The Assessment and Management of Marine Archaeology in Port and Harbour Development -

Historic England

wessex archaeology -

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Contents

List of Abbreviations

AEZ – Archaeological Exclusion Zone

BMAPA – British Marine Aggregates Producers Association

BP – Before Present

DCO – Development Consent Order

dGPS – Differential Global Positioning System

EIA – Environmental Impact Assessment

EU – European Union

GIS – Geographic Information System

HER – Historic Environment Record

HSC – Historic Seascape Characterisation

HSE – Health and Safety Executive

CIfA – Chartered Institute for Archaeologists

JNAPC – Joint Nautical Archaeology Policy Committee

LPA – Local Planning Authority

MMO – Marine Management Organisation

MPS – Marine Policy Statement

NPPF – National Planning Policy Framework

NPS – National Policy Statement (for Ports)

NRHE – National Record of the Historic Environment

NSIP – Nationally Significant Infrastructure Project

PLA – Port of London Authority

OASIS – Online AccesS to the Index of archaeological investigationS

ROV – Remote Operated Vehicle

SMR – Sites and Monuments Record

UKHO – United Kingdom Hydrographic Office

USAAF – United States Army Air Force

UXO – Unexploded Ordnance

WSI – Written Scheme of Investigation

Summary and Key Messages

Port and Harbour developments within intertidal and marine environments have the potential to impact a wide range of heritage assets that hold value for this and future generations. This risk to the historic environment can be managed through the processes of environmental assessment: through identifying and assessing potential impacts and through the adoption of appropriate mitigation strategies to minimise risk, preserve assets *in situ* or to record assets before they are lost.

This document provides practical advice on assessing the impact of port and harbour development in England upon the intertidal and marine historic environment. The information presented here is relevant to port and harbour owners, operators, developers and contractors, regulatory authorities, curators, archaeological consultants/contractors and other stakeholders.

The document does not address elements of the historic environment located above high water. Neither does the document address the effect that routine port operations or activities covered under existing Harbour Orders may have upon heritage assets. Rather the document focuses specifically upon the environmental assessments required for new development projects only, including applications for new Harbour Revision or Empowerment Orders.

Overall, the aim of this document is to provide good practice advice for any organisation or individual involved in the planning and development of port and harbour facilities that involve marine environmental assessment. It is intended as a model to demonstrate how the historic environment represents a component of responsible environmental stewardship as necessary to support the securing of consent. The key messages set out within this document are as follows:

1. Introduction

- The application of good practice in relation to the historic environment represents a component of responsible environmental stewardship as necessary to support the securing of consent;
- The need for advice is prompted by inconsistency in approach to the historic environment within ports and harbours coupled with the current national requirements for substantial additional port capacity and the resulting increasing pace of port and harbour development and enhancement programmes;
- This advice is relevant to regulatory authorities, curators, developers, port authorities and harbour commissioners, contractors, archaeological consultants/ contractors and other stakeholders;
- The advice addresses only those aspects of a development or redevelopment that fall within marine and intertidal areas only and consideration of the development of port and harbour facilities above high water is not included.

2. The Historic Environment

- Many ports and harbours in use today have a long history of use, often extending back into prehistory, which has left evidence in place below the high water mark and which may inform gaps in knowledge of our nations' maritime past;
- The range of potential heritage assets encompassed within the intertidal and marine historic environment comprise sites, structures, features and artefacts associated with:
  - Submerged prehistory: (evidence for the occupation of terrestrial and coastal prehistoric landscapes at times of lowered sea level);
  - Maritime (evidence dating from the prehistoric period to the modern era relating to human exploitation of the sea, including supporting infrastructure);
  - Aviation (evidence dating from the advent of fixed wing-aviation in the first half of the 20th century).
- The potential for archaeological evidence within ports and harbours can be particularly high as sheltered, low energy environments favour preservation of heritage assets.

3. Conservation Principles and the Significance of Heritage Assets

- The significance of heritage assets depends upon a wide range of factors and there is no single approach as to how to measure this significance across the heritage sector although guidance is available to archaeological contractors, consultants and developers in how to address the issue of heritage significance;
- Historic England's approach to 'constructive conservation' aims to recognise and reinforce the historic significance of places, while accommodating the changes necessary to make sure that people can continue to use and enjoy them;
- The term 'heritage significance' expresses the sum of the cultural and national heritage values of a place and considers not only material remains but also the social and cultural circumstances in which they were produced, their relationship to the different ways in which they may be valued by people and the relative importance of these values, historically-associated objects and collections and the contribution made by their physical context and 'setting';
- In environmental assessment, heritage significance is most commonly expressed as a subjective measure, from low to high, of archaeological 'value' or 'importance', based upon professional judgement.

4. The Regulatory Framework

- The Marine Management Organisation (MMO) is the marine licensing authority, or marine regulator, and are the first point of contact for all port and harbour developments that take place below high water;
- Historic England is the Government's statutory adviser on the historic environment and, as the National Curator for England, Historic England acts as the historic environment advisor to the MMO;
- Local planning authorities are the regulator for all plans that affect works above the mean low water boundary (including intertidal areas). Advice on the historic environment is provided to local planning authorities by Local Government Archaeological Officers (LGAO), or local curators;
- The decision making framework for port and harbours developments considered to be nationally significant infrastructure projects is set out in the *National Policy Statement for Ports 2012*;
- The Government's planning policies for the marine environment are set out in the UK *Marine Policy Statement 2011*;
- Environmental assessment must be a consideration for all port and harbour development and redevelopment in marine and intertidal areas (governed by the 'EIA' Directive 2014/52/EU):
  - Screening: Not all schemes will require full EIA and it is the decision of the local planning authority or the MMO/Secretary of State whether or not EIA is required for an individual project;
  - Scoping: developers required to set out the level of detail and the sources of information that will be used in the course of EIA. Early and comprehensive scoping allows for areas of concern to be highlighted by the regulator, and other stakeholders, at an early stage in the process;
  - Advice on the screening and scoping process is provided by local authorities and by the MMO.

5. Establishing a Baseline

- The baseline will comprise both the known and potential historic environment;
- The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset;
- Individual heritage assets must be placed contextually within a wider framework of both the historic character and heritage significance of an area;
- Specific advice on the historic environment is provided by local (LGAOs) and national (Historic England) curators, including detailed information on the requirements for assessment pre-consent (to establish potential effects) and post-consent (to manage or mitigate these effects). Early engagement with curators is essential;
- Approaches to establishing a baseline for the historic environment will comprise a combination of the following interrelated data-gathering techniques:

    - Desk-based assessment;
    - Archaeological assessment of geophysical data;
- Geoarchaeological assessment (archaeological assessment of geotechnical data and palaeoenvironmental assessment of sediment samples);
- Ground-truthing (walkover surveys, test-pitting, augering, or trial trenching in intertidal areas, diver or Remote Operated Vehicle (ROV) survey in marine areas).

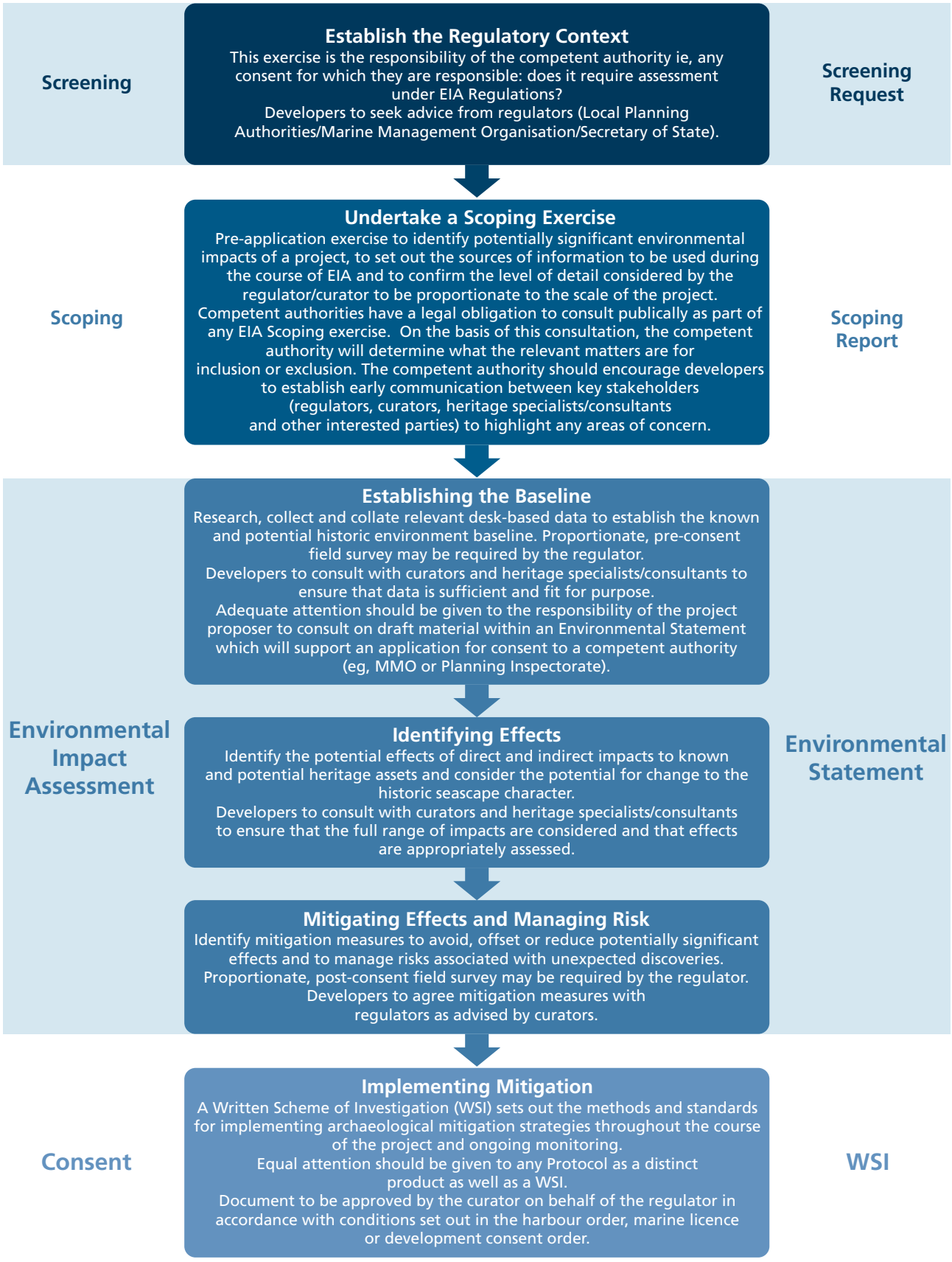
6. Identifying Effects

- All damage to, or disturbance of, heritage assets and their physical surroundings is permanent. Once damage occurs or an asset is lost it is not possible to retrieve the information that is correspondingly lost. It is nearly always the case that the effect of direct impacts to archaeological material will be considered significant;
- The effect of indirect impacts upon heritage assets is directly linked to any changes that can be predicted to occur to the prevailing physical processes within a study area. If these changes lie beyond the range of what might be expected to result from natural variation, they may be considered significant.

