition and extent of palaeolandscape within the region is currently unknown. Research indicates a remarkable state of preservation in some places; although these would benefit from further assessment (Ransley and Sturt 2013, 23). In the coastal zone survival has been shown to be irregular and this may be exacerbated by on-going erosion and wave action. However, it is these coastal processes that are revealing more and more material about the palaeolandscape that allows further assessment to be made. Research was being conducted through the Regional Environmental Characterisation (REC) projects, with the aim to 'acquire data of the highest quality and detail possible; to enable broad scale characterisation of the seabed habitats, their biological communities and potential historic environment assets within the regions' (http://www.alsf-mepf.org.uk/projects/rec-projects.aspx). The region was covered the Humber REC (http://www.cefas.defra.gov.uk/alsf/projects/natural-seabed-resources/rec-0803.aspx).

The condition of the resource is affected by conflicting influences. This area of coastline and offshore seabed is under increasing pressure from development and industry. This includes potentially damaging activities such as aggregate dredging, trawling and large developments both onshore and offshore such as recreation and harbour improvements.

In contrast, a number of other influences are changing our understanding of the resource in a positive manner. This was most clearly exemplified by the large amount of research being funded by the ALSF. The REC study area was a crucial resource for aggregate developers with large licensed areas. Overarching academic research is also adding to this.

Rarity And Vulnerability

Palaeolandscapes are rare survivals, both in the UK further afield. The palaeolandscape components in this region have a national and international significance for a number of reasons.

The vulnerability of the resource is demonstrated and not supported by our understanding of it. Some basic questions still need to be asked and answered concerning the full extent of the material and the conditions of the asset.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: ENCLOSED LAND

CHARACTER TYPE: RECLAIMED LAND

Introduction: Defining/Distinguishing Attributes

Large areas of reclaimed land survive in the East Yorkshire to The Wash region. Areas of low-lying topography in the region have been subjected to marine inundation in the past. Of particular note are the extensive areas of the Fens around The Wash, in Cambridgeshire and the Lincolnshire Marshes, but also in wetland areas close to the Humber. All three areas have at various times been reclaimed wetlands, as well as tidal marshes, which were created through geomorphic processes derived from retreating ice and marine transgression.

Reclaimed land takes several forms, such as drainage ditches and boundaries that are associated with past flood and sea defences, and features such as wind pumps and turbary cuttings.

Figure 27. Lincolnshire fens – reclaimed land at Scrane End, near Boston – a view from the sea bank.

Historical Processes; Components, Features And Variability

Large scale reclamation of coastal wetlands in the region is said to have been started in the Roman period. There are areas of small scale reclamation by the Romans but these were probably a result of the construction of features such as Car Dyke, or Fossdyke, rather than a deliberate attempt to reclaim large areas of wetland in the Fens. The Sea Bank is often described on the OS mapping as the 'Roman' Bank and was a sea defence. However, where it has been excavated early medieval dates have often been returned. It is likely that the Roman bank actually marks the coastal limit during the Anglo-Saxon period rather than the one in Roman period, although Roman salterns that were incorporated into the bank construction during the early medieval period, suggest that there may have been small-scale localised reclamation.

Reclamation increased in scale in the 12th and 13th centuries as the wealth and prosperity of the region grew with the burgeoning textile industry, although rising sea levels also resulted in the need to defend land from flooding that had previously been reclaimed enclosed land. For example, the Climatic Research Unit has suggested that there were 58 weather events recorded between 1307 to 1500, and 42 of these were storms or floods (Hinman and Popescu 2012, 4). Besides this hindrance, reclamation continued during the medieval period as piecemeal and small scale drainage schemes. Land was reclaimed for both grazing marsh and arable purposes. In these new fields dykes were used to drain but also acted as fences dividing the property, as well as providing drinking water for grazing stock. Dutch specialists were probably employed in these drainage schemes, often lending their names to dykes and canals. These medieval reclamations are often recognisable today as the original pattern of the saltmarsh was retained as serpentine dykes. Reclamation accelerated in the late medieval/early post medieval period, under the direction of religious houses, such as Sempringham monastery and Spalding monastery.

In 1585 the General Drainage Act was introduced into parliament, allowing large landowners to overrule local proprietors and suppress common rights that obstructed the path of drainage schemes (Williamson 2006, 202). This had a profound effect on enclosure in many parts of the country where wetland was present, such as in the Fens, Lincolnshire Marshes and Humber wetlands. In particular a large scheme was sanctioned in the 1630s to drain the Fens of West Norfolk, Cambridgeshire, as well as Lincolnshire. For example, a series of canals were dug under the direction of Dutchman Cornelius Vermuyden. Hatfield Chase in the Isle of Axholme, was drained in 1628, and the River Goole redirected in the 1630s. In the 1650s Vermuyden attended to the second phase of the draining of the Fens which included initiatives such as allowing areas of land to flood in periods of bad weather, to absorb the extra water that could not drain to the sea. He also proposed a catch drain around the eastern edge of the fen, although this was not implemented until the 20th century (http://en.wikipedia.org/wiki/Cornelius_Vermuyden).

Reclamation of coastal marsh continued into the 18th century but slowed, partly because large areas were already enclosed. Reclamation began again in earnest in the later part of the 18th century as the population rose and when there was a demand for cultivatable and grazing land and the investment to implement drainage schemes. At this time a series of parliamentary enclosure acts allowed the conversion of common wetland into private property which consequently led to the enclosure of almost all remaining areas of wetland common such as South Holland in the Fens.

Associated with the draining of wetland and reclamation processes, were features such as wind pumps or drainage mills. Drained land had begun to deteriorate as early as the end of the 17th century. This resulted in the introduction of wind pumps or drainage mills. Drainage was improved by the arrival of the steam pump in the mid-19th century, although they didn't replace the ubiquitous windmills until the 20th century. Steam pumps were ultimately replaced by electric pumps. The 20th century saw some dramatic changes to reclaimed land. Much drained land was progressively abandoned in the earlier half of the 20th century, with the reversion back into wetland. The second half of the 20th century saw a reversal of fortunes and much of the remaining grazing marsh was converted to arable. Drainage served to alleviate potential flooding, as well as to increase arable production. This occurred after the floods in 1953 (http://en.wikipedia.org/wiki/North_Sea_flood_of_1953) which inundated much reclaimed land in the coastal parts of East Yorkshire to The Wash, such as Mablethorpe (http://www.britishpathe.com/video/lincolnshire-flooding). Subsequently sea walls were raised and pumps widely installed, transforming the landscape once again. Further transformation is occurring with examples of 'managed realignment' being implement. For instance, there is a project to deliberately flood land at the former North Sea Camp (near Boston, Lincolnshire) by breaching the tidal embankments.

Values And Perceptions

Reclamation has dramatically shaped the coastal landscape in this region as we know it, although this aspect of human influence can often be overlooked. In some cases reclaimed land has been assigned great cultural and historical value in the East Yorkshire to The Wash region. Drained marsh is the dominant land cover in the Fens, the Lincolnshire Marshes and in parts of the Humber. Dykes and existing drainage mills can be hundreds of years old and are distinctive features of the region's character. Reclaimed grazing marsh is also an important habitat for breeding waders and wildfowl. The transition from brackish to fresh water within dykes also provides a great deal of environmental interest.

Research, Amenity And Education

Reclaimed land has proved a great amenity in the past, providing extra fertile land at times when it was much needed. It continues to be an important element of the modern day agricultural industry. There has been much research into the history of reclaimed land, for example in the draining of the Fens (e.g. Darby 1956, 1940). However archaeological discoveries continue to add to our knowledge of the Fen landscape and the longer-term histories of land use. There is a great deal of potential for using reclaimed land in an educational context. This particular landscape type brings together examples of sustainability and loss. It leaves visible historical depth in the landscape and involves economics and engineering.

Condition And Forces For Change

One of the main forces for change of this character type is the changing climate. In particular rising sea levels and erosion in this area are leading to further loss of reclaimed land and its reversion back to wetland or into tidal land, or even saltmarsh, which in contemporary parlance is called managed realignment and rewetting.

The intensification of agriculture continues to have an impact on land use, with much grazing marsh abandoned in favour of ploughing for arable or vegetable production. Similarly development pressure means that land use can change from agricultural altogether.

Rarity And Vulnerability

Coastal grazing marsh is becoming rare with c. 300,000 ha in the entire UK. Reclaimed land and particularly grazing marsh is exceptionally vulnerable to processes of climate change. The government is attempting to deal with rising sea levels via the creation of certain management strategies, identified through processes such as Shoreline Management Plans (SMPs), implementing 'managed realignment'. The archaeological evidence of reclamation in features such as embankments and sea walls, is also vulnerable to rising sea levels and plough damage.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

CHARACTER TYPE: AQUACULTURE

Introduction: Defining/Distinguishing Attributes

Overall approximately 30% of cultivated shellfish from the UK come from East Yorkshire and The Wash (http://en.wikipedia.org/wiki/Shellfish_Association_of_Great_Britain), withi much of it coming from The Wash. Several other areas are also sourced along the East Lincolnshire coast, such as at Freiston Shore. The species cultivated in this area are generally oysters and mussels. Shellfish farming is the only type of aquaculture currently undertaken in the coastal and offshore region, although much freshwater fish farming occurs inland.

Figure 28. Cockling in The Wash.

Historical Processes; Components, Features And Variability

Historical examples of shellfish cultivation, mostly in the form of oyster pits, have been found all along the coastline of the study area. Most are square or rectangular and cut into saltmarsh, ranging from 2 m square to over 70 m long but can vary from banked to unbanked,

planned or chaotic. Such features are notoriously difficult to date. However it is likely that most known examples are medieval or post medieval based on their position in relation to sea walls and therefore to dates of reclamation.

Shellfish were certainly commercially farmed in areas of The Wash, East Lincolnshire coast (south of Gibraltar Point) and some in the Humber. In general, native oysters are present all along England's coastline. Recent projects such as the Rapid Coastal Zone Assessment Surveys (RCZAS) and National Mapping Programme (NMP) have frequently identified these features in Lincolnshire and in the Humber. Relict oyster pits are evident in The Wash embayment, as well as further north towards Wrangle (Jobling and Brigham 2010), in areas now reclaimed but that were inter-tidal in the medieval period.

In the past European flat oyster (Ostrea edulis L.) was cultivated however these declined in the 20th century due to overfishing, disease and other factors such as changes in the practices of reclamation. For example, many people were employed by oyster farming in Cleethorpes during the mid-19th century but this is an industry that no longer exists. The European flat oyster was replaced with imported American oysters (Crassostrea Virginica (Gmelin)) and Portuguese oysters (Crassostrea angulata (Lamarck)) half grown and relaid for a season. American imports ceased in 1939 and, as a result of disease in the 1960s and 1970s, import of Portuguese oysters was banned. Research at this time concluded that Pacific Oysters could be successfully cultivated and this species was subsequently planted.

Values And Perceptions

Modern aquaculture is increasingly coming to the attention to the wider general public because of its concern as a sustainable practice. Therefore, modern perceptions of aquaculture are often related to the destruction of the fish resource and the seabed. Aquaculture is far more common in The Wash area. The archaeological presence of aquaculture in the estuaries, and from the relict pits in areas of now reclaimed land suggests that aquaculture was more prolific in the past. The effects relating to the changing dynamic of the coastline and the changes made so as to ensure the protection of one area from flooding includes altering shellfish cultivation. An example can be found in the former farm that now lies isolated in the inter-tidal area of Freiston Shore.

Research, Amenity And Education

There is scope to investigate the relict oyster pits of the region many of which were identified during the recent NMP and RCZA projects. In the past it is clear that large scale shellfish cultivation was undertaken in the region and it may be possible to reconstruct the history of this industry. Shellfish as a whole are important to the region as a tourist amenity, supplied by small vendors in coastal resorts. It is very often these smaller industries which are suppliers of cultivated shellfish. Aquaculture can also have educational value in terms of making the public aware of sustainable approaches to fish farming, and the dangers of over farming.

Condition And Forces For Change

Aquaculture in this region primarily comprises shellfish farming. The industry appears to be relatively successful and is a sustainable way of producing shellfish for consumption. This is crucial in terms of the recent problems with over fishing and the quota system in the North Sea.

Shellfish cultivation has very little impact on the surrounding environment and can have a positive impact on decreasing stocks. It is affected by the state of shellfish stocks in the North Sea and is also affected by the Marine and Coastal Access Act, in particular through the

replacement of Sea Fisheries Committees (SFCs) with lnshore Fisheries and Conservation Authorities (IFCAs) from April 2011.

Rarity And Vulnerability

Aquaculture is generally expressed through the husbandry of natural shellfish stocks and is closely tied in to the collection of natural shellfish resources. Aquaculture, therefore, is also vulnerable to the same forces which affect the collection of shellfish resources that is overexploitation and climate change.

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 input to these future trends.

Although shellfish cultivation in this area is not prolific it is surviving well and is not rare in a national sense. It is a low impact activity and is not likely to be easily affected by many changes, and as such is not particularly vulnerable. However on a wider scale the shellfish industry as a whole is vulnerable in the same way as all the local fisheries as stocks deplete. Shellfish are also particularly vulnerable to water pollution along the coast and in estuaries from sewage discharges and from fertiliser and nitrate leaks and run-off from agriculture.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: FISHING

CHARACTER TYPE: FISHING

Introduction: Defining/Distinguishing Attributes

The North Sea has always been important for its commercial fish stocks and resulting industry both in the past and today. Overall the North Sea holds c. 150 species of fish, 15-20 of which are of commercial value. The fishing industry in this region is dominated by boats based in Grimsby, with 134 registered vessels fishing in offshore waters (MMO 2011) but which have a potential capacity of 18,507 Tonnes; the third largest in the UK. In addition a series of small fleets operate from ports and beaches along the coastline. Fishing activity occurs in the Humber, especially on the south side of the River, at Spurn Point, Hull, and South Ferriby to Immingham although this is now declining. At these places local potting and fishing takes place, as well as offshore fishing, alongside recreational angling (CEFAS 2002, 20). Along the north-east coast of Lincolnshire finfish provide the mainstay, although there are very few safe anchorages. Consequently, small boats tend to operate to trawl and longline, and using drift nets, exploiting seasonal varieties in the fisheries. Shellfish, as well as herring and sprats are the mainstay for The Wash area, with bait diggers and shellfish gatherers operating in the inter-tidal waters (CEFAS 2002, 22). However, fishing in this region is usually undertaken on a daily basis, rather than extended periods at sea, therefore fishing grounds are often within 6-12 nm of the shore (Sturt *et al.* 2009, 93; CEFAS 2002, 22).