7. Mitigating Effects and Managing Risk

- Significant effects can be mitigated through:
    - Avoiding Effects (Preservation *in situ*) eg, archaeological exclusion zones;
    - Offsetting Effects (Preservation by Record) eg, desk-based research, geophysical and geoarchaeological assessment, ground-truthing anomalies, fieldwork to excavate and/or record a heritage asset;
    - Reducing Effects eg, watching briefs, reporting protocols;
- Any work carried out in respect of the historic environment should be disseminated into the public domain for the benefit of the public interest (formal publication, popular publication, grey literature, education and outreach);
- Mitigation agreed to avoid, offset or reduce significant effects should be set out in an archaeological Written Scheme of Investigation (WSI), often a requirement of consent.

The Environmental Impact Assessment Process



1. Introduction

1.1.1 The marine historic environment is a physical link to the past and is a shared cultural and intellectual resource that needs to be managed effectively if it is to be enjoyed and utilised by future generations.

1.1.2 The aim of this document is to provide good practice advice for any organisation or individual involved in the planning and development of port and harbour facilities in England, ranging from large scale, major ports through to the smallest harbours and marinas. The guidance includes an overview of the range of options available to developers and the heritage industry to ensure that the principles of 'construction conservation' (see Section 3.1.6) are adhered to. It is intended to demonstrate how the application of good practice in relation to the historic environment represents a component of responsible environmental stewardship as necessary to support the securing of consent. Where relevant, this guidance document has been prepared in a manner compatible to and consistent with guidance associated with other forms of marine development and industry, such as the marine aggregate industry, the offshore renewable energy sector and the fishing industry.

1.1.3 Ports and harbours play an essential role in the UK and the use and exploitation of the marine environment, including movement of goods and people by sea, remains vital to the operation of an island economy. As part of the energy sector, ports play a vital role in the import and export of oil, liquefied natural gas and biomass, in the construction and servicing of offshore installations and in supporting terminals for oil and gas pipelines (Department for Transport 2012). With regard to tourism and leisure, ports support many different forms of economic and social activity such as cruise liners, ferries and sea going pleasure craft.

1.1.4 In 2012 there were 110 active commercial ports in the UK with the 51 active major ports handling 98% of the overall traffic (Department for Transport 2013a). Total port freight traffic

London Gateway Port

in 2012 amounted to 500.9 million tonnes, compared to 2.3 million tonnes handled at UK airports and 770 thousand more units travelling between UK major ports and France than through the Channel Tunnel (Department for Transport 2013b). In 2011, the UK ports sector directly employed 117,200 workers and contributed approximately £7.9 billion to the UK GDP (Oxford Economics 2012).

1.1.5 The Government believes that there is a compelling need for substantial additional port capacity over the next 20–30 years, to be met by a combination of development already consented and development for which applications have yet to be received (Department for Transport 2012, 16). Government policy, set out in the *National Policy Statement for Ports* (NPS),[1] seeks to encourage sustainable port development to cater for this long-term forecast growth and it is formally recognised that 'new port infrastructure should ensure that access to and condition of heritage assets are maintained and improved where necessary' (Department for Transport 2012, 11).

1.1.6 This document was commissioned by English Heritage (now Historic England) as part of the National Heritage Protection Commissions Programme to provide information for the port and harbour industry on how to address the

1. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3931/national-policy-statement-ports.pdf

Port of Southampton

historic environment as part of environmental assessment programmes. These programmes will be required to support construction and redevelopment projects ranging from major port infrastructure projects, and all projects requiring Environmental Impact Assessment (EIA), to smaller developments that may not be subject to formal EIA. In the latter instance, planning authorities will often require the provision of baseline information in consideration of environmental issues, including the historic environment, relevant to their decision to grant consent.

1.1.7 It is recognised that approaches to assessing and managing the historic environment within the context of port and harbour developments must be proportionate and in line with other archaeological planning and mitigation standards in use in England.

1.1.8 This document outlines the techniques and methodologies that can be employed to identify a range of heritage assets that may be encountered during intertidal and marine port and harbour development and addresses the potential impacts to those assets and their setting. It will help port and harbour owners, operators and developers to recognise and categorise the options and processes for gathering enough quality data to avoid impacts to the marine historic environment and to mitigate those impacts that cannot be avoided.

1.1.9 The document is pertinent to regulatory authorities, curators, developers, port authorities and harbour commissioners, contractors, archaeological consultants/contractors and other stakeholders and has incorporated the views from those operating in the industry in these capacities.[2]

1.1.10 The advice addresses those aspects of a development or redevelopment that fall within marine and intertidal areas only and consideration of the development of port and harbour facilities above high water is not included here.

2. It is noted that the term 'regulator' can be used to refer to port authorities when specific powers in relation to heritage assets are held by them. In this document, however, 'regulator' is usually used to refer to the licensing authority (the LPAs, MMO or Planning Inspectorate on behalf of the Secretary of State). See Section 4 for more details.

2. The Historic Environment

2.1.1 The NPS for Ports (Department for Transport 2012, 65) defines the historic environment as:

> *all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, landscaped and planted or managed flora.*

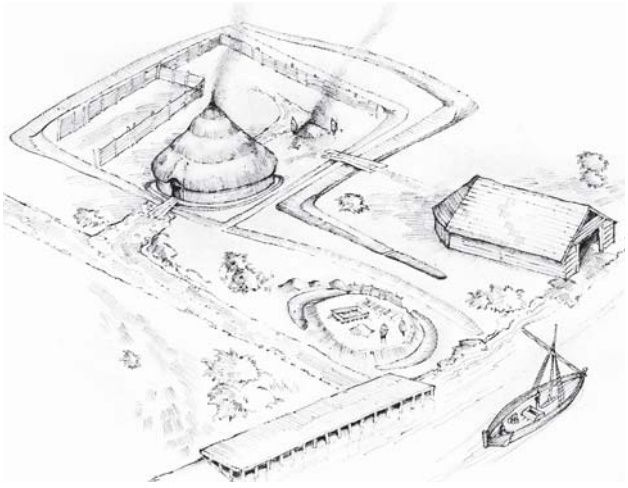
2.1.2 Many ports and harbours in use today have a long history of use, often extending back into prehistory. Even before any port infrastructure existed in a particular location, the advantages of natural geography and topography may have been utilised by early seafarers, and it would have been this early use that gave rise to increasing port or harbour infrastructure; from perhaps a few storage buildings in the late prehistoric or Romano-British period, to the multi-functioning port and container handling facility that we would recognise today. This historic use of ports and harbours has left evidence in place, below the high water mark, which may inform gaps in the knowledge of our nations' maritime past

2.1.3 The range of heritage assets encompassed within the intertidal and marine historic environment comprise sites, structures, features and artefacts associated with:

- Submerged prehistory: (evidence for the occupation of terrestrial and coastal prehistoric landscapes at times of lowered sea level);
- Maritime (evidence dating from the prehistoric period to the modern era relating to human exploitation of the sea, including supporting infrastructure); and
- Aviation (evidence dating from the advent of fixed wing-aviation in the first half of the 20th century).

2.1.4 Since the first recorded hominin (human or human ancestor) activity in Britain (*c.* 970,000 years BP), the entire north-west European landscape has been shaped by fluctuations in global climate. Alternating warm and cold conditions, and the associated rise and fall in relative sea level, have influenced both the evolution of the landscape as well as the suitability of these landscapes for hominin exploitation at various times in the past. Sea level at various points throughout the prehistoric period was substantially lower than today allowing for settlement within areas that are now submerged. Consequently, prehistoric archaeology within the marine environment includes not only the potential remnants of early watercraft but also evidence for the prehistoric settlement activities and wider landscape use within areas that were once dry land, but that are now located offshore.

2.1.5 The study of submerged prehistory is most often focused upon artefactual evidence (stone tools, organic artefacts and faunal remains brought to the surface during dredging or by fishermen, for example) and the assessment of the former environments in which our prehistoric ancestors lived (through mapping palaeo-landscapes and identifying preserved palaeo-environmental remains that demonstrate the types of resources that were available, the prevailing climatic conditions and the variety of flora and fauna present at times in which hominin activity took place). Within the intertidal zone there is also the potential for the remains of prehistoric structures such as wooden trackways, fish weirs/traps, buildings, human and animal footprints and stone structures. These types of *in situ* structures from the past may equally



Second century Romano-British salt production site and wharf on the Thames

survive in the marine environment although they are more difficult to identify.

2.1.6 The location of many ports and harbours, predominantly within rivers or estuaries, means that the potential for prehistoric archaeological evidence can be particularly high. The resources associated with watercourses were attractive to prehistoric populations and archaeological evidence for settlement is often concentrated around them. As sea levels rose, and former channels became submerged, prehistoric populations would have moved further inland but the evidence for these former settlements can now be found within the marine environment.

2.1.7 In addition, the selection of port and harbour locations, in areas protected from the high energy impact of the sea, will be a major factor in the preservation of some submerged heritage assets. High energy conditions have the potential to result in the increased physical degradation of heritage assets. As such, it follows that by comparison, low energy environments have the potential to favour the preservation of these assets. In many instances, this protection from the high energy action of the sea also allows fluvial and marine sediments to accumulate which in turn, may bury archaeological material. The low oxygen environment that these sediments may provide further increases the chance of preservation of submerged heritage assets. This is particularly the case in relation to organic material. On this basis, marine or waterlogged contexts are generally regarded to offer greater preservation to organic material than that provided by terrestrial contexts.

2.1.8 Evidence for early prehistoric maritime activities is rare although the resources required to construct simple watercraft, such as hide-covered log or boat rafts, would have been available during this period and it has been postulated that early prehistoric communities (late Upper Palaeolithic, *c*. 13,500 to 10,000 years BP) utilised these craft for coastal journeying and fishing (McGrail 1987; 2004). From the later prehistoric period (ie, from the Bronze Age period, *c*. 2400 to 700 BC) onwards, however, a much clearer understanding of the evolution of our past relationship with the sea emerges, from the discovery of early log boats and plank-built watercraft to the prowess of England's post-medieval sailing fleet through to the enormous container fleets of the present day. Since the earliest times that people were using watercraft, vessels have been periodically lost as a result of weather, collision, seaworthiness, equipment failure, abandonment, navigational error, or any combination of the above and countless other factors. These losses are commonly represented in marine and intertidal areas through wrecks and hulks, ballast mounds, cargoes and anchors, structural debris, and artefact assemblages. Artefacts from the sea may also be indicative of the use of these vessels, as well as providing evidence of historic shipping patterns and sea routes, with objects lost overboard, either accidentally or deliberately, ranging from cannonballs fired during naval battles to everyday items such as crockery and cutlery.

2.1.9 Evidence for the exploitation of the sea is also represented below high water through the fabric of ports and harbours. Maritime infrastructure such as quays, jetties, piers, wharfs, harbour walls and breakwaters, as well as the foundations of installations such as harbour walls and lighthouses, may be found below high water either as extant structures or as archaeological remains. Some features are protected by law as listed buildings or scheduled monuments and, therefore, require particular consideration within marine environmental assessment. Many undesignated features may also be of equivalent significance to designated assets and will be subject to similar constraints if impacted by development. Up to date details of all nationally designated heritage assets are held in the National Heritage List for England database.[3]

2.1.10 Examples of extant structures may also include wartime installations associated with the defence of Britain, particularly during the First and Second World Wars. Below ground features and demolished or destroyed structures may also be represented archaeologically within marine and intertidal deposits. Typical anti-invasion defences include pillboxes, anti-tank obstacles (ditches, concrete obstacles, anti-tank roadblocks) and beach defences, for example. Further information on the extent and range of these structures can be found through the Defence of Britain Project completed in 2002.[4] Structures and remains of material used in the preparation for and mounting of D-Day operations in June 1944, for example, can be found at many locations in southern England and represent floating

3. http://historicengland.org.uk/listing/the-list/
4. http://archaeologydataservice.ac.uk/archives/view/dob/

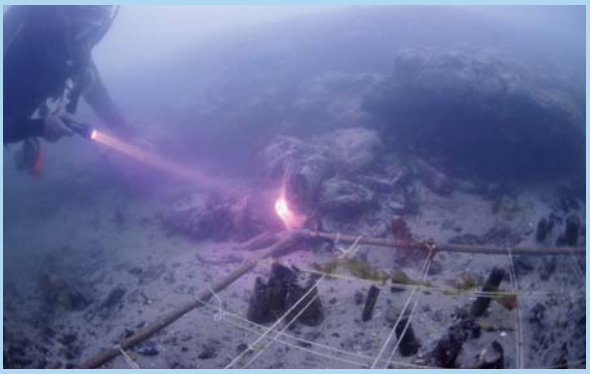
harbours, embarkation and assembly facilities and vehicles such as tanks and landing craft. These are often concentrated close to ports and harbours and include intertidal and sub-tidal elements.

2.1.11 A further significant aspect of wartime Britain are the remains of crashed aircraft, particularly associated with the Second World War. Finds of aviation related material are common in the marine environment, especially so along the south-eastern seaboards of England (Wessex Archaeology 2008a) which were subject to a high volume of hostile aviation activity in the southern North Sea and the English Channel forming a frontier between the Allies and Axis Europe. Large numbers of military aircraft have been lost at sea and major ports were frequently the subject of targeted bombing raids during times of conflict. Civil aviation losses have also occurred, although in much fewer numbers. Intact aircraft wrecks survive in offshore contexts although the often catastrophic nature of loss means that discoveries of scattered wreckage and debris, including ammunition and possible human remains, are more common.

2.1.12 Further information on the wide range of heritage assets that may be present within marine and intertidal environments can be found through the Historic England Introductions to Heritage Assets and Scheduling Selection Guides available through the Historic England website.[5]

Submerged Prehistory

Bouldnor Cliff is a submerged *c.* 8000 year old prehistoric site lying 11 m below water off the north coast of the Isle of Wight investigated by the Maritime Archaeological Trust (Momber *et al.* 2011). Work began at the site during the 1980s when preserved peat deposits and a prehistoric forest were identified. In 1998 worked flints were discovered and excavations have been ongoing ever since. Finds have included large number of burnt and worked flints and organic material including worked Mesolithic timbers, wood chippings and twisted fibres believed to have been used as binding. Analysis of the environmental remains recovered from the site has revealed a changing environment which saw a pine forest replaced over time by oak/hazel woodland with alder fringing the rivers and streams. The



Mesolithic site is thought to have comprised a wetland habitat associated with a river, which was subsequently inundated by rising sea-level and buried by estuarine silts. The erosion of the overlying geology by the Solent's tides has increasingly exposed various aspects of the prehistoric land surface.

Maritime Prehistory

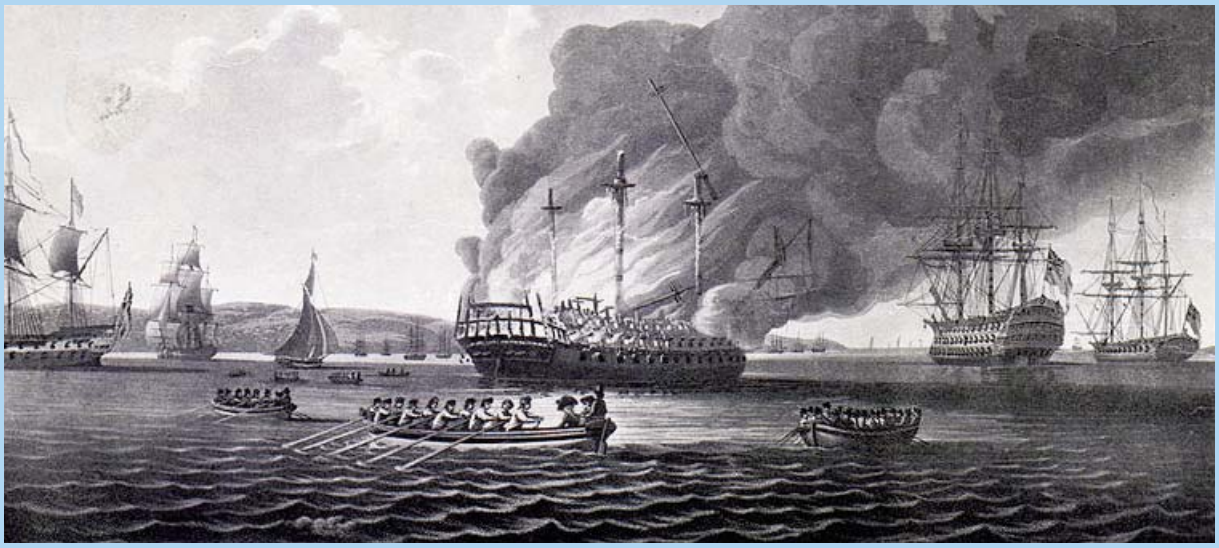
In 1964 a log boat was dredged from Poole Harbour, east of Brownsea Island, radiocarbon dated to *c.* 300 cal BC, placing it firmly in the Iron Age (Wessex Archaeology 2004). The boat has been linked to two nearby Iron Age jetties, which are thought to relate to cross-channel trading which took place on Green Island in Poole Harbour. Representative of the oldest constructed port in North West Europe to date, the jetties are considered to be of national archaeological significance on this basis (see Section 3 for significance definition). An Iron Age harbour has also been identified at

Hengistbury Head where ships could be beached and cargo unloaded and loaded (Cunliffe 1991; 2004).

5. https://historicengland.org.uk/listing/selection-criteria/scheduling-selection/ihas-archaeology/

Maritime Wrecks

HMS *Boyne* was a second-rate ship of the line launched at Woolwich in 1790, the flagship of Admiral Sir John Jervis. In May 1795 a fire caught hold whilst lying at anchor at Spithead which could not be contained. The ship was abandoned, and drifted onto the Horse Sand after the anchor cable burnt through. Approximately six hours after catching alight the ship exploded and sank (Hepper 1994, 78). The wreck obstructed the main channel into Portsmouth Harbour for many years until it was dispersed in 1838 to reduce the danger to navigation. The remains lie south of the entrance to Portsmouth Harbour, marked by the Boyne buoy. Diving investigations in advance of the Portsmouth Approach Channel Dredging revealed artefacts and features including a 32 pounder cast iron cannon, copper sheeting, bricks, worked stone, boat/ship timbers including nails and treenails, iron concretions and further buried metal anomalies (Maritime Archaeology Ltd 2007).



Aviation Wrecks

In July 2004 an Ministry of Defence salvage team lifted the wreckage of a de Haviland Mosquito Mk VI bomber (NS998) which crashed into The Wash in 1945.[6] The aircraft was lost on 20 March 1945 during a training mission with two crew on board, Flt Lt Gabriel Ellis, from Norwich, and Sgt William Reidy, from Boscombe, Dorset, belonging to 85 Squadron, RAF Swannington. The remains, formerly hidden by sand, were found during a survey of a shipping channel at King's Lynn and included what remained of the metal structure, although the wooden outer structure was no longer extant. The remains indicate that the aircraft broke up on impact in shallow water and it is thought a wing of their aircraft clipped the sea during a high-speed turn, giving them no time to bail out before impact. The remains of the pilot and gunner were found and buried in May 2005.

6. http://news.bbc.co.uk/1/hi/england/norfolk/3917503.stm

3. Conservation Principles and the Significance of Heritage Assets

3.1.1 Significance in terms of heritage policy is defined in the *National Planning Policy Framework*[7] (NPPF) (2012) as:

> *The value of a heritage asset to this and future generations because of its heritage interest. That interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting.*

3.1.2 The NPS for Ports (Department for Transport 2012, 67) states:

> *In considering the impact of a proposed development on any heritage assets, the decision-maker should take into account the particular nature of the significance of the heritage assets and the value that they hold for this as well as future generations. This understanding should be used to avoid or minimise conflict between conservation of the significance and proposals for development.*

3.1.3 The significance of heritage assets depends upon a wide range of factors and there is no single approach as to how to measure this significance across the heritage sector. Rather, the ways in which significance is assessed will vary according to:

- The type of asset;
- Its context, in terms of physical environment and social-cultural context;
- Specific research objectives and knowledge gaps; and
- The requirements of curators, regulators and developers with regard to individual projects and developments.

3.1.4 There is, however, a range of guidance available to archaeological contractors, consultants and developers in how to address the issue of heritage significance.

3.1.5 The document *Conservation Principles, Policies and Guidance*[8] (English Heritage 2008a) sets out best practice for Historic England for the provision of historic environment advice with additional application for local authorities, property owners, developers and professional advisers. This advice is guided by six high-level principles:

- The historic environment is a shared resource;
- Everyone should be able to participate in sustaining the historic environment;
- Understanding the significance of places is vital;
- Significant places should be managed to sustain their values;
- Decisions about change must be reasonable, transparent and consistent; and
- Documenting and learning from decisions is essential.