Figure 29. The Ross Tiger, docked at the National Fishing Heritage Centre, Grimsby (Oscar Aldred).

Historical Processes; Components, Features And Variability

There is not much known about Prehistoric or Roman fishing activities in the region, except where well-preserved remains are found like netting and boats, such as in the Humber wetlands and The Wash embayment. In contrast to the paucity of evidence in these earlier periods, from the medieval period onwards fishing became a major and well-documented industry.

There is scant evidence for fishing along the Lincolnshire coast in the early medieval period, although there appears to have been plenty of small settlements and hamlets from this period on sand banks within the wetland areas which would have had good access to the sea. There was clearly interaction between land and sea during this period. At Fishtoft, near Boston, and at Gosberton there were a number of settlements that were permanently occupied in a saltmarsh environment (Crowson *et al.* 2005; Cope-Faulkner 2012; Ransley and Sturt 2013, 122). A possible fish trap at Cleethorpes, of uncertain date, was visible as a structure on aerial photographs taken in 2002. The site comprised a linear stone bank which forms an arc around the area to its north (NMR hob_id 1433269).

The fishing industry became central to the economy of the region during the later medieval period, principally because of the herring fishery. The herring fishery was evident in the 10th and 11th century, and although this has fluctuated over time, it continued to persist as an industry until the early 20th century. The herring fishery led to Grimsby's elevated status in 1201 when it was conferred a Royal Charter by King John, partly as a result to raise taxes from the herring. Herring migrates every autumn in vast shoals off the coast in the North Sea, and is one of the most important pelagic species in several North Atlantic ecosystems. However, stocks have fluctuated enormously in the past in response to both natural variations in the environment and the intensities of human exploitation. Exploitation is partly due to its abundant character, so it is often caught. The mature herring has largely withdrawn from the eastern half of the North Sea and is found in a westerly band running from the Southern Bight to the northern North Sea. After spending their first few years in coastal nurseries, two-year-old herring move offshore into deeper waters, eventually joining the adult population in the feeding and spawning migrations to the western areas of the North Sea. These migration patterns, developed as juveniles, are generally regarded as being relatively constant over periods of several years despite environmental variation. It was fished all along the coastline. The lack of natural coastal harbours in the central stretch of the region, meant that there were many smaller fishing fleets coming from just a few set places, such as Grimsby, Hull in the Humber, and in The Wash embayment at Boston, as well as a few other places. However, in the region it was the development of the fishing industry at Grimsby that was significant, not only for herring but also for the exploitation of other fisheries.

In the 15th century fishermen entered into the Icelandic cod fishing industry, possibly partially due to Dutch interest in the herring fishery (Jones 2006, 6). This was also to become a major industry following the Anglo-Danish treaty of 1490, which eased restrictions on fishing. This industry declined during the 1530s as a result of politics, and by the 1550s the fleet was greatly reduced. Full recovery in the Icelandic fishery was not seen until the early 17th century: in 1614 125 ships sailed and in 1628 160 ships were recorded as being 'ready to sail' (Jones 2006, 5). The industry was rocked by the Civil War but built itself up again until its complete decline by the 18th century, mainly due to a large tax on salt, which was needed to preserve the fish. Significantly ships sailed to Iceland in March, returning in August or early September, thereafter herring fishing continued on some scale during September-December. (http://www.maritimeheritageeast.org.uk/).

The region's fishing industry, like other parts, began to centralise as it exploited inshore fisheries. In the 19th and 20th centuries small local fleets declined. This may have been because of the development of other fishing towns, such as Grimsby which grew rapidly after the construction of the Royal Dock in 1852. This coincided also with the implementation of the railway infrastructure, allowing the transportation of fresh North Sea produce to London in a matter of hours after catching. It also coincided with the use of steam as opposed to sail vessels. By the end of the 19th century and the beginning of the 20th century, the majority of ships trawling were steam. As a direct effect of these initiatives, the population of Grimsby grew from 1,500 in 1801 to 78,198 people in 1901. Although the industry was badly damaged by both World Wars and by fluctuating fish stocks, in general, landings increased after WWII to a peak of over 1 million tonnes in 1965. Distant water catch peaked in 1956 at 8.5 million tonnes. This may have been because the fishing had become more industrialised and ranged wider afield than the North Sea, leading possibly to the 'cod wars' in which Grimsby took on Icelandic fishing fleet.

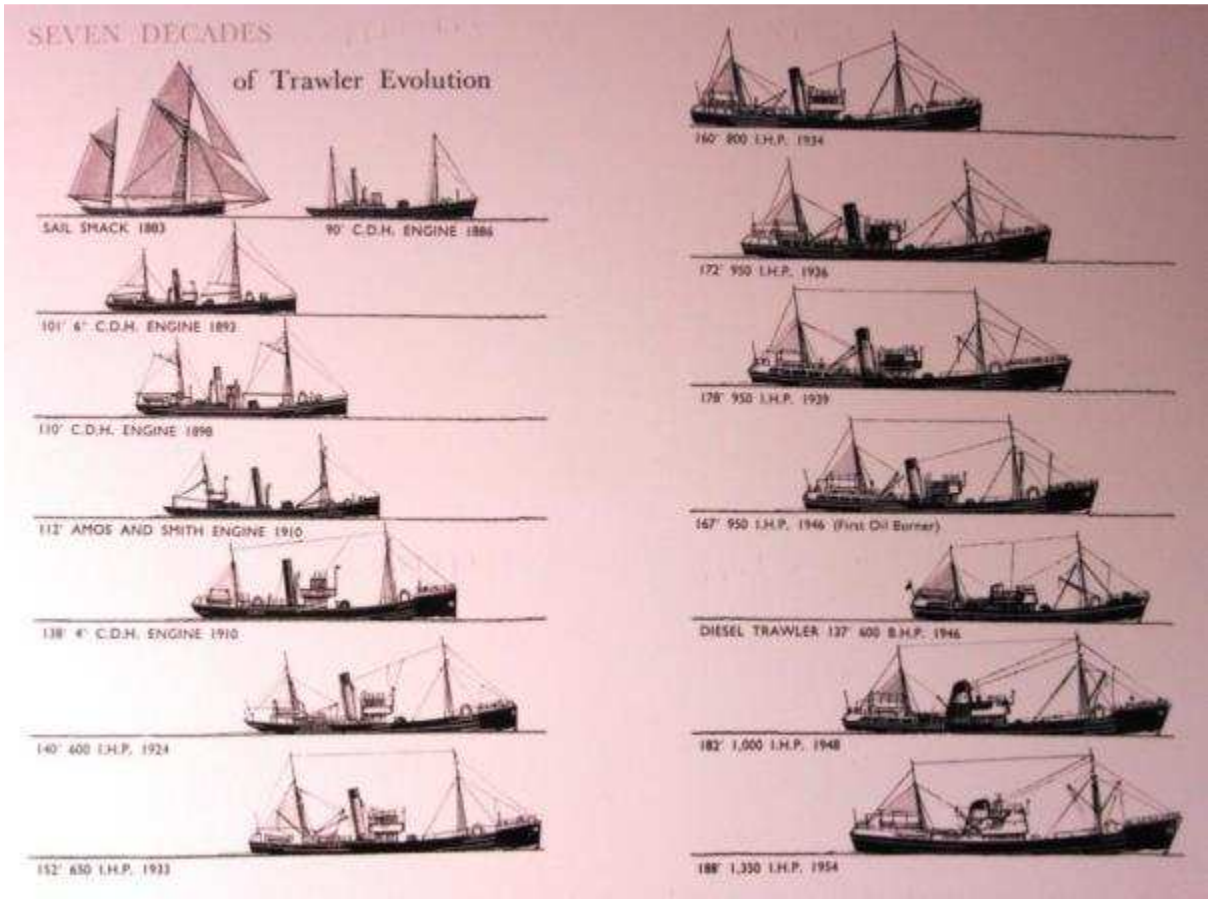

Figure 30. Seven decades of fishing trawler evolution – at the National Fishing Heritage Centre, Grimsby (Oscar Aldred).

Values And Perceptions

Commercial fishing has long been important to this region and the industry remains a distinctive element of its seascape character. At sea drift net fishing for herring remains the most characteristic operation type although it is significantly smaller than in previous centuries. Not many fishing boats remain on the beaches along the coastline, although some have now been abandoned as the industry struggles. Fishing rights are still paramount amongst the local communities and the opposition to EU quotas is on-going. The 'cod wars'

are well documented and continue to be an area of contestation in the generation of histories, especially at the National Fishing Heritage Centre, Grimsby (http://www.nelincs.gov.uk/resident/museums-and-heritage/fishing-heritage-centre/).
Generally fishing fleets today have distinct fishing grounds, predominantly within 12 nm of their home port. As such the local fishermen from each area know their fishing areas intimately. From a recreational point of view the traditional fishing industry has now taken on an almost 'quaint' character, a memory of better days. Tourists are attracted to the deteriorating boats and the few traditional fishermen who sail regularly, as a bygone industry. Freshly caught fish remains one of the draws for holidaymakers all along the coast.

Research, Amenity And Education
The fishing industry has a great deal of research potential, particularly for the historic environment. Archaeologically, fishermen have long been bringing up (and reporting) objects of interest in the wider region. This includes artefacts relating to the drowned landscapes of the North Sea Basin (see Palaeolandscape) such as the bones and tools from around Brown Bank (Louwe Kooijmans 1970-1). Fishing can also reveal more recent artefacts lost at sea such as cargoes. Significantly net fastenings - objects upon which fishing nets snag - have long been a relatively reliable form of identifying wreck locations.

The success of the BMAPA/English Heritage 'Protocol for Reporting Finds of Archaeological Interest' (see Extractive Industry), shows how heritage and industry initiatives can be successfully applied and it would be valuable to implement a similar scheme for the fishing industry. Any such scheme could be based upon an equivalent Dutch scheme which has seen fishing vessels report and land their trawled mammoth, woolly rhino, etc., bone at their ports - currently at a rate averaging 10 tonnes per annum.

Historically, the declining fishing industry is crucial to the current character of the area and is remembered in a number of ways along the coastline. In particular, a number of small, local maritime museums tell the story of the great herring and Icelandic fisheries which were so important to the area. This is particularly true in the areas where the industries were central to economies, such as Grimsby. Another educational aspect of fishing is the current ecological focus into which research is on-going. This includes presenting information about over-fishing and overexploitation and therefore about the sustainability of fish stocks for future generations.

Condition And Forces For Change
The fishing industry in this region has been undergoing dramatic change since the 19th century, transformed from a thriving economic mainstay to a small economic force in the region. There are a number of reasons for this steep and on-going decline including over-fishing and more natural factors affecting the fish stocks in the North Sea, as well as economic and political forces. The efficiency of modern fishing methods has resulted in the reduction of many fish stocks including herring and cod that were once central to the region. This in turn has led to the implementation of EU directed fishing quotas (Total Allowable Catch or TAC) depending on the state of stock as defined by the International Council for the Exploration of the Sea (ICE S), regulated and monitored by CEFAS. These are based on whether stocks are inside or outside Safe Biological Limits (SBL) defined by a minimum safe stock size and maximum exploitation rate.

The main issue affecting fisheries in this area is the sustainability of the North Sea fish stocks and the consequent need to impose a quota system. Boats less than 10 m long, although regarded as a more sustainable form of trawling, have just 3% of the UK's catch quota. As such it was reported in April 2010 that the entire fleet was "on the verge of collapse" as

smaller operations were filling their Government designated monthly amounts within days of the start of the month (East Anglian Daily Times April 15th 2010). Fishermen therefore had to stop fishing for the remainder of the month, or face prosecution. Annual reports for regional fishing bodies indicate that more and more fishermen have to give up each year. Furthermore, new controls on bottom trawls in The Wash embayment will have an adverse effect on the commercial viability of fishing in this area (MMO 2013).

Other factors include global temperature change and water movement which can affect the distribution of fish. In addition, the construction of wind farms and aggregate dredging can cause conflicts and temporarily suspend fishing in some areas. In the case of wind farms fishing is forbidden within a certain distance of the array and in some cases compensation has been given to fishermen. The restrictions can however mean the encouragement of fish stocks in these areas.

Much of this has been subject to further change following the Marine and Coastal Access Act of November 2009. The MCAA heralded a significant change in the approach to the management of the marine environment off the English Coast (ESFJC 2009). The establishment of a framework has been used to better manage marine activities, and has attempted to protect the marine environment. Although no MCZs were recognised in the first tranche in 2013, there are several areas still under consideration; such as The Wash Approach, Holderness Inshore, Holderness Offshore, Lincs Belt and Silver Pit.

The regional project group Net Gain was involved in the recommendation process (http://webarchive.nationalarchives.gov.uk/20120502152710/http://www.netgainmcz.org/) but is managed by the JNCC/NE. The region was covered by the Eastern Inshore Fisheries and Conservation Authority (http://www.eastern-ifca.gov.uk/).

Rarity And Vulnerability

The fishing industry in the region is close to complete depletion. Few traditional boats remain in full time service and traditional methods of fishing have been mostly replaced by trawling; leaving few small fleets in operation. The region is proud of it fishing heritage, and this is exemplified by the way that it is remembered in numerous fishing places, and in the National Fishing Heritage Centre at Grimsby, and in the publication of books about the local industry (e.g. Bale 2010). The increase of trawling has also has an effect on the historic environment as bottom trawling effectively destroys past land surfaces and artefacts on the seabed.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: ENERGY INDUSTRY

Introduction: Defining/Distinguishing Attributes

The region's offshore area is dominated by the energy industry, especially the hydrocarbon industry (gas), with a few existing wind farms and several new areas being proposed.

Figure 31. Windfarm in the inshore zone, 5km from Skegness.

There are several different kinds of features associated with the hydrocarbon industry, which is exclusively gas in this region. There are pipelines that bring the natural gas from the hydrocarbon installations directly from the fields, which reach land in several places including Mablethorpe and Easington. In other locales, especially in the Humber, there are places where ships carrying gas, but also crude oil, offload through pipes that lie in the inshore zone. For example at Tetney, and in the Immington area where there are a number of power stations and refineries. This also involves buoyage, navigation channels and routes, all of which are an essential part of making the transportation and offloading of hydrocarbons safe. Not all gas fields in the region are actively exploited and there are many relict wellheads

and installation features, but which continue are active in terms of their historic character because of exclusion zones on the surface and impact on the sub-sea floor sea floor and water column (https://www.gov.uk/oil-and-gas-onshore-exploration-and-production).