3.1.6 It is these principles that underpin the approach to the historic environment marine environmental assessment through 'constructive conservation', the aim of which is 'to recognise and reinforce the historic significance of places, while accommodating the changes necessary to make sure that people can continue to use and enjoy them'.[9]

3.1.7 Fundamental to this approach is the idea of 'significance' and it is only through understanding this significance that 'it is possible to assess how the qualities that people value are vulnerable to harm or loss' (English Heritage 2008a, 14). *Conservation Principles* recognises that people value the historic environment in many different ways but that these may be grouped into four categories:

- Evidential value (the potential of a place to yield evidence about past human activity);
- Historical value (the ways in which past people, events and aspects of life can be connected through a place to the present – it tends to be illustrative or associative);

7. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf
8. http://historicengland.org.uk/images-books/publications/conservation-principles-sustainable-management-historic-environment/
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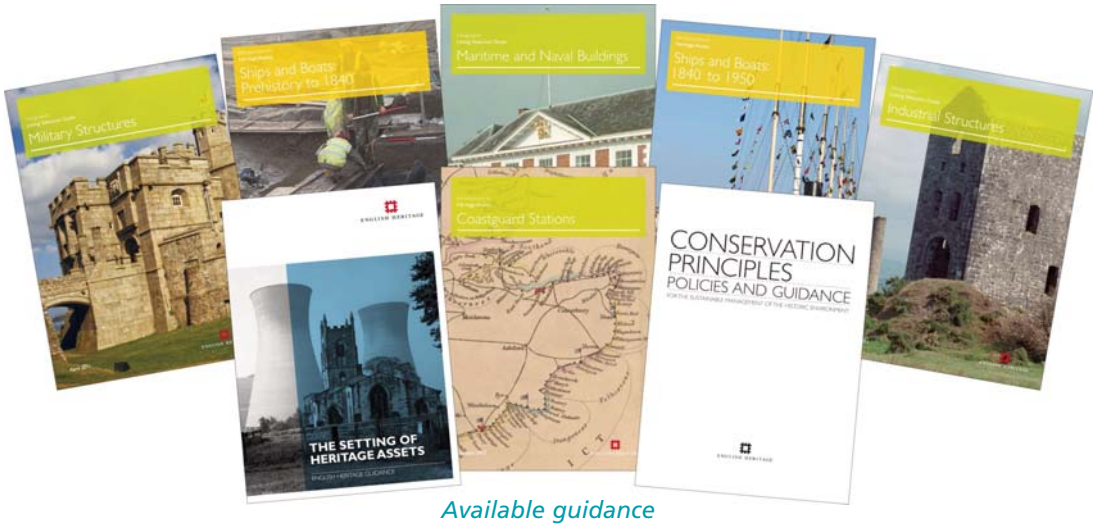


Available guidance

- Aesthetic value (the ways in which people draw sensory and intellectual stimulation from a place); and
- Communal value (the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory).

3.1.8 Judgements of heritage significance do not consider the economic (sale) value of assets although the cultural-economic value, through tourism, research and outreach for example, may be a consideration with regard to the four categories above.

3.1.9 The term 'significance', as defined in the NPPF (2012) encompasses all of the different interests that might be grounds for designating a heritage asset. The determination of the significance of heritage assets relies on professional judgement and is the responsibility of the heritage specialists and/or archaeological contractor and is agreed in consultation with the curator. Guidance on how to assess the significance of heritage assets is provided by Historic England through a suite of documentation, including thematically-arranged selection guides providing detailed guidance about what may be eligible for scheduling and designation. Each sets out asset-specific designation criteria and are supported by a series of *Introductions to Heritage Assets* covering different building types, archaeological sites, designed landscapes, battlefields and ships and boats.[10]

3.1.10 For example, the guide for Ships and Boats sets out the criteria used to assess assets for designation under the *Protection of Wrecks Act* 1973. These non-statutory criteria comprise the assessment of a vessels age and rarity; documentation (surviving historical and modern analytical documentation that can be used to support a claim to national importance); group value (physical or cultural associations within a wider context); survival/condition; potential (scientific and outreach); fragility/vulnerability; and diversity (diversity of forms in which a particular vessel type may survive and diversity of surviving features).

3.1.11 Statutory protection may be provided to an asset judged to be an above average example in regard to these criteria although the, 'absence of designation for such heritage assets does not indicate lower significance' (National Policy Statement 2012, 65). Non-designated heritage assets of archaeological interest that are demonstrably of equivalent significance to designated assets, 'should be considered subject to the policies for designated heritage assets' (National Planning Policy Framework, Department for Communities and Local Government 2012, 32).

3.1.12 In environmental assessment, heritage significance is most commonly expressed as a measure, from low to high, of archaeological 'value' or 'importance'. As the term 'significance' essentially expresses the sum of the cultural and national heritage values of a place in terms of heritage policy (as defined in *Conservation Principles*, English Heritage 2008a), it can thus be considered as a term synonymous with 'importance' or 'value' in environmental assessments. It is this measure of importance that is set against the magnitude of impacts to gauge the 'significance' of an effect attributable to a proposed development. Assessment of import-

10. https://historicengland.org.uk/listing/selection-criteria/wreck-selection/ihas-ships-and-boats/

ance with regard to the above criteria helps to characterise an asset, or a group of assets, and to assess how representative it is in comparison to other similar archaeological, architectural, artistic or historic heritage assets. Approaches to assigning a measure of 'importance', however, are necessarily founded on elements of professional judgement and are subjective in nature. Thus, any approach to assessing archaeological importance must be, at least in part, descriptive and illustrative and must be accompanied by an explanation as to how that importance has been assessed.

3.1.13 Where there is insufficient information available to ascertain the importance of a heritage asset (eg, an unidentified shipwreck or a geophysical anomaly of suspected archaeological interest) the precautionary approach is to assign a high level of importance. This will ensure that, where uncertainty occurs and risk remains high, impacts are not under assessed and significant impacts can be avoided.

3.1.14 *Conservation Principles* sets out clear guidance for assessing heritage significance which considers not only material remains but also the social and cultural circumstances in which they were produced, their relationship to the different ways in which they may be valued by people and the relative importance of these values, historically-associated objects and collections and the contribution made by their physical context and 'setting'.

3.1.15 'Setting' embraces all of the surroundings (land, sea, structures, features and skyline) from which the heritage asset can be experienced or that can be experienced from or with the asset (English Heritage 2011a, 4).

3.1.16 All heritage assets have a setting, including buried remains and other assets that are equally less readily experienced, such as those in a marine setting. The contribution setting makes to the significance of a heritage asset does not depend on public rights or ability to access the setting. The extent and importance of a setting is most easily expressed by reference to visual considerations although other factors such as noise, dust and vibrations, spatial associations and our understanding of the historic relationships between places are also relevant.

3.1.17 Specific guidance on the assessment of setting in relation to the significance of heritage assets is provided in *The Setting of Heritage Assets*[11] (Historic England 2015).

Assessing Importance

As part of the 2002 environmental assessment for London Gateway, archaeological importance was rated, on the basis of documentary investigation, as 'Low', 'Medium', 'High', 'Very High' or 'Uncertain', and sometimes as a range (eg, 'Uncertain, possibly High or Very High'; 'Uncertain possibly Low'). It was recognised, however, that whilst there were some known wrecks that were clearly important, their overall number was quite small and there was a much larger number of known sites whose importance, being subjective, was open to debate (Firth *et al.* 2012). This was especially so with smaller wooden vessels likely to be of late 19th- or 20th-century date, and ships (eg, merchant ships and small warships) lost in the 20th century.

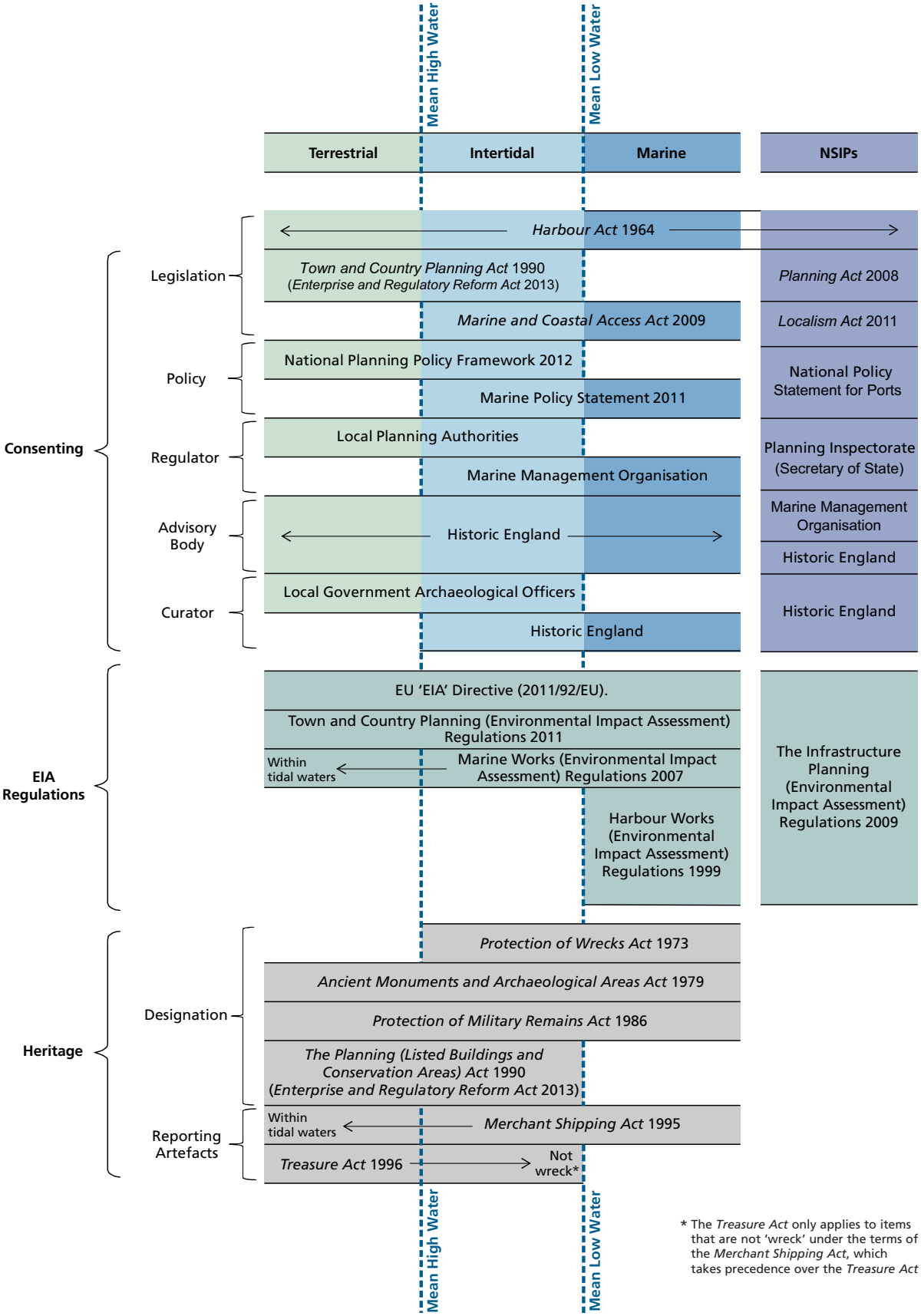
Further desk-based research was carried out as part of the post-consent development of mitigation strategies in 2005–2006, guided by the adoption of Wessex Archaeology's Build-Use-Loss-Survival-Investigation (BULSI) model for the investigation of shipwrecks. This system allows for a narrative of the life of a vessel to be built up using a combination of both archaeological and historical evidence that facilitates the identification of specific areas of interest and relative importance specific to that vessel.

The documentation sourced at this stage included ship plans, models and photographs, together with contemporary accounts, investigations, and other documents concerning the actual loss of the vessels concerned. Research included the analysis of the social history of the vessels and their wider place in the history of the Thames Estuary and the people whose lives have revolved around it. Not all the research was carried out by archaeologists. Professional researchers hired by a TV production company undertook work in relation to a number of wrecks that featured on the subsequent two-part programme *Thames Shipwrecks: A Race Against Time* (broadcast 26 August and 2 September 2008).