There are several wind farms in the region, located on the edge of The Wash embayment. The Lynn Offshore Wind Farm and the Inner Dowsing Offshore Wind Farm (http://en.wikipedia.org/wiki/Lynn_and_Inner_Dowsing). Each is connected to the shore at Winthorpe, north of Skegness, by power cables. Archaeological investigations in 2002 suggested a high degree of potential of finding Mesolithic to medieval archaeology along the cable's path (Wessex 2002).

Historical Processes; Components, Features And Variability

While natural gas from inland reservoirs were being exploited and used in the 18th century, it was not until 1960s that the North Sea became a major source for gas, and in the 1970s for oil. Gas was first discovered in British waters in 1965 in the West Sole gas field off the north east coast. The discovery of oil at the Argyle and Forties fields followed in the 1970s. By the mid-1980s there were over 100 installations in the North Sea and Britain had become a net exporter (http://www.abdn.ac.uk/oillives/about/nsoghist.shtml). In 2012 there were c. 260 hydrocarbon 'installations' in the region consisting of platforms, shafts, and c. 1627 wellheads, representring the whole time-depth of drilling and exploitation activity. The main areas of exploitation in the East Yorkshire to The Wash region are located in the gas fields Amethyst West and East, Ceres and Mercury, West Sole, Barque, and Windermere. Nestled in-between these areas are zones for dredging and wind farm licensing. The hydrocarbon industry has been in decline since 2000 and more than half of the North Sea oil reserves have been extracted, according to official sources in both Norway and the UK (http://en.wikipedia.org/wiki/North_Sea_oil).

Wind power is the fastest growing form of global renewable electricity generation and has become increasingly important in the region 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 2009 The Department of Energy and Climate published The UK Renewable Energy Strategy which commits to sourcing 15% of its energy from renewable sources by 2020 – an increase in the share of renewables by almost a factor of seven from about 2.25% in 2008, in scarcely more than a decade (http://www.decc.gov.uk/ TheUKRenewableEnergyStrategyExecutiveSummary.pdf)

This is facilitated by the fact that Britain has one of the best offshore wind resources in Europe, alongside the Netherlands, Germany and Belgium who all share the North Sea. The region's offshore zone is well placed to take advantage of the potential, as indicated by the large number of wind farm proposals. For example in the offshore zone at Heron Wind Offshore Wind Farm and Njord Offshore Wind Farm. Closer to the inshore are wind farm proposal with licences at Lincs, Humber Gateway, Race Bank and Triton Knoll. Additional infrastructure is used to connect the power that is generated to the National Grid, which has a further impact on the inter-tidal and coastal zone.

Values And Perceptions

The North Sea as a whole has always been important to the energy industry, most notably for its natural oil and gas resources which have been heavily exploited since the 1960s. In the region, renewable energy sources have become increasingly important as a result of a great

awareness and concern over CO^2 emissions from energy generation using fossil fuels. The North Sea has remained crucial to these emerging energy industries.

Figure 32. Idle oil rigs in the Humber.

Research, Amenity And Education

A recent project undertaken by The British Library National Life Story Collection and the University of Aberdeen entitled 'Lives in the Oil Industry' (http://www.abdn.ac.uk/oillives/) recorded first hand oral accounts of working in the oil and gas industry.

The advent of renewable energy has also been crucial. The development and maintenance of the offshore energy industry creates a large amount of data relating to the seabed, most notably geophysical data. This has led to feasible research projects such as the North Sea Palaeolandscape Project (Gaffney *et al.* 2007) using the geophysics and other technical measurements rcorded by the energy industries to identify new areas for development. This has provided information on past landscape surfaces, as well as shipwrecks and other intrusive features. It is useful for archaeologists to work alongside energy developers at the stage at which geophysics is undertaken to help design and create mitigation schemes so as to avoid damaging the historic environment. In addition renewable energy developments are often accompanied by educational facilities to inform the general public about the benefits of this type of installation and any additional data produced.

Condition And Forces For Change

As outlined above, one of the greatest forces for change in the energy industry is the opinion that greenhouse gas emissions should be reduced in order to reverse environmental decline. This is compounded by the fact that the hydrocarbon resource is finite; replacement energy sources are therefore essential to avoid future energy crisis in England; such as the shale gas deposits. As such, existing oil and gas fields continue to be exploited, although the industry is in rapid decline. In contrast large wind farms are being developed off the region's coast. The construction of new wind farms will have some effects on the current seascape. Arrays are mostly sited in areas removed from shipping lanes, with low recreational and fishing activity, good seabed properties and the absence of known archaeology. However, some effects are inevitable, with safe zones set up for recreational traffic and restrictions on fishing activity and may be close to previously explored areas for gas – wellheads principally. Further change may be produced by the development of new technologies being used to harvest wave and tidal power (http://www.thecrownestate.co.uk/mrf_renewables).

Rarity And Vulnerability

At present the energy industry is not rare or vulnerable, but its seascape expression is liable to change in the future. The main drivers affecting the industry's expression will be environmental concerns and technological change. With the switch from fossil fuels to renewable energy sources it is likely that elements of the hydrocarbon industry will become increasingly rare in the coming years. However, there will remain elements of infrastructure on the seabed in the form of wellhead capping, and possible related drilling equipment which may be hazardous to future generations who will continue to exploit the marine environment. As such some provision is needed to preserve aspects of the energy industry, perhaps in a similar way to the 'Lives in the Oil Industry' project.

The effects of the energy industry on the historic environment can be various. For example scour around the base of turbines can affect the physical remains on or within the seabed and precautions have to be taken to prevent this. However, the physical effects of turbines are expected to be relatively small comparable with storm and flood events, commercial shipping, dredging and trawling.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: EXTRACTIVE INDUSTRY (MINERALS)

Introduction: Defining/Distinguishing Attributes

The character of the extractive industry (minerals) in the region is mainly associated with marine aggregates extraction. There are several areas of aggregate extraction, linked with dredging licences. These are called Humber Estuary, Inner Dowsing, Outer Dowsing, and Off Saltfleet. The sediment in the area is mainly coarse sand and gravel, with large areas of pure gravel, making it particularly viable for this activity. Overall larger licensed areas are present but not all are currently in use. Dredging activity is related to market pressures such as supply and demand, therefore activity can be sporadic and difficult to predict (Rogers 1997).

Sand and gravel is extracted for onshore construction including concrete, mortar and asphalt, general fill, roadstone, and drainage, construction of harbours and coastal risk management both within the UK and in Europe where offshore dredging restrictions apply. The region covers part of the southern North Sea area, which is one of the two main areas of potential for marine aggregate in England (Wenban-Smith 2002).

Figure 33. Albert Dock, Hull – aggregate from the North Sea.

Historical Processes; Components, Features And Variability

The materials that are being exploited were originally deposited by river systems that are now submerged (BMAPA 2000; ODPM 2005). Large areas of the sea floor were periodically exposed as dry land during the upper Palaeolithic. This not only created a space for human

occupation and the potential for associated past human remains on those landscapes, but it has also left the sands and gravels as a potential resource for aggregate dredging. Several of the areas in which artefacts have been found on the sea floor would be possible sources for aggregate deposits. These have come from Brown, Leman and Ower Banks (North Sea Prehistory Research and Management Framework (NSPRMF) 2009, 22-3). With increases in dredging it is likely that more material will be found.

The Fens, which was a part of the Holocene transgression 6,000 year ago, is also an area rich in minerals. There are several extractive industries operating in the Fens. For example, coprolite (fossilised animal dung and bones) extraction industry developed in the Fens during the 19th century. Coprolite is located between the London clay and the later crag deposits and is phosphate-rich and makes good fertiliser when processed. The industry took off in the 19th century when an efficient refining process was discovered which efficiently extracted the phosphates. Coprolite was initially extracted from eroded seams or from the ubiquitous crag or clay pits where the nodules would be clearly visible. Ultimately pits were purpose-dug for coprolite extraction and are often marked on 19th century Ordnance Survey maps. Coprolite pits were often several hundred metres wide and some metres deep and were therefore substantial landscape features. However the pits were short-lived and backfilled once coprolite extractions were complete and are now difficult to locate.

Marine aggregate dredging has become progressively more important to supplement quarried aggregates since the 1960s when pressure for development increased. Dredging began off the East Yorkshire to The Wash coastline in 1973, when 3 million tonnes of material were removed, and has steadily grown ever since with nearly 10 million tonnes of material being removed in 2001 (http://hubpages.com/hub/Coastal-Erosion-in-East-Anglia; (http://www.thecrownestate.co.uk/marine_aggregates). Smaller scale clay extraction has been found on the Lincolnshire coastline, in the inter-tidal zone during the RCZAS.

Values And Perceptions

In places where the smaller industries thrived such as the copperas and coprolite industries these aspects have become part of the landscape and the character of those areas. The larger and more recent industries of aggregate quarrying and dredging on the other hand have elicited mixed responses from different sectors of the community. Many people believe that the extensive dredging is contributing towards the increasingly severity of coastal erosion in the region. In short it is felt that removal of sandbanks allows larger waves to reach the shore, stripping away material. Another effect of this is that the shore becomes steeper and deposition of new material more difficult (http://hubpages.com/hub/Coastal-Erosion-in-East-Anglia).

In terms of the historic environment, aggregate dredging has a two-way effect of perception: viewed as destruction of past landscapes and features, however various measures are being taken to address or mitigate this; and on the other hand creating an opportunity to reveal the archaeological character of the much of the Southern North Sea zone, in reference to the land bridge that connected Britain to Europe 6000 BP (reference section on palaeolandscapes, above). Aggregate extraction undoubtedly has a strong economic value to the region, employing large numbers of people both offshore, landward and at wharves and docks. In addition the aggregates are essential to the construction industry and therefore helping to support further development in the region and beyond.

Research, Amenity And Education

This character type has a lot of potential for research. In particular, offshore aggregate dredging can provide much archaeological and historical information. This applies to all

stages of the dredging process including site location through to sorting on the wharves. This has been significantly aided by the Aggregates Levy Sustainability Fund (ALSF), conceived to address the environmental costs associated with quarrying or dredging, not already covered by legislation. The fund was distributed for DEFRA by three different bodies including English Heritage. Between 2002-2008 the ALSF funded over 250 projects relating to the historic environment to a value of over £23 m; the anticipated value of projects in 2008-2011 was £4.5 m (Flatman and Doeser 2010, 161).

Condition And Forces For Change

The extent and condition of extraction material is related to Cultural topography, and the distribution of sands and gravels. The extraction industry remains a significant force for change in its own right of the region's character. The offshore dredging is dictated by the health of the construction industry. Onshore extraction is a viable industry, especially in the Fens. Little survives of the smaller 19th century industries within the region. Forces for change mainly relates to development impact, where land containing industrial features is lost to construction or from the effects of agriculture that mask earlier landscape changes.

The current aggregate industry is susceptible to a number of forces for change, most significantly economic ones. 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). As outlined above the established relationship between industry and the heritage sector in this industrial field is a positive force for change in relation to safeguarding the historic environment.

Rarity And Vulnerability

Current extraction industries, although not rare, affect areas of historic environment that are more vulnerable. Dredging of the seabed and quarrying on land effectively destroys any pre-existing historic environment evidence in that area. As such archaeological mitigation is crucial. It has been noted here that much knowledge about relict industries has been lost, the remains of which are mostly abandoned, unrecorded and in the process of being destroyed. Consistent approaches to the assessment of this industry are needed so as to ensure that the loss to the historic environment is monitored, especially on the sea floor.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: PROCESSING INDUSTRY

Introduction: Defining/Distinguishing Attributes

Processing industry character areas in the region today are associated with the Oil refineries, and Chemical works, such as located on the outskirts of Hull. There are also sewage works, as well as spoil and waste dumping areas in The Wash embayment. Along the south shore of the Humber there are several areas of non-specific industrial production. In the past, especially during the Roman period, salt production was a major industry of the Lincolnshire coast. Coastal salterns, in all periods, were attracted to areas with the highest saline concentration, avoiding deep waters and regions diluted by rivers and high rainfall, and often exploiting small inlets and tidal marshlands which were subject to natural evaporation (Went 2011).

Figure 34. Oil refinery at Killingholme close to Paull Holme.

Historical Processes; Components, Features And Variability

Like East Anglia, the processing industries in the East Yorkshire to The Wash region have traditionally been small scale and associated with agricultural production. However, the earliest maritime-based processing industry in the region was salt production which may have

begun in the Bronze Age but was certainly in existence in the Iron Age. Salt-working sites were originally located on the edge of the tidal zone, probably just above the reach of maximum high spring tide (de Brisay 1975). Containers were used to collect brine and were then heated to boiling point, evaporating the water and eventually leaving crystallised salt.

The industry expanded considerably in the late Iron Age and Roman periods. Salt was essential to the Roman economy, and was used for preserving meat and fish, for the production of other foods, and for tanning leather, and later on ceramic production. It is believed that the origin of the word '*sal*ary' is related to the partial payment of Roman soldiers in salt. In addition some roads and ports may have been built specifically to ensure the provision and transportation of salt. The presence of extensive tidal marshes along the Lincolnshire coastline, and the reclamation processes that turned some areas that were salt marshes into reclaimed land, seem to have been salt producing areas on the basis of archaeological evidence from NRHE and HERs, but also indicated on old OS maps. Salt production was located at Marshchapel and North Cotes, North Creek and Wainfleet. There were probably more extensive remains, correlating with Roman settlement evidence, but many of these coastal areas have disappeared because of erosion. The few surviving sites along this coastline were located in tidal creeks, or are later in date.

Figure 35. Salt End salt production works, east of Hull.

An alternative approach to salt-making, used from the medieval period, involved washing salt-impregnated sand. This process was known as 'muldefang' in Lincolnshire. Salt-caked

sand from the spring tide line was placed it in a trench along with sea water. The resulting solution was then tapped, whilst the de-salted sands were thrown away and the trench refilled. Having gained enough brine, salt was then extracted by boiling the brine in a metal or ceramic pot, scooping out the crystals as they formed, without allowing the pot to boil dry. Salt production in the region continued into the medieval period, and salterns were documented in Domesday book. These were essential to the fishing industry, especially herring. Salt processing declined during the post medieval period, and when one of the great floods occurred in 1571, the industry was decimated. The salt and fishing industries were hit hard by the salt tax of 1702-1825 which made it cheaper to import salt from the continent.

Values And Perception

Overall, processing industries in the region were connected to the coast and estuaries. The natural resources that the sea provided created the conditions for the production of salt that had consequences for the production and values ascribed to other types of goods such as fish. Specific features, such as the remnants of salt production, rather than whole landscapes, were important. More modern industries such as oil refineries, chemical works and sewage plants are often viewed as negatively as noisy, smelly and sometimes dangerous, even though the actual processes of filtering and the step-by-step cleaning were quite similar.