These measures of importance ultimately informed the post-consent mitigation which included the dredging and removal of several wrecks identified as being insufficiently important to warrant preservation *in situ*.

11. https://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/

Ports and Harbours Regulatory Framework for Heritage



* The *Treasure Act* only applies to items that are not 'wreck' under the terms of the *Merchant Shipping Act*, which takes precedence over the *Treasure Act*

4. The Regulatory Framework

4.1 Legislation

4.1.1 In England, intertidal and marine development and redevelopment in ports and harbours is governed by specific legislation through the *Harbours Act* 1964 and through general planning law, namely the *Town and Country Planning Act* 1990, the *Planning Act* 2008 and the *Marine and Coastal Access Act* 2009. In addition to this planning framework, there are statutory controls on archaeological material in marine and intertidal areas. Key examples of legislation include:

- *Protection of Wrecks Act* 1973;
- *Ancient Monuments and Archaeological Areas Act* 1979;
- *Protection of Military Remains Act* 1986;
- *The Planning (Listed Buildings and Conservation Areas) Act* 1990
- *Merchant Shipping Act* 1995; and
- *Treasure Act* 1996.

4.1.2 Further details of this legislation relevant to the protection of the marine historic environment in ports and harbours, are included in Appendix I.

4.1.3 In 2010, the Marine Management Organisation (MMO) was established and given powers under the *Marine and Coastal Access Act* 2009, including responsibility from the Department for Transport for certain functions under the *Harbours Act* 1964.

4.1.4 Under the *Harbours Act* 1964, a port or harbour authority has statutory duties and powers to improve, maintain or manage a harbour. There are three different types of 'harbour orders':

- Section 14 harbour revision orders: a harbour authority, or an individual or body with a substantial interest in the harbour, can apply to the MMO to amend or extend existing powers;
- Sections 15 and 15A harbour revision orders: the MMO can make an order to reconstitute the harbour authority or alter its constitution, to regulate the harbour authority's procedures and to withdraw from appointing members of the harbour authority; and
- Section 16 harbour empowerment orders: any person or organisation may apply for an order to construct a new harbour or to gain powers to improve, maintain or manage an existing harbour where no such powers already exist.

4.1.5 Port and harbour authorities have a statutory obligation under these powers to ensure safe navigation which may include a requirement to raise and remove wrecks that impose an obstruction, impediment or danger to navigation. The authorities also, however, have a responsibility to consider the environment in their management of a port or harbour, including having regard to any building, site or object of archaeological, architectural or historic interest.

4.1.6 Detailed guidance on the powers of the MMO under the *Harbours Act* 1964 and the application process for harbour revision orders and harbour empowerment orders is provided through the gov.uk website.[12]

4.2 Planning Policy

4.2.1 Not all facilities, however, are governed by 'harbour orders' with many other ports, harbours, marinas and smaller installations subject to general planning regulations.

4.2.2 The *Marine and Coastal Access Act* 2009 amended legislation covering seabed development and made the MMO the marine licensing authority, for a revised consenting system. The MMO should be the first point of contact for port and harbour projects to determine any requirement for consent under the 2009 Act. Historic England is the Government's statutory adviser on the historic environment and, as the National Curator for England, Historic England acts as the historic environment advisor to the MMO.

12. https://www.gov.uk/harbour-development-and-the-law

Policy documents

4.2.3 Within intertidal areas terrestrial planning policy, underpinned by the *Town and Country Planning Act* 1990, also applies. Local planning authorities are the regulator for all plans that affect works above the mean low water boundary. Advice on the historic environment is provided to local planning authorities by Local Government Archaeological Officers (LGAOs), or local curators.

4.2.4 The Government's terrestrial planning policies for England, and how these are to be applied, are set out in the NPPF (2012). The Government's planning policies for the marine environment are set out in the *UK Marine Policy Statement*[13] (MPS) 2011. The MPS has been jointly adopted by The Secretary of State, Scottish Ministers, Welsh Ministers and the Department of the Environment in Northern Ireland and it is the shared view of the UK Administrations that:

> *Heritage assets should be enjoyed for the quality of life they bring to this and future generations, and that they should be conserved through marine planning in a manner appropriate and proportionate to their significance. Opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost* (Marine Policy Statement 2011, 21).

4.2.5 The decision making framework for nationally significant infrastructure projects (NSIPs) is set out in the *Planning Act* 2008 and in relevant National Policy Statements for major infrastructure. NSIPs are large-scale developments requiring 'development consent' according to thresholds, above which certain types of infrastructure development are considered to be nationally significant. National infrastructure planning became the responsibility of the Planning Inspectorate (PINS) under the *Localism Act* 2011. Consent for NSIPs takes the form of a Development Consent Order (DCO). Provisions for the creation of a harbour authority or changes to its powers or duties may be included in a DCO.

4.2.6 The NPS for Ports was published by the Department for Transport on 26 January 2012 and covers both England and Wales. The NPS recognises that the construction, operation and decommissioning of port infrastructure has the potential to result in adverse impacts on the historic environment and provides advice and guidance for the assessment of these impacts and for decision making.

4.3 Environmental Impact Assessment

4.3.1 In accordance with the existing regulatory framework in England, the requirement for environmental assessment must be a consider-ation for all port and harbour development and

13. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

redevelopment in marine and intertidal areas. This includes developments subject to harbour revision orders and harbour empowerment orders, to planning permission from the local authority, to marine licensing from the MMO and to applications for NSIPs.

4.3.2 Environmental Impact Assessment (EIA) is fundamental to the planning system and ensures that the environmental implications of planning decisions are fully considered before a decision is made. This need is governed by European Union (EU) 'EIA' Directive (2014/52/EU).

4.3.3 The EU Directive (85/337/EEC) has been in force since 1985. The directive has been amended three times (in 1997, 2003 and 2009) and was codified by Directive 2011/92/EU (13 December 2011). This has subsequently been amended further by Directive 2014/52/EU which entered into force on 15 May 2014. The amendments reduce the administrative burden, improve the level of environmental protection and pay greater attention to threats and challenges that have emerged since the original rules came into force, such as resource efficiency, climate change and disaster prevention.[14]

4.3.4 Article 3 of Directive 2011/92/EU sets out the requirement for EIA to identify, describe and assess in an appropriate manner, the direct and indirect effects of a project on environmental factors including material assets and the historic environment. This is reiterated in Annex IV which sets out the requirements for EIA including:

> *A description of the aspects of the environment likely to be significantly affected by the proposed project, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors* (Directive 2011/92/EU, Annex IV: 3).

4.3.5 The EU Directive is applied to the planning system in England through the Town and Country Planning (Environmental Impact Assessment) Regulations (2011) with the exception of NSIPs which are subject to The Infrastructure Planning (Environmental Impact Assessment) Regulations (2009) amended 2012. The Marine Works (Environmental Impact Assessment) Regulations (Amended) (2011) puts into practice the EIA Directive in relation to marine licences while the Harbour Works (Environmental Impact Assessment) Regulations (1999) amends the *Harbours Act* 1964 to implement the EIA Directive in relation to harbour orders.

4.3.6 Not all schemes will require full EIA and it is the decision of the local planning authority or the MMO/Secretary of State whether or not EIA is required for an individual project.[15] The 'screening' process requires an applicant to provide information on which a screening decision can be made.

4.3.7 If a project does require EIA, developers should undertake a 'scoping' exercise that sets out the level of detail and the sources of information that will be used in the course of EIA. A scoping report should include a description of the nature of the development and its possible effects with a broad indication of their likely significance. Early and comprehensive scoping allows for areas of concern to be highlighted by the regulator, and other stakeholders, at an early stage in the process.

4.3.8 Advice on the screening and scoping process is provided by local authorities and by the MMO.

14. http://ec.europa.eu/environment/eia/review.htm
15. http://infrastructure.planningportal.gov.uk/wp-content/uploads/2013/04/Advice-note-7v2.pdf

5. Establishing a Baseline

5.1.1 Effective management of risk to the historic environment from development requires that it is first necessary to establish the archaeological baseline that may be subject to impact from development. The prehistoric, maritime and aviation baseline will comprise both the known historic environment (previously discovered heritage assets and landscapes/seascapes previously identified and known to exist at a specific location) and the potential historic environment (as yet undiscovered heritage assets and landscapes/seascapes which, on the basis of assessment, are considered likely to exist within a study area). Individual heritage assets must also be placed contextually within a wider framework of both the historic character and heritage significance of an area.

5.1.2 In line with the principle of 'constructive conservation', change is inevitable and may, in fact, be essential in order to secure the economic, cultural or social future of a port or harbour, including the long term curation of its heritage. In this respect, heritage is more than just a map of individual assets within a 'setting' and also necessitates consideration of the historic character of an area, comprising all the cultural and historical processes that have shaped that area. Consequently, it is necessary to understand these processes, and how they are perceived by people and communities, before any consideration can be given to how change will occur as a result of development.

5.1.3 The NPS for Ports (Department for Transport 2012, 66) states that as part of an environmental assessment:

- The applicant should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance;
- The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset; and
- Where a development site includes, or the available evidence suggests it has potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment.

5.1.4 In order to achieve this there are appropriate methodologies and proven approaches that reduce risk and uncertainty, and constitute good practice. The required expertise, knowledge and skills of these practices are a prerequisite to such work being undertaken by a specialist archaeological consultant/contractor with appropriate experience in the intertidal and marine environment.

5.1.5 The Chartered Institute for Archaeologists (CIfA) has developed a range of codes, standards and guidelines[16] to ensure professional standards amongst their members. Further good practice advice is provided by Historic England through the subject specific guidelines and standards available from their website.[17] The methodologies presented here have been developed in accordance with these standards.

5.1.6 In establishing a baseline for the marine and intertidal historic environment the level of detail required will also be dependent upon whether an applicant is undertaking a screening or scoping report (pre-application), a full EIA (to accompany an application) or is providing environmental information where formal EIA is not required. Advice on the level of detail required can be obtained from the local planning authority or the MMO and these bodies should be consulted early in the process to ensure that this detail is relevant and proportionate to the stage of the application and to the scale of the scheme. Whatever level of detail is required, scoping and assessment are obligatory stages of the process.

5.1.7 Specific advice on the historic environment will be provided by the local (LGAOs) and national (Historic England) curators, including detailed information on the requirements for assessment pre-consent (to establish potential effects) and

16. http://www.archaeologists.net/codes/ifa
17. https://historicengland.org.uk/images-books/

A Proportionate Approach

As stated in the NPS for Ports (2012, 66) the approach to establishing a baseline will be proportionate 'to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset'. This proportionate approach is provided through the baseline study which brings together current knowledge about the potential for, and probable importance of, anticipated and known heritage assets within a development site.

A desk-based scoping study will in, the first instance, establish the likely importance of the heritage assets present, or with the potential to be present, within a development site. In accordance with the NPS for Ports (2012, 66), if heritage assets are identified, 'the applicant should carry out appropriate desk-based assessment'.