Research, Amenity And Education

Some research has been carried out into the small processing industries on a local level, especially associated with salt production (e.g. Went 2011). However there is scope for much larger studies into these industries and use within the education system as case studies. The salt industry is well researched and understood, however more evidence is identified by processes such as the RCZAS and NMP. Most modern processing industries are amenities in some way, particularly sewage works. Although they may not be popular they are critical to the economic well-being of local communities.

Condition And Forces For Change

Salterns often remain as earthworks or cropmarks in what is now agricultural land or incorporated into sea defences, and are therefore susceptible to damage. These sites are observed from aerial photographs. Chemical works, and to some degree sewage plants, are dependent on the needs and requirements of the population, and so are influenced by changes in the economic conditions.

Rarity And Vulnerability

A number of the early processing industries have disappeared altogether, from coastal erosion, or from plough damage. While infrastructures may remain, such as former harbours, roads that connected the salt source with the markets and docks, the actual remains of the processing sites may have disappeared. Although much is known about the Roman salt industry in the region, not much is understood about earlier or later workings. An increasing number of reclaimed marshes are ploughed resulting in salt working sites remaining only as cropmarks or being removed altogether.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: INDUSTRY

CHARACTER TYPE: SHIPPING INDUSTRY

Introduction: Defining/Distinguishing Attributes

There are no large-scale shipping industries in the region at scale of the characterisation, although along the estuaries and tidal rivers there are small boat yards that are incorporated into other character types. Historically, the ship yards would have been located at the fishing ports and harbours, but due to the gradual demise of that industry there are few large enough to be visible in the characterisation.

While, there is plenty of contemporary shipping traffic into the Humber, the dual use of the routes with recreational and occasional usage with other vessels being used for fishing, means that these navigation routes have not been characterised as commercial shipping routes. Much of the area has traffic, but is nevertheless criss-crossed with shipping lanes running from south-west to north-east and from south-east to north-west that are recreational and ferry traffic.

Figure 36. Alexandra Dock, Hull.

Historical Processes; Components, Features And Variability
Britain as a whole has always been a trading nation and emerged as one of the leading industrial powers of the 19th century due in no small part to the strength of the shipping industry (Hedges 1974, 5). However, there is lack of good, natural harbours along the coast in this region. This is not to say that the region has not had an important maritime shipbuilding character in the past. There is plenty of evidence for boat production, with specific kinds of boats adapted from other regions being used for trade as well as for fishing. Much of the region was associated with Germanic and Scandinavian people with strong maritime links in the early medieval period. For example, Grimsby contains the *–by* placename element which denotes a Scandinavian settlement. In the post medieval period, Hull had important shipping industry workings, located at Alexandra Docks, although today they are associated with recreational activities or with port and dock infrastructures.

Values And Perceptions
There is a strong correlation with the identity of people from this region and the early medieval association with the Germanic and Scandinavian peoples. And the maritime association is strongly linked to the sense of identity and place for the local community. While the shipping industry cannot be said to be well represented today, clearly areas such as the Humber, and The Wash embayment were important areas of shipping in the past, providing an important economic resource. Awareness of the importance of the medieval and post-medieval activities associated with a shipping industry for the area is also felt today, but in association with the fishing industry.

Research, Amenity And Education
Research into the archaeology of shipping in the region has been conducted, especially early medieval shipping. However, there is scope for much more research on the topic. There is also scope for a regional study about shipbuilding. Communities in the region have strong links to the shipbuilding industry as a local tradition, developing their own stylised trawlers, which are on display at the National Fishing Heritage Museum at Grimsby.

Condition And Forces For Change
Continued coastal erosion, and changes in the economic structure of the region as a result of changes in the fishing industry and hydrocarbon industry, will also result in a change in the character of the area with regards to shipping.

Rarity And Vulnerability
While there was no surviving evidence for large and extensive medieval and post-medieval shipbuilding industry in the region, many of the local industries have been lost due to changes brought about by changes in other associated industries.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

CHARACTER TYPE: MILITARY DEFENCE AND FORTIFICATION

Introduction: Defining/Distinguishing Attributes

The East Yorkshire to The Wash coast has been of strategic military importance for many centuries due to its proximity to continental Europe (Williams and Brown 1999, 34). The coast faces towards Europe, and for the most part has good landing beaches (Williamson 2005, 144). In general, there is evidence for military defences and fortifications from most periods, although the post medieval to modern periods are well represented. Some strategic places such as Hull, the Humber estuary, as well as Boston, may have had longer military defence and fortification histories.

Figure 37. Hail Sands Fort which is located on a sand bank in the Humber.

Many of the post medieval defences in this area were a reaction to the threat from invasion, especially from Napoleonic France. However, along the East Yorkshire to The Wash coast, there is no string of 'Martello' towers as found in the East Anglia region. The East Yorkshire to The Wash region was also highly significant for defence in both World Wars and a number of defences remain. In particular the WWII anti-invasion defence system originally stretched along almost the entire length of the coast. Parts of this system remain relatively well preserved, most commonly features such as pill boxes, gun emplacements, and anti-tank

cubes along with associated fieldworks structures such as linking trenches. Other fortifications which survive in places include monitoring posts, anti-aircraft batteries, scaffolding obstacles and bombing decoys. In Humber's inter-tidal / inshore zone, off the south coast there are two forts, Bull Sands and Haile Sands.

Historical Processes; Components, Features And Variability

In the East Yorkshire to The Wash region there is no evidence for coastal fortifications before the medieval period. Even in the early medieval period, the evidence is scarce, and from the 9th century, river and estuarine waterways were used by Vikings to raid inland towns. It has been suggested that along the south-east coast in particular, there existed a network of coastal defence intelligence (Baker and Brookes *in press*), though there is no evidence for this along the coastline of the East Yorkshire to The Wash.

There are several known later medieval fortifications located in close proximity to the sea along the region's coastline (http://www.ecastles.co.uk/index.html). For example, there are fortified manors and castle fortifications at several places. Thornton Abbey which was a 12th century foundation, has the remains of a barbican gatehouse. At Paull Holme there is a 15th century tower that is the remains of a fortified manor. On the eastern edge of Boston there are two towers, Rochford tower dating to the 15th century, and Hussey tower dating to c. 1460. In the 16th century, a fortification and a gun battery were located at the entrance of the Hull and the Humber. The Paull Battery was enhanced during the Napoleonic War, and became part of the Palmerston defences of major ports in the mid-19th century. Hull was also a defended city from the 14th century with town walls including towers, and a castle built in the mid-16th century and a citadel built in the 17th century (http://en.wikipedia.org/wiki/Fortifications_of_Kingston_upon_Hull; Gillet and MacMahon 1980; Foreman and Goodhand 1996).

Figure 38. WWII pill-box at Wolla Bank, close to Sutton on Sea, along the Lincolnshire coast (Oscar Aldred).

There are two surviving WWI fortifications which were built to protect the Humber. These are known as the Humber Forts (http://en.wikipedia.org/wiki/Humber_Forts): Bull Sands Fort and Haile Sands Fort. Planned in 1914, they were not finished until 1919, and were then re-established as forts during WWII. Spurn Point was also used as a military defence, to defend Hull and the Humber (http://www.pastscape.org.uk/hob.aspx?hob_id=916014). A battery at Easington (Kilnsea Battery) and the Stallingborough Battery, on the southern shore, alongside the other coastal defences protected access into and out of the Humber.

However the WWII remains survive much more extensively along the entire length of the region's coast. Following the German invasion of France in June 1940 a huge programme of military coastal defence construction was undertaken. This included long linear obstacles like barbed wire, scaffolding and anti-tank cubes, which linked together important nodal points such as pill boxes, anti-aircraft batteries. Defences also included underground monitoring posts, barrage balloon sites, check points, infantry strong points and enclosed minefields. The Humber Forts were incorporated into the WWII offshore defence network. As with the Maunsell Sea Forts in the Thames Estuary – used principally to protect the coast from invasion during the WWII (http://www.undergroundkent.co.uk/maunsell_towers.htm) - the Humber Forts were abandoned in 1956. Military defences continued to be important in the region after WWII, although this involved the development and adaptation of former airbases during the Cold War, and in the testing of weapons at places such as Donna Nook.

Values And Perceptions

Remaining fortifications of different dates are perceived in diverse ways by the general public. For example visiting structures such as medieval and later fortifications and castles is a recreational activity. The WWII defences in contrast have been adapted for new uses, or destroyed. Taking the defences from all periods, the defence heritage along the coastline in this region is perceived as being an important aspect of the seascape character.

Research, Amenity And Education

There have been several projects in recent years on 20th century military defences, most notably the Defence of Britain Project, which ran from 1995 to 2002 under the auspices of the CBA. The project aimed to record the 20th century military landscape of the United Kingdom, 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/). During its lifetime nearly 20,000 20th century military sites in the United Kingdom were recorded by c. 600 volunteers. This has been enhanced by the RCZAS.

Condition And Forces For Change

There are few if any fortifications dating to earlier than the later-medieval period which remain well preserved. The fortified manors and castle are mostly in a dilapidated state but are mostly legible and recognised as such in being Scheduled Monuments or Listed Building – adding to the distinct character of the region. Furthermore, the 20th century defences in particular tend to be left. The few traces of WWI defences left are protected, but maintenance is expensive. Main challenges are related to coastal processes, which are eroding parts of the region's coastline rapidly. The gun battery at Spurn Point has fallen, and other monuments are exposed. These features are well placed to create heritage tours along the coast which will be helped by the opening up of coastal access.

Rarity And Vulnerability

As outlined above many of the 20th defences are at risk from erosion and significant numbers of features have already been lost this way. However the increasing recognition of these Monuments as a valued part of our tangible heritage means that many are now being preserved. The WWI structures in particular are relatively rare. Many were destroyed in the 1970s but several are Listed Buildings and Scheduled Monuments; such as Bull Sands Fort and Hail Sands Fort.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: MILITARY

CHARACTER TYPE: MILITARY FACILITY

Introduction: Defining/Distinguishing Attributes

The East Yorkshire to The Wash coast was strategically important location for military facilities in the past until WWII, given its proximity to continental Europe. The majority of features are recent in date. However, Hull was a defended place which would have included barracks (see Military Fortifications and Defences).

Figure 39. Donna Nook Military practice area (Oscar Aldred).

During WWI and WWII Williamson suggests that East Anglia was England's Airfield (Williamson 2006, 77). However, there were also a few airfields in the Humber are and along the Lincolnshire coast which retain their historic character (cf. http://www.forgottenairfields.com/united-kingdom/), and proximity to the sea was a significant factor in their location. These include North Cotes, Goxhill, North Killingholme and Waltham (close to Grimsby). There are several others close to the coast which no longer retain features of their former use: for example Killingholme, formerly known as RNAS Immington, was a seaplane base during WWI on the Humber estuary; and a base at Donna Nook was destroyed by floods in 1953.

A few areas along the region's coastline, inter-tidal and inshore zones are delineated as military practice areas. These are located at Holbeach St Matthew and Friskney Flats,

(Wainfleet Sands) in The Wash embayment, Saltfleetby and Donna Nook. An offshore practice area is located in the vicinity of Outer Silver Pit. There is also a firing range, close to the Welland Outfall, near to Boston.

Historical Processes; Components, Features And Variability

Much of the region's history, its processes, components, features and variability are recent. However, the most significant early features were located in the Humber, the defences of which were integrated and formed part of the development of Hull as a fortified place from the 14th century onwards. Works developed in the way they did because of the success of the commercial enterprises, so that defensive facilities were built up and round Hull as it became a civilian facility during the 19th century.

The military facilities from the early 19th century were mostly in response to a threat of invasion from Europe, whether Napoleonic or during WWI or WWII. There is a correlation between the defensive sites at Paull Holme, Easington, Stallingborough, and those at Hull with the addition of later defences during WWI. This included new categories of features, such as airfields during WWI at North Cotes and the seaplane base at Killington on the Humber. During WWII Goxhill, North Killingholme, Grimsby and Donna Nook were all added to the facility network. Added to this, before and during WWII several areas were designated practice areas for bombing and which continue to be used today. Holbeach St Matthews (RAF Holbeach) weapons range is one of two such facilities situated on The Wash, the other being Friskney Flats (RAF Wainfleet) which has been closed. The range is used by RAF, USAF and other European air forces for bombing and strafing practice. RAF Holbeach opened in 1926 and extends over an area of 3,875 hectares which includes 3,100 hectares of inter-tidal mudflats and 775 hectares of saltmarsh. RAF Wainfleet was opened in 1938, although usage dated back to 1890, and closed in 2010. The practice area at Donna Nook was opened in 1927, when it was also used as a decoy site.

Values And Perceptions

At various times in the past, but especially during WWII, this character type dominated much of the landscape in this region. This was imbued with a sense of imminent danger from sea and air invasion by the Germans who were occupying France, Belgium and the Netherlands. Today military facilities are a part of recreation, or have been converted and renovated into other uses.

Research, Amenity And Education

The military facilities of the region have provided a basis for much local research, especially into the naval and air bases, and in the collation of information such as the Defence of Britain Archive (http://archaeologydataservice.ac.uk/archives/view/dob/), as well as the Rapid Coastal Zone Assessment Surveys and the National Mapping Programme. All have mapped large areas of military facilities along the region's coastline. Some of the older facilities have been taken out of military service. A few have been reused, and one was lost during the 1953 storm.

Condition And Forces For Change

The military facilities of the region have undergone extreme changes as a result of successive defence reviews during the last few decades. Many closed during the 1990s and some have been abandoned whilst others have seen major reconstruction and re-use as outlined above.

The drive towards preservation of these facilities and their use, particularly for education, has led to a number of groups, such as the National Trust and local interest groups, taking on redundant military facilities.

Modern active military facilities in the area only exist at a few places along the coast, as well as offshore. The military practice areas are subject to changes associated with industries such as aggregate dredging and wind farms, however the military function will always take precedence when required. Furthermore, in conjunction with active bombing practice, leading to fewer pressures from other activities such as agriculture and fishing, several areas have been designated SSSIs as well as NNRs. For example, Donna Nook NNR, Saltfleetby – Theddlethorpe Dunes SSSI, NNR and The Wash SSSI, NNR.