The level of detail required for desk-based assessment will be lower for developments with a small footprint, and assets expected to be of limited importance, than for developments with a large footprint with the potential to impact a range of assets of variable importance, including those of potentially high importance. The level of detail, as advised by the curator, will be only that which is appropriate and necessary to determine the impact of the development, both positive and negative.

post-consent (to manage or mitigate these effects). This advice is always project and region specific and it is beyond the scope of this document to provide definitive advice on what will be required at any given stage for any given development. This will be determined by the regulators as advised by local and national curators on a case by case basis. It is recommended that engagement between developers, regulators and relevant stakeholders is undertaken from the early stages of the project in question so that heritage requirements are recognised and understood at the onset of a planning application development proposal. This communication will ultimately be to the benefit of the project in clarifying whether or not it will be possible to merge archaeological objectives with approaches required for other assessments as well as ensuring that any designed mitigation recommended is achievable by the contractor in the first instance.

5.1.8 The approaches provided below represent the full range available in establishing a baseline for the historic environment. It is possible, however, to provide indicative examples of the types of approaches that may be relevant to each stage as part of the general overview of environmental assessment.

5.2 Desk-based Assessment

5.2.1 Desk-based assessment comprises the accumulation of existing written, graphic, photographic and electronic information with the aim of identifying both known and potential heritage assets within a defined area of study and elucidating the character and significance of the historic environment relevant to that area. For environmental assessment a defined study area comprises the footprint of a proposed development with an agreed buffer to ensure the capture of all relevant records, given the relatively poor positional data for marine heritage sites and possible distributions of archaeological material.

5.2.2 Records of known heritage assets may be sought from:

- Historic England – National Record of the Historic Environment (NRHE):
  - Known maritime and aircraft wrecks;
  - Coastal installations;
  - Archaeological sites; and
  - Event records (records of archaeological works).
- County HER/Sites and Monuments Record (SMR):
  - As above, although the coverage and content may differ to that of the NRHE in a given area.
- The National Heritage List for England:
  - All nationally designated heritage assets including Listed Buildings,
  - Conservation Areas, Scheduled Monuments and Protected Wreck Sites.
- The United Kingdom Hydrographic Office (UKHO):
  - LIVE wrecks (LIVE = wreck considered to exist); and
  - LIFT wrecks (LIFT = a salvaged wreck; material is expected to survive although the main portion of a wreck has been removed); and

- DEAD wrecks (DEAD = Not detected by repeated surveys, therefore considered not to exist); if material has previously been located at a position it is expected to be present, probably buried and therefore no longer a charted navigational hazard).

5.2.3 Records indicative of potential heritage assets may be sought from:

- The NRHE and County HER/SMR:
  - Documented losses (or casualties): historical records of vessels or aircraft lost at sea but for which no remains have yet been found, grouped by the NRHE at arbitrary points on the seabed called Named Locations, representing general loss locations and not (except by chance) relating to actual seabed remains. Seabed obstructions and fishermen's fasteners (known sites of potential archaeological interest); and
  - Findspots (previously recovered artefacts indicating the potential presence of similar artefacts and types of activity in the locality).
- The Receiver of Wreck:
  - Material raised from the seabed and reported to the Receiver under the *Merchant Shipping Act* 1995 may not be attributable to a known wreck and may be indicative of further, unknown material on the seabed;
  - The United Kingdom Hydrographic Office (UKHO) (via third party service);
  - Documented losses: records of wrecks documented as having been lost at a location may still be recorded as LIVE if they have not been shown to be absent through survey;
  - Seabed obstructions and fishermen's fasteners (known sites of potential archaeological interest); and
  - ABEY wrecks (ABEY = existence of wreck in doubt. Not shown on charts); and
  - DEAD wrecks (DEAD = Not detected by repeated surveys, therefore considered not to exist); if material has not previously been located at a position this probably concerns a documented loss only.

5.2.4 Proportionate consideration of the historic environment as part of a scoping report will require, as a minimum, searches of records set against background archaeological knowledge to assess the likely heritage assets, and potential heritage assets, within a defined area. The scoping report also provides the opportunity for the developer to set out the level of detail they intend to provide, and the further sources that will be consulted, during environmental assessment, including provision for geophysical and geotechnical survey. Through their formal scoping response, regulators, advised by the curators, will provide comment on this level of detail and can provide early advice on specific requirements for consideration in support of an application.

5.2.5 For assessment, all mapped data should be compiled within a project GIS so that datasets can be compared spatially in order to identify inter-relationships and potential interactions with the planned proposal. A gazetteer of heritage assets within the study area can be compiled using the GIS to identify duplications between datasets, enhanced by information from further sources. This gazetteer is placed in context against the background geology, archaeology and history of the area in order to provide the greater level of detail required for environmental assessment.

5.2.6 Interrogation of documentary evidence is essential to this further research. Not all data relating to archaeological discoveries within marine and intertidal areas are encapsulated by the NRHE, HER or UKHO. Results from development-led studies, for example, are often dependent upon commercial confidence during the application process resulting in often long delays before results, already within the public domain through the planning process, are formally published, archives are created and data submitted to national and local heritage databases. Furthermore, documentary evidence and previous studies are essential to placing identified assets within their wider context. Key sources include:

- Previous desk-based assessment and environmental assessment reports (unpublished reports);
- Previous archaeological evaluations and excavations (unpublished reports);
- Historic and modern aerial photography and LIDAR (National Mapping Programme);
- Historic and modern charts and maps;
- Historic England programmes such as Rapid Coastal Zone Assessments Surveys and Historic Seascape Characterisation (HSC);
- Discoveries reported through finds protocols;
- Existing geophysical and geoarchaeological surveys; and
- Published articles, monographs and books.

5.2.7 This information is also utilised in establishing the potential for further archaeological evidence to be present. Comparison with similar geological and geographical environments where archaeological material has been found will help to indicate where similar material may be present within the study area. Similarly, the identification of known archaeological sites and finds from the wider region, both in terms of physical remains and documented historical accounts, will help to predict likely discoveries within a particular area.

5.2.8 Existing geophysical and geoarchaeological survey data should be sought and assessed where present and accessible. Where existing survey data of the proposed development area is present, its suitability in facilitating archaeological objectives should be fully assessed and a level of certainty be assigned to the dataset in question. This data can be extremely useful with the potential to further inform upon the nature of the historic environment within a given area. Should the data be considered to be fit for purpose (in archaeological terms), the emphasis on collecting subsequent additional survey data is likely to be reduced. This will depend on a number of factors, including the date, quality and coverage of the data as well as the methods employed for its retrieval. The suitability of any existing data in place of additional survey data should be raised as a point of discussion between the developers, archaeological contractors and archaeological curators in the early stages of the scheme so that the need for any additional data can be factored in to both project timescales and budgets from the outset.

5.2.9 The effective use of existing data can, therefore, reduce requirements for the collection of new geophysical and geotechnical data, significantly reducing the cost to a developer. This approach, however, is dependent upon the willingness of developers and operators to share data and to ensure effective archiving and dissemination of results to facilitate access to assessment results. This is of particularly note if uncertainty and risk are further reduced through additional investigation of specific anomalies (ground-truthing).

5.2.10 The NPS for Ports (Department for Transport 2012, 66) states that, where desk-based research is insufficient to properly assess the archaeological interest of a heritage asset, the applicant should carry out a field evaluation. This approach also represents best practice in

Remote operated vehicle (ROV)

situations where areas of the seabed or intertidal zone considered as part of a development proposal have not previously been subject to research and analysis. In areas where no previous archaeological investigations have taken place, it follows that an understanding of the historic environment is inherently limited. In these situations, desk-based sources alone cannot always elucidate the baseline character of the marine historic environment. It is the responsibility of the developer to demonstrate that no significant impacts upon heritage assets are predicted to occur as a result of a proposed development, and as such, it may be deemed necessary to attain further data in these circumstances. The application of *field evaluation* enables the historic environment of such areas to be more fully assessed through facilitating the use of further techniques which are effective in elucidating the nature and extent of known and potential heritage assets and landscapes.

5.2.11 Field evaluation may be considered a pre-consent requirement, where the results are assessed and incorporated as part of the application, or may be undertaken post-consent as a condition necessary in in order for consent to be granted. This will be agreed in consultation with regulators, curators and heritage specialists/archaeological consultants in the early stages of the project. In the marine environment field evaluation comprises remote techniques (geophysical and geotechnical survey) and ground-truthing through diver or remote operated vehicle (ROV) survey. Intertidal approaches may include terrestrial evaluation techniques such as a walkover survey or test pitting, for example.

5.2.12 The systems of archaeological assessment used must be able to determine rapidly and effectively what, if any, historic environment interest is present and subsequently help to

Historic Seascape Characterisation (HSC)

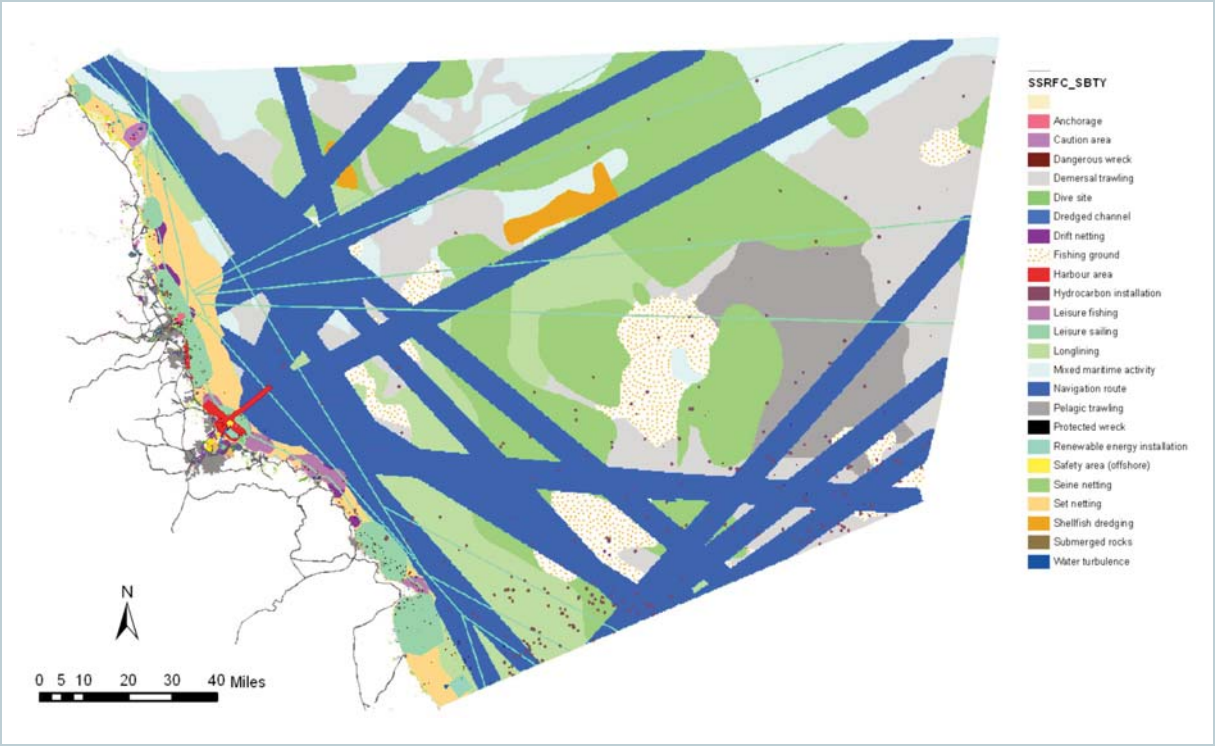
HSC was designed to map an understanding of the cultural processes that have formed the character of an area, extending the principles of Historic Landscape Characterisation to heritage in coastal and marine environments. A nationally-applicable HSC method was finalised in March 2008 from the England's Historic Seascapes Programme, funded by the Aggregates Levy Sustainability Fund and the HSC has now been implemented across England[18] (Tapper 2008).