Rarity And Vulnerability

Natural processes of erosion for fixed facilities are the major challenge that these sites face. Furthermore, because several of them are also incurring actual human-made destructive forces, these represent a major threat to other features associated with these areas, such as their biodiversity and the loss of plant species – although it is also recognised that low human activity also results in the enhancement of biodiversity at military sites. In addition, several of the airfields are being encroached by other land uses, especially golf courses and intensive agricultural farming.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: MARITIME SAFETY

Introduction: Defining/Distinguishing Attributes

The dynamic character of the coast and inter-tidal waters, and its relationship to shipping of all kinds, has meant that maritime safety has an important contribution to make towards the historic seascape character of the region. Daymarks, lighthouses (and lightvessels), buoyage, as well as safety areas and services are common features along the coastline. At different times in the past, each of these has played greater prominence in marine life than others.

Many different types of structures have functioned as daymarks. Many of those in the region comprise churches with towers and spires, beacons and staffs, and lights (especially along the upper reaches of the Humber and the tidal rivers e.g. River Ouse) as well as other landmarks such as windmills.

There are no active lighthouses in the region, though there are several disused ones. The main ones are at Spurn Point, Paull, Thorngumbald Clough, Withernsea, Killingholme, Saltend, Ferry house, Grimsby (harbour entrance and Grimsby tower), Thrusthorpe, and Skegness.

Figure 40. Lighthouse at Paull Holme, east of Hull along the northern edges of the Humber (Oscar Aldred).

There are also no active light vessels in the region, though there were many on the approach to and from the mouth of the Humber, The Wash and hazardous waters further offshore. For example, the Bull light vessel, Inner Dowsing light vessel, and Outer Dowsing light vessel.

Buoyage, beacons and lights were, and are, used extensively in the offshore area to mark the numerous sandbanks, marine features and shipping lanes as an aid to navigation. Other safety features include traffic separation schemes, pilot boarding areas and radio-call in points. The offshore area also has numerous caution areas due to elements such as submarine cables and high speed craft as well as hydrocarbon installations.

In terms of maritime rescue, MRCC Yarmouth (at Great Yarmouth) and MRCC Humber (located at Bridlington), are the centres which cover the region's coastline and offshore areas. Spurn Point had a lifeboat station until 2012.

Historical Processes; Components, Features And Variability

Not much is known about the early system of daymarks. However, it is generally understood that topographic features, and other modified features were used for maritime navigation (Parker 2001). Clearly the relationship with the topography was a feature of later daymarks. Churches for example would be located in the higher areas, especially in the wetland areas along the east coast of Lincolnshire, north of Boston. Furthermore, it is clear from the historic pilot views of the cliffs and daymarks that high ground with good visibility towards the sea were preferably locations for daymarks being used for navigation.

Of the earliest daymarks in the region were probably the churches, many of whose towers and spires were built in the medieval period. How this would have worked as part of the navigation network is evident from the pilot views dating to the 17th century (Collins 1693).

During the late medieval and early post medieval periods the region was important for trade, as well as for its fisheries, and it would have been an active marine environment with many ships. It would have been essential that there was good maritime safety. In 1795 the first Hydrographer to the Admiralty was appointed, and the first chart appeared in 1800. In this respect, the knowledge of daymarks and navigation became more widely known and accessible.

All the lighthouses in the region are relict features. Nonetheless, where they survive they retain their historic seascape character in the present-day as they have a significant landscape presence. For example, Spurn Point lighthouses are iconic features which still characterise the area, even though they are in different states of repair. The first known reference to a lighthouse at Spurn Point was in 1427, though in more recent times there have been two lighthouses: high light and low light. The first high light was built in 1776, and lasted until 1895. The more recent high light was built in 1895, and used till 1985. The low light was built in 1852. The lantern was removed in 1895. A similar history of change and adaptation is associated with other lighthouses in the region.

A lighthouse at Paull is indicated on the 17th century charts by Collins (1696), though it is possible that there were lighthouses here in the 11th century. The present Old Lighthouse was built in 1836, though it was abandoned in 1870. The nearby lights (part of the Paull group) at Thorngumbald and Saltend were established in 1870, and although maintained by hand are now operated automatically; the keepers cottages were demolished in 1996.

Lightvessels (ships which act as lighthouses in areas unsuitable for lighthouse construction) were also used in areas close to the entrance to the Humber via access to Hull, Grimsby and other landing places. There were also others guiding access into and out of The Wash embayment, to and from Boston and King's Lynn. A few light vessels were located further out from the coast marking areas of shallows, shoals, sandbanks and reefs.

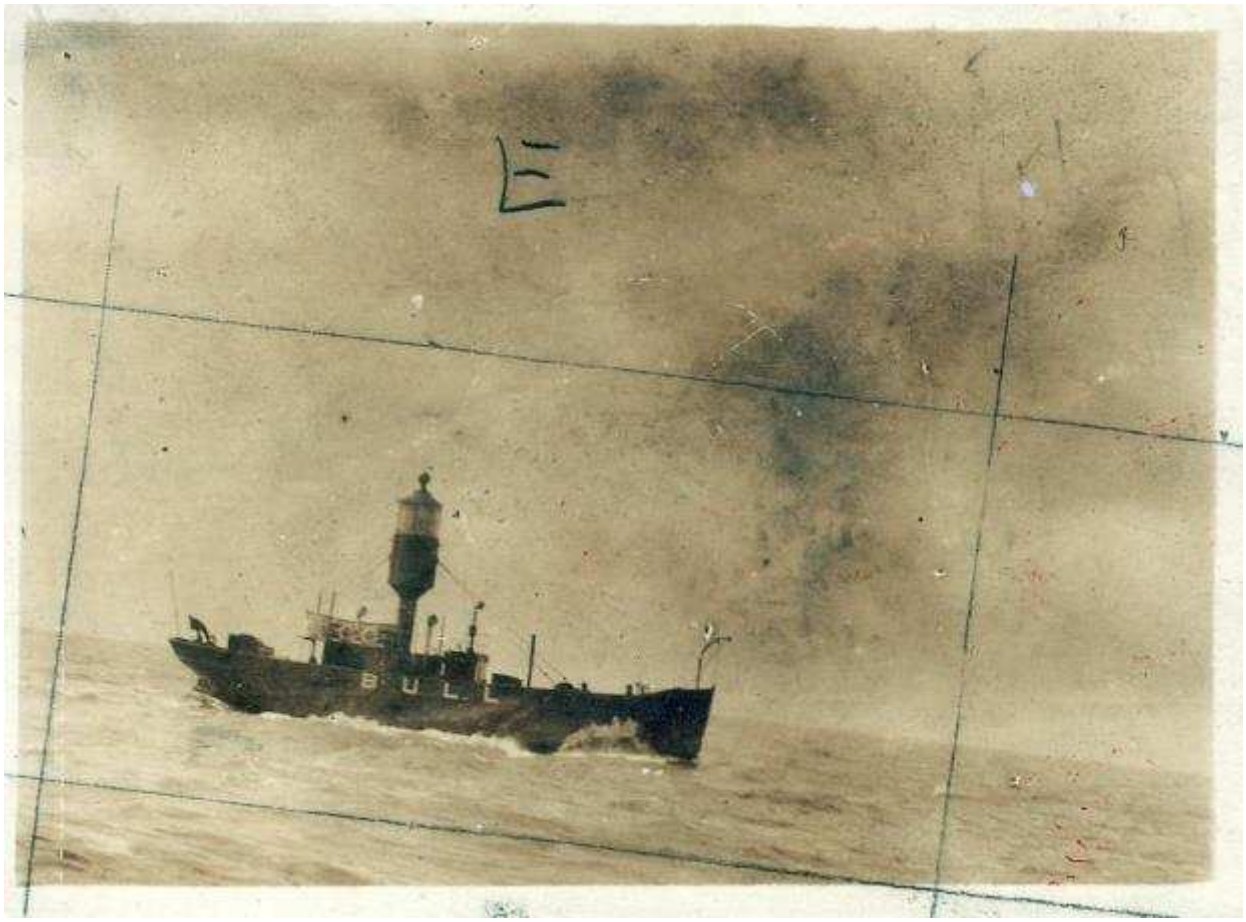

Figure 41. Bull light vessel [UKHO archive - 1C AND PAGE 47.]

The first active petition for a lightvessel came in 1679. However, questions were raised about the feasibility of holding such as vessel securely and how to crew it. As a result the first lightvessel was a private endeavour, and not installed until 1732 (http://www.hullcc.gov.uk/museumcollections/collections/storydetail.php?irn=7andmaster=10. The first light vessel in the Humber – the Bull Light Vessel - was not built until 1820, after an accident and collision between two vessels. In 1926, the Humber Conservancy Board (who had taken over the administration of the Humber from Trinity House in 1907) commissioned The Goole Shipping and Repairing Company to build a light vessel that was launched in 1927.

Lifeboat stations were operational in this region from 1810 with the RNLI Humber; subsequent stations were solicited at Withernsea (1862), Cleethorpes (1868), Mablethorpe (1883) and Skegness (1830) (http://rnli.org/Pages/Default.aspx).

Values And Perceptions

Overall maritime safety features are considered both invaluable and locally characteristic of this area, although those located wholly offshore will only be known to small sectors of the community.

The coastal landscape is covered with daymarks and lighthouses which are now seen as particularly iconic. For example, the Grimsby tower, the numerous churches and the lighthouses, as well as the light vessels which are representative of an iconic age during the 19th century in England's maritime history.

Research, Amenity And Education

There is scope for research into the historical elements of maritime safety in the region, particularly the coastal buildings such as the lifeboat houses and lost lighthouses and navigation marks. However there is already much interest, reflected by a number of websites about the maritime safety in the region and beyond. Furthermore, there is local interest in the subject due to the close relationship that local communities have with the sea. As such much information is available for education purposes, including from the local maritime museums which have displays relating to maritime safety and occasionally incorporating obsolete vessels into their collections. Furthermore, some of the lightvessels have been reused for other purposes, including the Inner Dowsing lightvessel which is used as a place for accommodation (http://www.nationalhistoricships.org.uk/register/131/light-vessel-16-inner-dowsing). Other amenities include the lighthouses, some of which are open to the public, either throughout much of the year or one day annually.

Condition And Forces For Change

Changes in navigation methods, particularly the use of satellite navigation systems, have altered the way in which mariners use daymarks and lighthouses, making many now redundant. This has also led to Trinity House suggesting the abandonment of some lighthouses, often resulting in objections that in the event of failure of new systems the older methods can always be relied upon. Objections also arise from the potential loss of an iconic local landmark.

Safety services and features such as safety areas offshore are also becoming more important and more common with the development of larger ports and harbours. However, the region's coastline is not well served by stations perhaps reflecting the small number of ports and harbours available for landing with docks and quays.

Rarity And Vulnerability

As a result of changes to navigation some elements of the maritime safety system have now become almost obsolete due to more economical or better technological alternatives. Most notably this includes light vessels, but also several decommissioned lighthouses. In terms of the built environment continues to provide additional challenges. However, the network of onshore daymarks and decommissioned lighthouses remain important features of an earlier system of navigation. In the event of disruption to more technologically advanced systems, the onshore system of daymark remains can be used. This alone, besides its heritage value, make it important to continue to research.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION ACTIVITY

Introduction: Defining/Distinguishing Attributes

Navigation activity plays an important role in the region's life and economy. This is bound up by the presence of several large and significant ports in the region, such as Hull, Grimsby, as well as Boston. There are several smaller harbours in the Humber and along the Lincolnshire coast, some of which were much more significant in the past than they are today.

(Kingston-upon-) Hull is by far the largest port in the region, with several docks and quays, most of which are still present in the built environment, while others have been incorporated into the urban fabric (http://en.wikipedia.org/wiki/Kingston_upon_Hull). Located 40km from the North Sea it was well placed to grow as a trade centre over time.

Figure 42. Navigation route into the Humber, looking from Donna Nook.

Grimsby is supposed to have been founded by settlers from Scandinavia in the 9th century, deriving from the personal name *Grims-* and the settlement element *–by* are derived from. It provided a natural 'haven' from the North Sea, protected somewhat by the Humber estuary. In the 13th century Grimsby was given Royal Charter status as it developed into a regionally

and nationally significant fishing and trading centre. The present form of the harbour facilities started in the late 18th century (http://en.wikipedia.org/wiki/Grimsby).

Boston was probably founded after the 11th century, although there is some suggestion that it may have had a much earlier date or origin – possibly from the 7th century. However, as a town and market centre, Boston developed in the 12th century, and received its Royal Charter in the 16th century.

The majority of navigation activity, in particular navigation routes, are focused in and around these regional centres. Navigation routes are densely distributed around the Humber and The Wash embayment especially. Past routes, mapped by Wessex Archaeology for English Heritage, show a similar regional pattern, as one might expect, although there were also other smaller ports that were networked, such as Skegness, Saltfleet and Saltfleetby. Saltfleet Haven was a port given a royal charter in the 13th century, although it eventually declined in its status and activity during the 19th century.

Today, there is a focus for navigation activity around the Humber, and less around The Wash, as well as up and down the coastline, and in the offshore zone, for navigation routes. However, the drainage of the Fens was also associated with the improvement of the existing waterways, enhancing the connection between the North Sea and ports that may have declined because of silting up of channels. The embanking of 'The Haven' channel with access to and from Boston, as well as the 'Welland Outfall' that enhanced the connection of Spalding to The Wash, allowed these areas to flourish in the 18th to 19th century.

Historical Processes; Components, Features And Variability

The East Yorkshire to The Wash region has several regional centres around which navigation activity clustered. This is also reflected by the evidence for earlier activities. Prehistoric remains have been found in many places all along the coastline, as well as in the now submerged land mass, south of Doggerland. Early evidence for coastal navigation is related to the collection of Bronze Age boats which were found at Ferriby, for example (Wright in Ellis and Crowther 1990; Van de Noort 2004; Ransley and Sturt 2013, 61).

There is not much Roman and early medieval evidence for direct navigation activity in the form of ships, or infrastructure. There would have been a great deal of maritime interaction in the region at this time, especially given the proximity that the East Yorkshire to The Wash had to the European coast and the difficulty of landing along the coast for larger vessels. However, much of the current knowledge about early medieval navigation activity is related to sites outside of the region; such as the *emporia* focused trade at places such as Ipswich. There is however, a suggestion that the Ipswich ware was being moved by boat, as many of the locations where it has been found between the Humber and the Fens is located in coastal areas, or places that were navigable by boat (Ransley and Sturt 2013, 119). The Humber was independently taking part in trade activities before the rise of York as a regional centre during the 9th century. In the 10th – 11th centuries activities were controlled more centrally from York. There is some suggestion that beach landing places were prevalent along the east coast. The Viking period affected the east coast, making it the subject for raids, as well as eventual colonisation.