HSC defines areas of the marine environment that share similar historic character, as 'Types' of historic seascape, allowing historic trends, processes and patterns of activity to be understood in the seascapes we have today (Tapper 2008, 12). A 'tiered' GIS spatial data model records the present and dominant historic character for each level: the sub-sea floor, sea floor, water column and sea surface. Alongside the GIS mapping, text describing and documenting the HSC 'types' include details of each Type's distinguishing attributes and principal locations:

- Their constituent components, features and variability;
- The typical values and perceptions that people have of these areas;
- The research, amenity and education potential they offer; and
- Their present condition and the forces for change affecting them, which in turn inform statements on their rarity and vulnerability.

Broad character types, character types and sub-character types are identified from the themes of navigation, industry, fisheries and mariculture, ports, docks and harbours, communications, military, settlement, recreation, palaeolandscapes and semi-natural environment.

Consideration of the HSC for the area in which a port or harbour is located will inform the broader sustainable management of change from port growth and development in line with the principle of constructive conservation.



Historic Seascape Characterisation

18. http://archaeologydataservice.ac.uk/archives/archiveDownload?t=arch-466-1/dissemination/pdf/HSC_Method_Statement_2008R024.pdf

Rapid Coastal Zone Assessment Survey (RCZAS)

RCZAS[19] is a national programme that was initiated by English Heritage in the late 1990s to enhance the knowledge of the coastal historic environment in an effort to inform future Shoreline Management Plans (SMPs). Data is gathered through two phases of investigation, desk-based assessment and field assessment which draws upon rapid walkover survey to ground-truth records from the desk-based assessment, to record new sites and to assess significance and vulnerability.

Enhanced HER/SMR and NRHE datasets and client reports for Historic England have resulted in a far greater understanding of the character and vulnerability of coastal heritage. Although RCZAS generally exclude sites below low water, with survey carried out to Lowest Astronomical Tide level, the data is relevant to port and harbour areas within the intertidal zone (and beyond, generally extending inshore for 1 km from Mean High Water Springs).

Whitby, for example, is located within the assessment area of the Yorkshire and Lincolnshire RCZAS, undertaken by Humber Field Archaeology on behalf of English Heritage.[20] The harbour has received significant investment in recent years to improve facilities, and this process is likely to continue with Whitby Harbour poised to play a major role in the development of the Dogger Bank offshore wind farms (*Whitby Gazette*, 14 May 2014).

The results of the desk-based assessment demonstrate that extensive and regionally/nationally significant port activities are represented at Whitby through maps and documentary sources and physically in the remains of docks, ships and ancillary buildings across the town (Buglass and Brigham 2008). The report concludes that the result of activities over the last 2000 years means that Whitby contains significant levels of archaeological remains, elements of which are vulnerable as they lie along the edge of the river and at the harbour mouth.

Additional sites and information described in the field assessment report demonstrate the survival of relatively rare features worthy of further investigation and recording, specifically the Half Moon Battery and surviving capstans on West Pier (Buglass and Brigham 2011). The harbour is identified as being of national significance, not least for its connection with Captain Cook (Whitby supplying the ships *Endeavour* and *Resolution* for James Cook's expeditions), but for the various component piers and smaller installations are at least of regional importance.

In advance of detailed assessment, therefore, RCZAS data can, together with early consultation with curators, provide developers with early warning of the key issues that may be encountered during the course of a project.

Whitby Harbour

19. https://historicengland.org.uk/advice/planning/marine-planning/rczas-reports/
20. http://archaeologydataservice.ac.uk/archives/view/yorksrcza_eh_2009/index.cfm

inform the necessary action taken by each relevant party, as appropriate to the findings.

5.3 Geophysical Survey

5.3.1 Using marine geophysical survey techniques it is possible to remotely sense the nature of the seabed and associated bedforms, the presence of material lying upon it and the geology beneath the surface. In applying these techniques for archaeological purposes it is possible to map submerged palaeolandscapes and to identify the locations of maritime and aviation wrecks and other anthropogenic material of potential archaeological interest. Geophysical survey also provides information on the dimensions and physical condition of material on the seabed which can inform the management and mitigation of potential impacts to these assets from development.

5.3.2 The correlation of the results of geophysical assessments with the desk-based research allows for anomalies to be matched to existing records of heritage assets and will assist with the identification of assets that have not previously been recorded. Comparison with the results of previous geophysical surveys from the defined area will allow for physical change to be assessed, for both assets and bedforms, that may be relevant to management and mitigation. In areas of high seabed mobility, for example, anomalies that were previously buried may now be exposed, or *vice versa*. Wrecks or other assets may show signs of deterioration or increased scouring, for example, that may be relevant to proposed mitigation strategies.

5.3.3 There are several types of marine geophysical survey and many different types of equipment that can be used to acquire data. The four main types with application to the marine historic environment are sidescan sonar, multibeam bathymetry, magnetometry and shallow seismic (sub-bottom profiler) surveys. General guidance on acceptable standards for marine geophysical survey can be found in *Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes*[21] (English Heritage 2012).

5.3.4 The specifications for an individual survey will vary according to the requirements of any given project. Typical factors for consideration include:

- The age and extent of any existing survey data within a defined area (for example, older data may no longer be representative of the current conditions and existing data may provide insufficient coverage of the development footprint);
- The nature of the development (for example, full data coverage of a defined area may be essential for capital dredging operations while targeted survey may be more appropriate for piling operations);
- The scale of the development (to ensure that survey requirements are proportionate to the size of the project in question);
- Pre-existing archaeological and historic knowledge, possibly with specific requirements set out by the regulator at the scoping stage (for example, in areas of previously established high potential); and
- Local conditions (for example, topography and geology, water conditions).

5.3.5 Geophysical survey within the intertidal zone may comprise either marine or terrestrial geophysical techniques. Taking into account the practical considerations of undertaking survey in this environment the coverage of this area is most usefully represented by a combination of techniques. Terrestrial survey techniques comprise magnetometry, earth resistance survey and ground penetrating radar, although for waterlogged deposits magnetometry has a more successful application. General guidance on acceptable standards for geophysical field survey can be found in *Geophysical Survey in Archaeological Field Evaluation*[22] (English Heritage 2008b).

5.3.6 It is often the case that surveys undertaken for non-archaeological purposes, such as engineering, can also be employed to achieve archaeological objectives. At the planning stage of these surveys good practice entails consultation with a suitably qualified archaeological contractor to ensure that the specifications of the survey are suitable for achieving these objectives without compromising those of the developer. It is often beneficial for developers to accommodate an archaeologist, or a geophysicist with appropriate archaeological expertise, on board a vessel during the acquisition of marine data and should be

21. http://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/
22. https://historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/

based on a determination of risk that known and unknown archaeological materials might be encountered as could be impacted by the proposed project. The on board expert can advise on the suitability of acquired data for archaeological purposes, and will propose minor changes to the survey method, settings, etc., in order to optimise archaeological results and thereby minimise the need for repeat surveys. If it is not possible to accommodate a geophysicist with archaeological experience then at least a prior briefing by the retained archaeologist should be undertaken. Advice on the survey requirements for a project will be provided by the regulator, as advised by the curator, at the scoping stage.

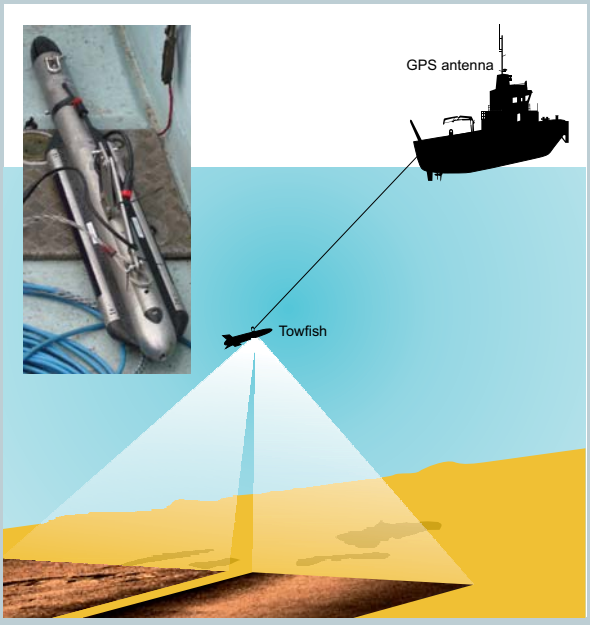
5.3.7 If geophysical survey is not required for non-archaeological objectives then developers may be required to undertake survey to meet archaeological objectives, as necessary to secure consent. The applicant should give consideration to using as full a range of geophysical techniques as possible to help in the effective identification and discrimination of potential heritage assets and the avoidance of risk. Without sufficient data to assess a defined area, the application may not be adequate for securing consent. Moreover, encountering an unexpected asset during the construction phase of a development can be costly in both financial terms and time delays.

5.3.8 However much geophysical data acquisition and interpretation takes place prior to development, it is unlikely to deal with all unexpected material or sites. Objects as large as entire previously unknown shipwrecks have been discovered in port approach channels, despite the application of detailed and repeated geophysical survey techniques. As a result, the developer may have to implement a sampling strategy for geophysical anomalies and will likely be required to have in place an effective method for dealing with unanticipated archaeological discoveries. These issues are dealt with in Section 7.

5.3.9 For some schemes, general seabed survey prior to seeking consent will be followed by targeted or full geophysical survey as part of any post-consent mitigation strategy agreed to manage potential impacts. This approach, however, has the effect of shifting uncertainty and risk to the post-consent phase of works. Unexpected discoveries of archaeological interest

Sidescan sonar

A sidescan sonar system is generally towed on a cable behind the survey vessel and consists of transducers on either side of a towfish (an instrument which is towed beneath the sea surface) which emit a fan-shaped acoustic pulse of energy. The system measures the intensity and strength of the reflection from the seabed. Upstanding areas of seabed or material reflect more energy back to the sensor and the morphology of the sea floor can be discerned. It is especially useful for low-relief sites as well as upstanding structure. High resolution sidescan sonar data suitable for archaeological surveys can be acquired by using a combination of high frequency and short range, typically 500 kHz at a range of 50 m or 75 m. Ideally, sidescan sonar data would be acquired at 200% coverage (100% overlap of swaths of sonar data) and, at least, at 100% (coverage of the seabed but with no overlap of data). Dependent upon the quality of the data, experienced marine geophysicists with archaeological expertise are especially skilled in distinguishing between natural features and anthropogenic material on the seabed. A sidescan sonar survey can aid the identification of wrecks, aircraft remains, submerged structures and other seabed features although buried remains are less likely to be visible using these systems.