By the medieval period the present-day distribution of ports and navigation activity in the form of consistently used routes was established. Trade and exchange, as well as fishing were the main economic activities, used to trade with merchants from Europe into the Baltic and the Mediterranean in return for goods, such as wines and luxury goods (Wren 1976, 19). The ports were also important to the fishing industry during the medieval period, with hundreds of

vessels fishing the local waters as well as undertaking long distance journeys to Iceland (see Fishing).

Tidal rivers were still relatively significant, acting as trade routes to places such as Lincoln, York, as well as into the Fens. This period of extensive activity was greatly diminished by continental wars, plagues, and a general decline in navigation activity for much of the 15th to 17th centuries. Overall ports and trade networks became increasingly localised and smaller ports and landing spots became redundant.

The emergence of the railways from the mid-1800s onwards instigated further changes in navigational usage, although the larger, regional centres, continued to thrive. However, it changed the nature of how goods were transported. These new, quicker over land routes increased the connection between coastal localities, but also had the effect of altering the network system in which only those places connected by railway lines thrived. WWI and WWII again impacted on navigation activity, and the 1960s rationalization of the railway network further impacted on the development of coastal centres, especially those on the Lincolnshire coast.

Values And Perceptions

Navigation activity brought about changes at places in the region that were networked into coastal trade, and therefore has been a central feature in the economy of the region, and in its seascape character. Coastal communities in particular originated and developed because of their proximity to the North Sea, and depending on how networked they were at various points during the past, this has affected their development. In this sense, past and present navigation activities were a key factor in shaping the identities of local communities in the region.

Research, Amenity And Education

There has been some research on navigation activities, such as England's Shipping project funded by the ALSF and undertaken by Wessex Archaeology. This project used GIS to map shipping movements recorded in historical archives, creating a resource central to the understanding of this Character Type during the historical period and the development of present patterns of navigation. However, more is known about the medieval and later periods than those before. Little is known about how the prehistoric coastal areas were linked to one another, or whether there were little seaborne navigation activities and instead focused mostly on overland routes.

Condition And Forces For Change

Present-day navigation activity in the region is intense because of offshore industry, especially in accessing the refineries and depots in the Humber, as well as the aggregate dredging and construction and maintenance of energy installations. In addition the existing ports are expanding with increasing demand, especially in the Humber, represented by the large number of beacons and buoyage along the upper reaches of the estuary. However, as these navigation activities are directly related to other activities occurring in the North Sea, any changes to development of industries means an effect on the intensity of navigation activities in the region.

Rarity And Vulnerability

Navigation activity in the region is constantly changing, reflecting varying levels of trade and wider economic activity, both in the region and nationally. As highlighted by the 'Demonstrating the Method' HSC project by SeaZone, wrecks can also provide an indication

of past routes and activities. This is illustrated by the large numbers of recorded wrecks adjacent to the coastline and clustering around large ports and harbours throughout England. This clearly relates to the successful coastal trade and the movement of goods, possibly during the medieval, but particularly during the post medieval and later periods.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION FEATURE

Introduction: Defining/Distinguishing Attributes

There are several navigation channels in the region, connecting the main ports with the navigation routes that are located in the offshore parts of the region. These reflect the trade links as well as the high volume of shipping in certain parts of the region such as in the Humber and The Wash embayment. For example, the upper reaches of the Humber is accessed by several named channels that take a path around the various sandbanks and islands in the estuary. In The Wash, similar features are evident, but also purposely embanked channels that were regularly maintained so as to provide consistent access into and out of the Fens. Significant channels in the region were defined and named along the Humber for Hull, Grimsby and upper reaches of the Humber, and The Haven for Saltfleet; and in The Wash embayment, although those to the east associated with King's Lynn and access along the River Great Ouse were part of the East Anglia region.

Figure 43. The Haven channel, Boston (Oscar Aldred).

Historical Processes; Components, Features And Variability

The region's ports along its coastline have been important for international and national trade for centuries.

Access to different parts of the Fens was initiated by the Romans, perhaps made with the construction of Car Dyke, a channel that connected the southern parts of the Fens with its

northern reaches, linking the Granta, or Cam, to the Ouse. Another Roman channel, Foss Dyke, linked the Witham to the Trent, creating a navigable route that connected Nottingham and Lincoln. Foss Dyke was enhanced during the 12th century, and continued to be used, whereas Car Dyke fell out of use along most of its course after the Roman period.

The coastline has also undergone considerable changes. Early representations of the coastline reflected in 17th and 18th century charts shows a difference in the shape shown on more recent charts that is more than just an issue to do with mapping accuracy. This is because the coastal processes in the region have been affected by the erosion and deposition of sediment, and which has also determined which places were accessed from the sea. Furthermore, inland waterways, as a part of the Fen reclamation have altered the way in which inland areas were accessed. For example, increased reclamation of the Fens from the 17th century onwards created greater access from the sea but also changed the sedimentation rates coming from the newly drained land. Access to Boston was enhanced, and possibly to Spalding, where specific channels were made and reinforced. As a result, a few of the named channels in the region are relatively late in date, accompanying the development of the reclaimed areas of coastal land. In early periods mariners would have had to be familiar with the navigation features in order to safely navigate in and out of the ports, but with the advent of more widely available mapping, navigation channels in this region became more known.

The Humber consists of several named channels on 19th century Admiralty charts, many of which also coincide with navigational hazards such as wrecks, sandbanks and shoals. Names such as Hawk Road, Grimsby Road, Inner Road, Sunk Road, White Booth Road, and Hull Road are indicated.

Values And Perceptions

The navigation features discussed above are crucial to those using waterborne traffic in this region, especially in the Humber and The Wash. They have traditionally been significant to mariners attempting to navigate the treacherous waters. However, the channels are probably little known to the general public other than defining areas where shipping movement has been regularly occurring.

Research, Amenity And Education

Research into navigation features contributes much to our knowledge about the history of navigation, and the ways in which the sea and estuaries were used in this region. A thorough study of historic maps and charts may indicate when channels came into being, were used and when they became redundant. Records of past channel-dredging activity could similarly add to our understanding.

The navigation features such as channels are by definition related to shipping and are also useful to non-professional sea users such as leisure sailors. However, concentrations of shipping along particular stretches of the coastline, such as the Humber and The Wash also contribute to the distinctive character of those areas. Navigation features such as channels (active and disused) are also evidence for the seascape of other features such as the history of trade, shipping and military in the region.

Condition And Forces For Change

As outlined above the character of navigation features has changed over the centuries as a result of the dynamic seabed and coast in this region. This is set to continue, with possibly dramatic changes as a result of sea level rise and increased storminess, which includes the release of sediment from erosion of the coastline. In addition the region is undergoing

significant development associated with the development of its ports. This may result in the dredging of new channels or changes to existing regimes.

Rarity And Vulnerability

Navigation features are frequently lost or rendered redundant as a result of changes to the region's environments. The name and position of channels have been recorded on Admiralty charts and will probably continue to be so. Maintenance dredging can alter both the character of these features and the seabed in which they lie. This may have effects on surviving palaeoenvironmental deposits in areas where palaeochannels are used as navigation channels.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: NAVIGATION

CHARACTER TYPE: NAVIGATION HAZARD

Introduction: Defining/Distinguishing Attributes

The region can be broken up into three areas with respect to its navigation hazards. The first is located around the Humber, which includes Spurn Point, where mixed mud and sand banks have a proliferation of wrecks. This was and continues to be an active shipping zone. Spurn Point also contains shoals and rocky ground, with a significant number of wrecks.

The second area is located along the Lincolnshire coast, and has few navigation hazards, although the long-shore drift that moves from south to north creates swells and difficult navigation (although not the dominant character type). There are a few shoals scattered along the inshore area, though close to the shore there are.

The third area is located in The Wash, which is defined as largely hazardous because of the shifting waters and constant movement of the underlying sandbanks. The channels and routes in this area are often prone to change, as suggested by the use of Old and Former in the names ascribed to channels (Bowskill 1998).

Figure 44. Spurn Point from the Humber.

Historical Processes; Components, Features And Variability

Sandbanks have acted as significant navigation hazards in this area for centuries. Most of the sandbanks are the product of reworking of fluvial, deposited sediments and erosion of cliffs; up to 2-3 miles of coast have been lost since the Roman period, creating a large area of moveable sediment. What is more, sediment coming from the reclaimed land areas in the Humber, Lincolnshire and Fens in The Wash, has contributed to the formation of sandbanks. These features often change shape, and are highly dynamic. Some of these changes can be seen between maps of different dates of the same areas. Knowledge and understanding of the natural hazards will have varied over time too, although local mariners will have kept note of the slow change. For example, Sunk Island which is today inland from the Humber estuary was originally an island in the Humber. The area to the north of Sunk Island was a channel in the Humber in the late 17th century, but is now a drainage channels called Fisherman's channel.

The proximity of navigational features and strong currents in the area has often resulted in the loss of vessels. Out of the three areas mentioned above, the Humber contains the greatest density of wrecks, which are mostly post medieval in date. However, wrecks probably started to accumulate during the Roman period and possibly before then if this was an active navigable route (which it was). The recorded losses on sandbanks illustrate the variety of transport that has used the adjacent channels. Many of these lie along long-lived coastal routes between London, East Anglia and the North, as well as Europe.

Values And Perceptions

Navigation hazards are often prominent in the consciousness of coastal communities as a result of the loss of lives they can cause.

Many of the sandbanks in the region are named. For example, in the Humber in the 19th century there was an area of sandbanks called the Middle, Burcom, Bull Sand, Holme Sand, Paull Sand, Skitter Sand. In the 17th century, there was Sunk Sand, Trinity sand, Burcum, Cly Nesse, Bull, Sandhaile Flatts, Staningborough Flatts, Foule Home, Cherrycum Sand, Skitter Sand, Hasell Sand, Hebles. In The Wash, there is Long Sand, Roger Sand, Hook Hill, Herrion Sand, The Scalp, Mare Tail and Gatt Sand. It is because these names were well-known locally, some of which continued to be used over a long time, that illustrates their significance in people's perceptions. Shipwrecks also provoke strong feeling among the maritime community and within the general public.

Research, Amenity And Education

The shipwreck assemblage within the region has considerable research potential due to its range of dates and types. Those wrecks for which we have details can tell us the origins and routes taken and, in the case of well-preserved vessels, the details of shipbuilding. Overall this would enhance our understanding of the region's maritime links in the UK and abroad.

Wrecks are also valuable for a number of other reasons. For example they have ecological value. Wrecks create an artificial reef for more unusual ecosystems which can be studied. In the same way wrecks can be a useful resource for fishermen. In this region lobster potting in particular is known to take place on wreck sites offshore. For many of the same reasons wrecks attract divers who are keen to view wildlife as well as things of historical interest.

Condition And Forces For Change

The navigation hazards in the region are in variable condition. Due to natural processes shoals and mud or sand banks are often in constant flux. This may be aggravated in the future by climate change, in particular sea level rise and increased storminess. In addition this

dynamism is also affected more directly by human activities such as harbour and channel dredging and increased industrial development in the coastal and marine zones.

The condition of the wrecks also varies depending on location, age and material. These may also be affected by increasing storminess and changes in the sedimentary regime. Wrecks are also affected by trawling which can destroy structures and spread material.

Offshore development can be detrimental or destructive to shipwrecks, however work carried out in advance of development can locate previously unknown wrecks through survey or lead to protection of certain sites. Survey as, for example, carried out in conjunction with the Protection of Wrecks Act 1973, can also give us updates on the condition of wrecks.

Rarity And Vulnerability

Shoals, flats and sandbanks are often dynamic, as outlined above, and can influence the rates of erosion along the coastline because they can act as barriers from waves and can be sediment sources or sinks (D'Oler 2002). As the climate changes all these processes are subject to change in response. From a heritage perspective the wreck resource is constantly at risk of destruction from erosion, and is constantly under threat.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: PORTS AND DOCKS

CHARACTER TYPE: PORTS AND DOCKS

Introduction: Defining/Distinguishing Attributes

The ports along the region's coastline are a key feature of the region's character. Furthermore, a number of existing large ports were, and continue to be, crucial to the UK economy. The main ports and harbours that are located at Hull (with its extensive docks), and to a lesser extent Grimsby and Boston, are also regional centres. There are several smaller ports along the coast, although there are considerably fewer than other regions such as the south-east or west of England due to the difficulty of landing larger vessels. The ports listed in the Ports and Harbours of the UK are as follows (from north to south): Hessel Haven; Barrow Haven; Goole; Hull; Humber Sea Terminal; Immingham; New Holland (Old Ferry Terminal); New Holland Dock; South Killingholme; Wainfleet Haven; Boston; and Fosdyke. There was an old port also at Barton Haven.

Figure 45. Kingston-upon-Hull docks, south of Scott Street Bridge.

Historical Processes; Components, Features And Variability

Not much is known about the early history of ports in the region, although it is likely that there were some during the Roman period, both in The Wash and the Humber. Any that were on the Lincolnshire coast have now disappeared due to a retreating coastline.

During the early medieval and medieval periods the ports of the East Yorkshire to The Wash region had an important role in shaping the region's historic character. Hull, Grimsby and Boston all had a contribution to make, as they continue to do so today (http://www.ports.org.uk/index.asp). Many villages have been lost to the sea along the East Yorkshire to The Wash coastline. For instance the medieval port at Ravenser Odd which was built on sandbanks until the sea and storm forces began eroding the port facilities in the 14th century. The settlement was eventually abandoned, and its population moved to Hull (http://en.wikipedia.org/wiki/Ravenser_Odd; Sheppard 1912). Other settlements along this region's coastline met similar fates, with a projected coastline change of 2-3 miles since Roman period.

In 1297, Hull became the only port from which goods could be exported overseas in the county of Yorkshire. In the 13th and 14th centuries, it was a major English port for the export of wool; much of it going to Flanders with wine as a major import in return. By the 15th century trade with the Hanseatic League had become important, and in the same period the growth of the English cloth industry meant that its export from Hull increased whilst wool exports decreased. The 16th century brought a considerable reduction in the amount of cloth traded through the port, but the export of lead increased. By the late 17th century Hull was the third largest port in after London and Bristol. Up until 1773, trade was conducted by the Old Harbour, also known as The Haven, which had a series of wharves with warehouses and the merchants' houses backing on to the wharf along the High Street. In the late 18th century the first docks were built on the east side of the River Hull, after which several others were constructed, including wet and dry docks. Hull today is the UK's leading timber port, and is the only passenger port on the Humber estuary. The port's position on the north bank of the River Humber also provides a major geographical advantage for transport links in to and out of the UK, especially to the north. The port has short-sea trade links with Europe, Scandinavia and the Baltic, in addition to world-wide deep-sea services. In addition, there are direct rail connections to the deep-water berths in King George Dock (Allison 1969).

During the 12th century Grimsby developed into a busy little fishing and trading port. In 1201 the town received its charter, and the town continued to grow and prosper until the 15th century. It started a long period of decline after the Haven began to silt up. By 1801 Grimsby's population was only 1,524. But with improvements in rail connections, and in the fisheries, during the 19th century Grimsby had improvements in its port development, with increased trade and population growth. By the late 19th century the town had 75,000 inhabitants (Gillet 1970).

The Great Grimsby Fish Docks is one of the major, long-standing centres of the UK fishing industry; Grimsby has evolved into the country's premier centre for the frozen food industry. As the fish industry at Grimsby grew, merchants from Spain, France and Germany as well as London were regular visitors to its fish market. The now well-known landmark- the Dock Tower, based on the design of the Palazzo Publico in Sienna - was opened in 1852 - designed to act as an accumulator of the water pressure operating the lock gates machinery and quayside cranes. By 1857, the first specialised fish dock, covering six acres, had opened. The port was about to rapidly grow and develop (Bale 2010).

With its excellent congestion-free rail, road and transhipment access to major UK markets, this port is now one of the country's fastest expanding and busiest complexes. It deals with a diverse range of general goods including some 250,000 vehicles per year and can handle vessels carrying up to 6,000 tonnes of cargo. Grimsby offers a natural route connecting Britain with mainland Europe and the rest of the world. The port's strategic location – only 10

km from the open sea on the Humber estuary – makes it an ideal option for shipping services between the UK and Scandinavia, the Baltic, Germany and northern Europe.

In the 12th century Boston became one of the main ports of medieval England, exporting wool from monastic and other estates, lead from Derbyshire and salt from the Lincolnshire coast. Imports included fine cloth, wine, furs, leather, spices and other luxury goods from Europe. International trade flourished; merchants of the Hanseatic League of ports came to dominate trade in the North Sea and Baltic, and they built a local depot in Boston in 1260. By the 1280s a third of all wool exports from England went through and out of Boston and in 1300 nearly 2 million litres of wine came into the port (Rigby 1984).

Figure 46. Boston warehouse (Oscar Aldred).

In time the canal linking Boston to the Midlands began silting up and when the Hundred Years War started with France in 1341 the wine trade was greatly reduced. After 1430 the wool trade slumped and by the early 16th century most of the Hanseatic merchants had stopped visiting Boston. By this time Boston was a local port handling a wide variety of goods for Lincolnshire, in and out, but with no major national imports or exports. By 1750 the River Witham was so shallow that few vessels could reach Boston. However, with the support of the economic effects produced by the Agricultural and Industrial and Revolutions the fortunes of the port were transformed. In the 1760s the vast reclaimed area of Holland Fen to the west of Boston started producing arable crops. This new produce had to be sent by water inland or around the coast to the centres of increasing population, and Boston became a rich boom town and port flourishing on the new trade.

During the Napoleonic Wars more of the fens around Boston were reclaimed and the coastal traffic of the port grew even greater. By 1848 it was the largest and richest town in the county but then the Great Northern Railway gave quicker access than by coastal shipping, and the port's prosperity evaporated. For thirty years the town stagnated until the Corporation built

Boston Dock and improved the Haven to start a revival of foreign traffic. It has expanded considerably during the 20th century. The Port covers 246 sq km of The Wash and 31 buoys are maintained to mark the approach channels. The River Witham is navigable for commercial shipping for 8km and 32 lighted river beacons allow safe passage on any tide. Pilotage is compulsory for all commercial vessels through its difficult channels avoiding sandbanks (Lower and Richardson 1997).

Values And Perceptions

The ports of Hull, Grimsby and Boston are economic hubs, and their character reflects this. The smaller ports or former ports try to sustain their character, retaining small fishing fleets or areas of trade, docks and warehouses. Some have adapted to modern use. Many ports have also become tourist destinations, retaining their maritime character without any industrial or trade element. Many of the disused docks in the ports are now used as maritime heritage attractions, such as at Grimsby.

Research, Amenity And Education

The ports in the region are essential to the UK's transport infrastructure and economy. They are also vital to the local economy, providing employment. RCZAS has conducted some research into the archaeology of ports and docks, but there is scope for further research.

Condition And Forces For Change

The ports and docks, like many places along the region's coastline have been subject to different types of natural and cultural forces for change throughout their history. However, only a few ports continue to exist in the region, and many have fallen into disuse and disrepair. Climate change and erosion remain real threats to the ports and docks along the coastline. Where historic dock structures may remain these forces continue to act.

As a result many of the ports are embarking on large development projects, supported by the government funding; for example Grimsby docks which is getting support to improve its coastal defences.

Rarity And Vulnerability

The ports and docks of this region have always been vulnerable to external factors such as silting of harbours and international relations. This remains the case today, particularly with regard to the problems of erosion and deposition seen along this coastline. Any archaeological remains of docks in the area are at constant risk of destruction from erosion which is expected to worsen as sea levels rise and storminess increases. Ports are relatively scarce in the region, and while there are several many smaller ports, these are in danger of being lost as a result of the decline of the fishing industry, in particular, and the increased destructive power of coastal processes.

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EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: RECREATION

CHARACTER TYPE: RECREATION

Introduction: Defining/Distinguishing Attributes

Recreation and seaside entertainment is located predominately along the Lincolnshire coast. Much of the coastal strip has been significantly altered by 20th century development of caravan parks and seaside resorts, and as a result many people come every year to the holiday parks, camps, resorts and entertainment parks and piers. This produces a distinctive regional seasonal character. The infrastructures remain all year round, and therefore maintain a presence in shaping the character of the region. The holiday camps, resorts and entertainment are located along the coast from Cleethorpes and Mablethorpe in the north to Skegness in the south.

There are many golf courses in the region, taking advantage of the dunes and sand, principally located along the Lincolnshire coast. There is also several wildlife watching areas, usually in areas that straddle the inter-tidal and coastal zones. Pleasure piers and related promenades in the region are located at Skegness and Cleethorpes.

Figure 47. Skegness (Oscar Aldred).

Historical Processes; Components, Features And Variability

The coast as a recreation and tourist destination emerged in the late 18th century when wealthier members of society were beginning to appreciate the healthy air and relaxation of the seaside (Williamson 2005, 141). On the coast, Cleethorpes, Mablethorpe and Skegness developed as tourist centres for holiday makers from the late 19th century. The middle-class areas of Victorian and Edwardian villas have been expanded during the 20th century by clusters of caravans, mobile homes, holiday camps and theme parks along much of the coastline in this area. The development of the recreational centre was largely influenced by the opportunities that the railway lines brought. Railways such as the East Lincolnshire Line, the Louth and East Coast Railway, the Alford and Sutton Tramway, Sutton Bridge Line and the Manchester, Sheffield and Lincolnshire Railway brought people to the coast from all parts of the country. Furthermore, these railway lines connected the Lincolnshire coast to other parts of England, facilitating easy transportation and particularly from the industrial towns.

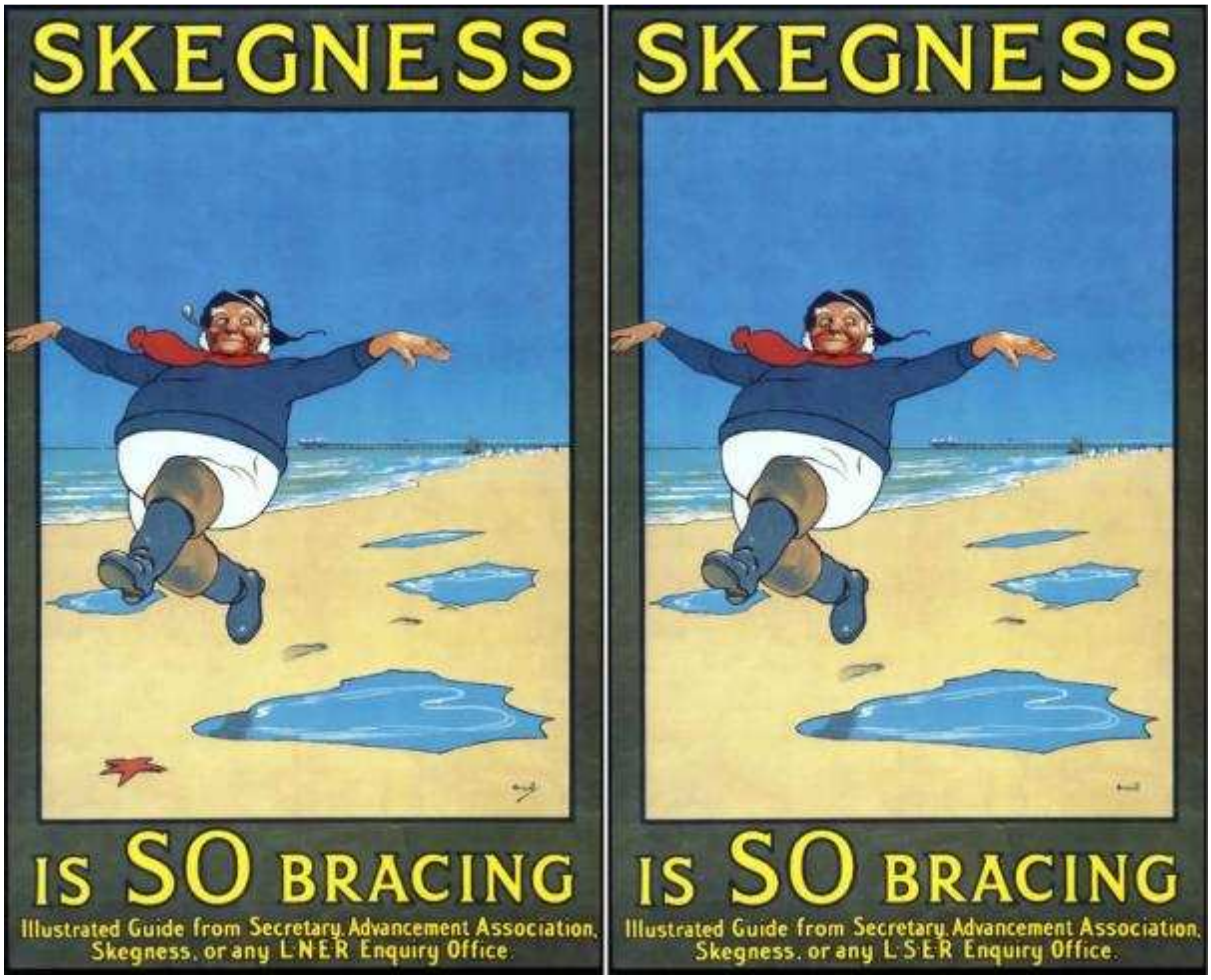

Figure 48. The Jolly Sailor.

www.ukcoastguide.co.uk Accessed 15/7/2013]

Cleethorpes developed as a 'healthy holiday' tourist resort in the 1820s, where taking sea baths and medicinal water was fashionable. The Pier opened in 1873, and a promenade in 1885. A mock castle intended to add to the historic character of the resort was built in 1863 by the Manchester, Sheffield and Lincolnshire Railway

(http://en.wikipedia.org/wiki/Cleethorpes). Mablethorpe developed late as a resort destination but today it has a great number of arcade and seaside amusements.

Skegness is probably one of the UK's best known recreation and tourist destinations. Until the arrival of the railway line in 1875, Skegness was a small fishing village. Skegness's iconic image as a resort was also created in part by the railways. In 1908, the Great Northern Railway commissioned the 'Jolly Fisherman' poster that helped to identify Skegness as a tourist destination. The first UK holiday camp, Butlins, was established in 1936, at Ingoldmells, close to Skegness. The pier was opened in 1881, and steamboat trips ran to The Wash and Hunstanton from 1882 to 1910 (http://en.wikipedia.org/wiki/Skegness).

Values And Perceptions

Recreation and seaside entertainment have been an important part of the region from an economic perspective. Holiday resorts such as Skegness are perceived as centres for seaside entertainment, traditionally attracting families groups. In contrast to these large holiday centres, several areas of the coast are undeveloped, offering a different kind of holiday retreat. The infrastructure in these areas tends to be less developed, discouraging some holiday makers. The character of the recreation areas in the East Yorkshire to The Wash region are distinctive and nationally important.

Research, Amenity And Education

The region has benefitted from the advent of large scale tourism which has brought economic strength. In addition the construction of recreational facilities has benefitted the residents who utilise these facilities for much or all of the year. Recreational areas significantly improve the lifestyles of those who live nearby because they keep clean and managed leisure beaches or coastal paths.

The recreational tourist industry has developed over a century and is generally well understood. Research into tourism and recreation on a regional scale may better inform developments and management plans which aim to sustain the region's environment or build on its current facilities. It may also inform local communities of the advantages and disadvantages of tourism.

Condition And Forces For Change

Recreation on the coastline is a strong characteristic of the area and provides stable incomes and employment for local populations, but this does mean that it is susceptible to change when there is economic fluctuation.

There are development pressures inside the urban areas, where the institutional resorts such as Butlins are located. In other areas, many places are protected in some way, under designations such as SSSIs and Heritage coasts which does not allow for major change. However there is increasing pressure for development in the area which may impact upon its historic character. Rises in sea level and increased storminess could have an effect on the region's recreation character as they become undesirable destinations or facilities are affected.

Rarity And Vulnerability

The recreation character type as a whole is not rare. However, the region contains some of the more significant coastal recreational destinations in the UK, which makes them more distinctive than other regions. These characteristics may be at risk from development if it is allowed to take place in certain areas, or if economic downturns have a negative effect on tourism. The tranquillity of the area is important to the local community and could be perceived to be at risk from the institutional tourism.

Published Sources
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Websites
http://en.wikipedia.org/wiki/Skegness

EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: SETTLEMENT

CHARACTER TYPE: SETTLEMENT

Introduction: Defining/Distinguishing Attributes

The coastal settlements of the East Yorkshire to The Wash region vary in character, from villages such as Sutton, Easington, Spurn Point, Paull, and Anderby Creek (along the Lincolnshire coast), to industrial centres along the southern shore of the Humber such as North Killingholme, to the regionally important places such as Hull, Grimsby, Boston and Spalding, and the bustling tourist destinations such as Skegness and Mablethorpe. The regional centres have distinctive urban characters, such as the port of Hull, fishing at Grimsby, and for recreation and tourism at Skegness.

Several less tourist-orientated settlements along the Humber have a character that is maritime due to their location, such as Ferriby, Winteringham, and along the coast, especially in The Wash area, such as the scattering of hamlets like Freiston Shore, Benington Sea End, and Wrangle.

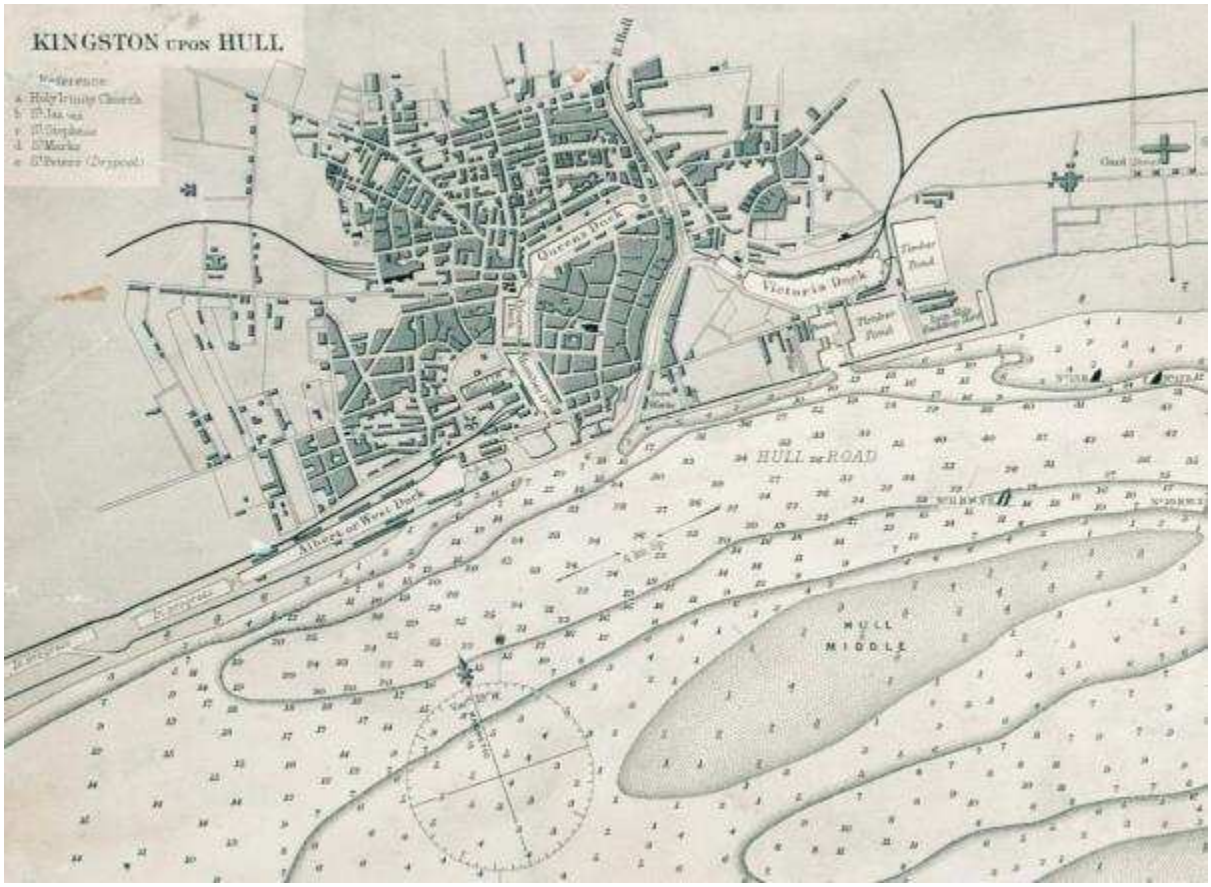

Figure 49. Hull [published 1878 UKHO archive - OCB109-C1.]

Historical Processes; Components, Features And Variability

The coastline within the region has undergone several periods of change that has affected the development of settlements through time; periods of both expansive land bridges that joined England with Europe, as well as periods of inundation, covering earlier settlement, and coastal processes that have eroded evidence of settlement. Coastal and sea activities have then largely shaped and defined the nature of settlement in the region in one way or another.

There is limited evidence for later Palaeolithic presence: at Anderby several flint blades were recovered from the foreshore (Jobling and Brigham 2010). In addition there are several areas of submerged forests such as at Grimsby, Mablethorpe, Sutton-on-Sea, and Skegness (Tann 2004, 17) which might be associated with contemporary human activities before the Neolithic. Thus, these areas are also likely to have evidence for the Mesolithic settlement (Van de Noort and Davis 1993), especially the beaches between Mablethorpe to Skegness, that predate though were the foundation for the more typical settlement period from the Neolithic onwards.

The Neolithic is a period of expansive settlement activity, with the clearance of woodland, and the adoption of cereals. Casual finds of flint artefacts suggest possible areas of settlement on the foreshore at Mablethorpe, Trusthorpe, Huttoft, Chapel St Leonards, and Skegness. Neolithic/Bronze Age flint blades or flakes have also been found from Trusthorpe and Chapel St Leonards, as well as barbed and tanged arrowheads recovered from Skegness. Although the Bronze Age is poorly represented, a scraper, dagger and antler pick were found from Chapel St Leonards, and an axe hammer from Skegness. Further indications of possible settlements were found at Ingoldsmells with the discovery of Bronze Age burials.

Nationally important saltings or salt production sites from the Iron Age and possibly in the Roman period have been found across much of the region from Donna Nook to Gibraltar Point (Jobling and Brigham 2010). Settlement activity was found at Ingoldsmells, and possibly from Sutton-on-Sea. A Roman road alignment was found at Saltfleetby, suggesting a former settlement at its seaward end which has been eroded by the sea. Other possible Roman sites have been found at Fishtoft, Trusthorpe, Huttoft, Anderby Creek and Chapel St Leonards.

There is little evidence for settlement in the early medieval period except in a few places in The Wash embayment, for example at Fishtoft and Gosberton. Furthermore, there is suggestion that permanent settlement was located on sand ridges, roddons and islands in fen areas at Easington, as well as in the East Anglia region fen edge at Terrington (Carver and Loveluck Appendix 5, in Ransley and Sturt 2013). However, early medieval settlement is likely to have been west of the so-called Roman Bank that ran parallel to the present-day coastline, which is now under modern day settlement.

The medieval period is well represented across the region, which also coincides with local reclamations and the building of sea defences. The lack of ports along the central stretch of the region between Grimsby to Boston, suggests that settlements such as Saltfleet Haven, Mar Haven and Mare Haven, were moorings for vessels rather than harbours with infrastructures. Smaller settlements in relation to these moorings were established at Freiston, Skidbrooke, Saltfleetby, Theddlethorpe All Saints, Theddlethorpe St Helens and Mablethorpe, and settlements along the Humber. There are also moated settlements at Mablethorpe and Skegness, although these are too small to have been included in the characterisation. Several of the medieval settlements located close to the coast were also associated with salt production. Many of the settlements dating to the medieval period have continued today, and these are all present on the modern OS maps.

There is a strong correlation between settlement patterns and salt production, and at places where small boats could land in connection with local fishing. In later periods settlements that were established in this way grew into commercial ports and had correlating industrial production areas or became recreation centres. In the region, Hull, Grimsby, Skegness and Boston are all regional centres (see Ports and Docks, as well Recreation).

Values And Perceptions

The settlements in the region that lie on the coast are of several types. There are commercial centres, often regional centres as well, such as Hull, Grimsby and Boston. There are also smaller settlements that have taken on more recent uses as holiday resorts and recreational character, such as Cleethorpes, Ingoldsmells, Mablethorpe and Skegness. There are also smaller settlements that have retained earlier features and not developed significantly in terms of their size or population. Many of the settlements in the region are either commercial centres or retreats for leisure and holidays. The settlements are often associated with the sea and maritime activities, especially with the fishing industry, as well as other offshore industries and activities, but more recently as tourist destinations because of their proximity to the sea.

Research, Amenity And Education

Settlements along the coast are often of unique character, important features in the region, bridging the gap between land and sea*scapes*. Settlements in the region often demonstrate time-depth and significantly contribute to the perceived character. Settlements tend to have varied histories making them amenable to further research. There is potential for considerable historical and archaeological research including educational projects. For example, many of the settlements discussed above have historical features and landscapes which could be used to create walks and trails.

Settlements are also vital to tourism and industry in the region, and for its economic strength, particularly in the summer months. The historic character of settlements is a key feature for tourism, and facilities such as docks and quays, piers and leisure beaches are important features for bringing people to the region.

Condition And Forces For Change

The majority of settlements along the coastline in the region have undergone considerable change since the medieval period, whether this is associated with population, socio-economies, or from the depletion of a settlement's physical assets as a result of destructive coastal processes. The main forces for change come from natural sources, such as rising sea level and increased storminess, but also from cultural processes such as re-use of buildings and land that alters the character of a place.

Rarity And Vulnerability

Many settlements in the region have a coastal character. Many settlements possess considerable time-depth, maintaining links to the North Sea, in one way or another. However, the character of the settlements is at constant risk from several directions, such as the development and over-exploitation of the coastline from industrial or recreational processes, as well as from coastal processes. Infrastructure in the region also remains rather fragmented which, while allowing smaller settlements to remain rural and preserve their historic character, also makes them more prone to depopulation. The development of the major ports may see distinct changes to the larger settlements, although there is a significant local interest in retaining character.

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Ransley, J. and Sturt, F. (eds.) 2013. *People and the Sea: A maritime archaeological research agenda for England.* York: Council for British Archaeology.

Tann, G. 2004. *Lincolnshire Coastal Grazing Marsh. Archaeological and Historical Data Collection*. Lindsey Archaeological Services.

EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: UNIMPROVED GRAZING

CHARACTER TYPE: COASTAL ROUGH GROUND

Introduction: Defining/Distinguishing Attributes

Coastal rough ground, incorporating rough grassland, scrub and heathland, is located along a few stretches of the coastline within the region. The more significant areas are incorporated into other character types such as Wildlife watching, or Military practice areas. In the region, the area that has the most extensive area of coastal rough ground not characterised as another type is along Spurn Point.

Figure 50. Coastal rough ground between the two lighthouses (old and new) at Spurn Point.

Historical Processes; Components, Features And Variability

Coastal rough ground in this region is usually represented by areas which would naturally be under tree-cover. 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. This subsequently allows the development of the characteristic under scrub vegetation dominated by heather that inhibits woodland regeneration (Williamson 2006). The areas under coastal rough ground are also exposed to the North Sea weather and coastal processes

that subject it to the threat of erosion. Spurn Point is a dynamic piece of coastline that has been transformed in several different ways; its eastward/seaward exposure is eroding, while its westward exposure is accreting from alluvial deposition. The areas along the Lincolnshire coast, between Donna Nook to Gibraltar Point, were once coastal rough ground areas which have now been used for the expanding recreational and resort uses since the early 20th century.

Values And Perceptions

Coastal rough ground is important in the region for a number of reasons. The heathland in particular is viewed as a valuable asset in terms of its beauty and its importance to wildlife, bringing tourism to the region. Coastal rough ground as a whole has value to the local community as a recreation area adjacent to the sea. Undeveloped land in the coastal zone is valued for these reasons.

Research, Amenity And Education

The coastal rough ground in the region is potentially vital for understanding past human land use. The landscape itself is a product of a specific type of human activity that has chosen to leave areas as coastal rough ground. The landscape type is also important in terms of its potential for research and education with regards to its ecosystems and wildlife. In particular, the areas of rough ground are important areas for walkers and for wildlife watching.

Condition And Forces For Change

Coastal rough ground areas in the region are nationally important because they are relatively scarce across the UK. The cultivation of traditionally grazed land and wide-scale establishment of conifer plantations, as well as development of the coast (such as the construction of military facilities like airfields, the conversion into recreational centres and the protection and management of which were turned into wildlife watching areas) resulting considerable pressure from multiple directions. This, coupled with its' relatively rarity make the coastal rough ground a valuable character to help manage. A number of measures are helping to protect coastal rough ground, and reversing the decline of heathland. This includes the UN Convention on Biodiversity (1992) which led to the 1994 UK Biodiversity Action Plan in which lowland heathlands were identified as a priority habitat with targets set for their conservation and recreation.

Rarity And Vulnerability

There is little ancient heathland surviving in England (see http://www.forestry.gov.uk/england-heathland), and even less in coastal areas. Whilst coastal rough ground has been at risk in recent years this risk has now receded with recognition that this is an important landscape type. Agricultural economic forces and recreational pressures have left much coastal rough ground at risk from neglect and visitor erosion. However, this risk is recognised, and measures to reverse its decline and maintain its character.

Published Sources

Williamson, T. 2006. *England's Landscape: East Anglia*. English Heritage.

Websites

http://www.forestry.gov.uk/england-heathland

EAST YORKSHIRE TO THE WASH REGIONAL PERSPECTIVE CHARACTER DESCRIPTIONS

BROAD CHARACTER: WOODLAND

CHARACTER TYPE: WOODLAND

Introduction: Defining/Distinguishing Attributes
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-focussed activities. Patterns of woodland also form distinctive elements of the coastal landscape visible from the sea, aiding position-finding from ships. However, there are few areas of coastal woodland in the region. The only woodland that has been characterised is a plantation associated with Wainfleet.

Historical Processes; Components, Features And Variability
In general it is unclear at what date the region was deforested, although this was probably during the Neolithic period. Indications of submerged forests on the shores of the Lincolnshire coast date to the Mesolithic. Following the clearance of the wildwood, there would have been areas of wood pasture where livestock would have grazed. There is little or no woodland recorded in Domesday for this area, instead, marsh and wetland dominated.

Values And Perceptions
Woodland is highly valued. In particular, woodlands are viewed as peaceful and tranquil places which attract those wanting to get away from the tourist hubs. Some woodland areas are protected. However, there are no Ancient Woodland designations with seascape character in the region. Wooded areas, although valued as a building material for ships, would have been sourced from Ancient Woodland, but also from imported wood.

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).

Opportunities to raise public awareness of the inter-related cultural, ecological and other aspects of coastal woodlands have been 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
The fact that there are no areas of woodland in the region suggests that there can be no forces for change.

Rarity And Vulnerability
Areas of ancient woodland are certainly rare nationally. However the younger plantations are a common feature of the landscape. Most woodland is sustainably managed and protected where necessary; therefore it is not particularly vulnerable. However the proposed reversion of areas of plantation may mean that this sub type is at risk in certain regions. Future political plans for woodland may also put them at risk.