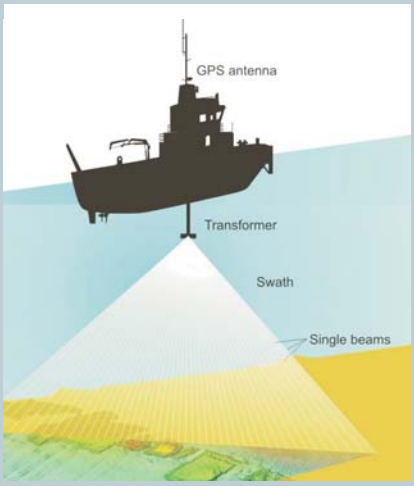


Multibeam bathymetry

A multibeam echo sounder measures water depth below its transducer with a fan-shaped array of acoustic beams that extend below and to the sides of the survey vessel to acquire a swath of spot depths (typically 10s of metres). While soundings can be dense enough to show objects on the seabed less than a metre across, multibeam surveys can have difficulty detecting small sites with little vertical expression. However, multibeam surveys can quickly map a single site, providing quantitative data to a high level of detail.

The resolution of the data is dependent on the distance between the sensor and the object: the greater the distance, the greater the water depth, the lower the resolution. The reflected acoustic signal (backscatter) can also be used by geophysicists to characterise seabed sediment types (eg, sands or gravel), although the resolution of this data is not ideal for the identification of archaeological material which generally occurs as small and discrete features and are better identified using sidescan sonar systems. Sidescan sonar systems also allow greater definition of intra-site features, particularly wreck sites, than backscatter of data.

Multibeam survey data can, therefore, aid the identification and characterisation of wrecks, aircraft remains, submerged structures and other seabed features, although assets with little height or those of smaller dimensions are less likely to be visible using these systems.



Magnetometry

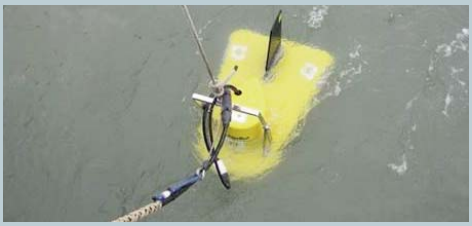
Marine magnetometers are used to detect ferrous material lying on or buried below the seabed by detecting alterations in the strength of the earth's magnetic field. A magnetometer towfish is an instrument which is towed beneath the sea surface astern of a survey vessel either individually or 'piggy-backed' off a sidescan sonar towfish by a short cable. Unlike sidescan sonar and multibeam bathy-metry data, magnetometer surveys can detect buried material and can also enable the determination of a wreck as being metal or wooden hulled. For example, a high magnetometer signature associated with a possible wreck identified in sidescan sonar data may indicate the presence of an iron or steel wreck. In addition, magnetometer data can be used to detect outlying ferrous material scattered around a wreck site, such as cannon or cargo.

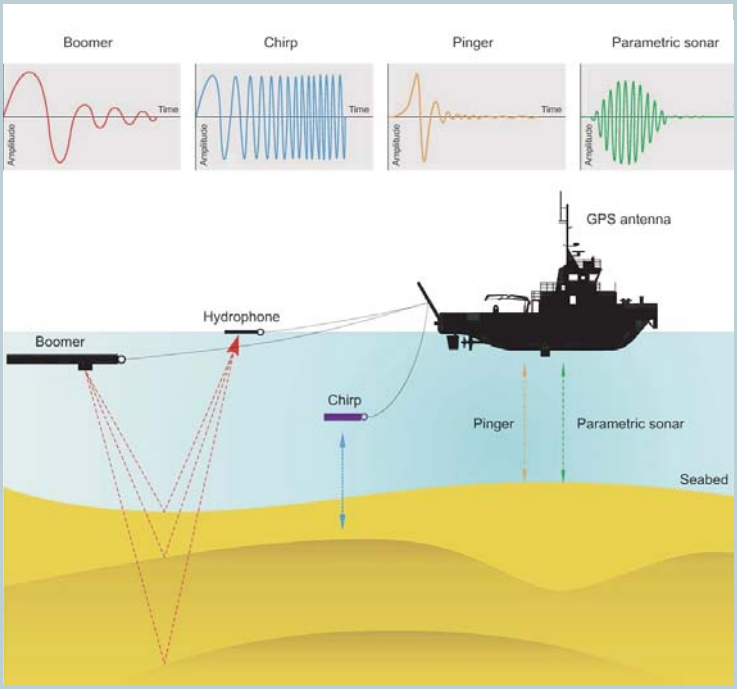
Sub-bottom profilers

Seismic surveys, in contrast to sidescan sonar and bathymetric surveys, are typically used to image the sub-seabed geology rather than to gain information on seabed features.

Although 3D seismic systems are available and are used in the oil and gas industry, typically 2D systems are used, such as boomer, pinger and chirp systems. The effectiveness of a sub-bottom profiling system depends on several factors, such as sub-seabed penetration (determined by power and frequency of the seismic source), positional accuracy, and lateral and vertical resolution.

Seismic energy is emitted from the source at a fixed rate, penetrating the seabed and partially reflected and refracted at each change in the rock or sediment properties. The reflected signal is recorded along the vessel transect and used to map geological and sediment structures below the seabed. Seismic survey data is therefore considered to aid the assessment and characterisation of palaeo-geographic features, such as palaeochannels, and associated sediment deposits present within a given area. Choice of line spacing is critical in determining the level of detail of the sub-seabed sediment units and features. The smaller the line-spacing, the greater the detail recorded. Sub-bottom profilers can also be used to detect buried wreck anomalies if passing directly over the anomaly.





encountered post-consent could result in project delay as assessment exercises are completed. It is therefore essential that during any pre-application stage project staff responsible for the proposed development (including archaeological consultants) seek advice from the national and any relevant local curator to ensure risks are understood and that an appropriate strategy is adopted from the outset.

5.3.10 Data should be supplied to the archaeological contractor as unprocessed, digital data with accompanying track-plots where these have been recorded and retained. This allows the archaeological contractor to process the data with the best settings to facilitate the interpretation of anomalies and features. Assessment can also be carried out from paper rolls although these do not provide the same utility of data management. Processed data provided as graphic files to a contractor will be of very limited use.

5.3.11 Processing and interpretation of geophysical data for archaeological purposes should be carried out by a suitably qualified and experienced contractor. Shallow seismic interpretation should be correlated with geoarchaeological results to map geological

sequences and palaeolandscape features to inform understanding of submerged prehistory. Features of anthropogenic origin identified in side scan sonar, magnetometer or bathymetric data should be identified and correlated with the results of the desk-based assessment to produce a single project gazetteer of known (wrecks, anchors etc.) and potential (seabed disturbances, debris etc.) heritage assets.

5.3.12 It is important to note that features of anthropogenic origin identified in geophysical data do not necessarily equate to heritage assets. Rather these anomalies should be considered to represent *potential* heritage assets. The archaeological interest of man-made features (as opposed to natural features such as boulders or bedforms) will often only be defined through ground-truthing exercises that allow for visual identification.

5.4 Geoarchaeology

5.4.1 Geoarchaeology involves the application of the principles and techniques of the earth sciences to understand the archaeological record. This approach, supplemented by environmental analysis and integrated with geophysical techniques, provides key information that help archaeologists understand former landscapes and environments and to map the potential for archaeological remains. For studies of submerged prehistory, the identification of palaeolandscape features and deposits, together with reconstructions of the palaeoenvironment, help to identify where prehistoric populations are likely to have been active, and hence where prehistoric archaeological material is most likely to be located. Detailed guidance on the application of geoarchaeological techniques is provided in *Geoarchaeology, Using Earth Sciences to Understand the Archaeological Record*[23] (English Heritage 2007).

5.4.2 Geoarchaeological investigations are conducted to support production of sedimentary deposit models that map the distribution of environmental features of archaeological interest. A methodological approach to support production of a deposit model involves a phased programme of analysis based on different levels of investigation depending on the palaeoenvironmental potential of the material effectively recovered. These stages are summarised in Appendix II.

5.4.3 In the first instance, geoarchaeology relies on the archaeological assessment of geotechnical data gathered to obtain information on the physical, mechanical and chemical properties of earth materials (ie, sediments/deposits). In marine environments, buried, waterlogged and undisturbed deposits provide excellent conditions for the preservation of palaeoenvironmental remains located in context within sedimentary sequences corresponding to past periods of lowered sea level. Peat, in particular, can contain preserved plant material many thousands of years old while microscopic analysis of sediment samples can reveal pollen, diatoms, foraminifera and ostracods; all of which can help archaeologists piece together the flora and fauna and prevailing environmental conditions that would have been encountered by our human ancestors.

5.4.4 Guidance for good practice in environmental archaeology is provided in *Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation*[24] (English Heritage 2011).

5.4.5 Geotechnical investigations, including borehole and vibrocore surveys and grab sampling, are standard civil engineering techniques for port and harbour developers. Core logs and samples from these investigations often provide geoarchaeologists with the opportunity to obtain data. This can be facilitated through early consultation with geoarchaeologists and curators. Geoarchaeological assessment of core material should be conducted in locations where there is a tangible risk to the historic environment. Where sampling is not planned for areas of high archaeological sensitivity this is likely to be because the project will not impact such locations.

5.4.6 Using information provided by geophysical data, the geoarchaeologist can identify specific points on the seabed at which cores and grab samples will be of most utility for obtaining information relevant to the interpretation of the prehistoric environment. These may correspond to palaeolandscape features identified in the sub-bottom profiler data or areas where peat or other organic deposits have been indicated. Following

23. http://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/
24. http://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/

recommendations by the geoarchaeologist, the developer can work with engineers and curators to develop a sampling strategy that will achieve a range of objectives.

5.4.7 The method of obtaining data with the greatest practical application is for a geoarchaeologist to be integrated into the geotechnical team on board a vessel while cores and samples are been collected. Where extrusion takes place on board, the geoarchaeologist is able to identify cores samples with the most relevance for archaeology and can take samples and make records before valuable information is lost This is particularly relevant for organic sediments that may not be immediately apparent from the geophysical survey data and that may not be clear from an onshore review of the core logs. As part of the geotechnical team the geoarchaeologist is able to understand to a greater extent the procedures and working practices employed to meet engineering aims and objectives. This allows for the effective application of a methodology that can be adapted to obtain geoarchaeological data without compromising the engineering requirements of the geotechnical survey.

5.4.8 Where cores are to be extruded under laboratory conditions onshore, the geoarchaeologist should be provided access during this process. Interpretation of sequences from core logs alone provides less accuracy and fewer opportunities to obtain additional data. It may be possible to retrieve cores and original samples from storage for further archaeological analysis if they have been retained by a geotechnical contractor or developer. There is no guarantee, however, that the samples have been stored intact or sufficiently protected to prevent deterioration or that sufficient records are available to identify and retrieve specific samples.

5.4.9 If it is not possible to accommodate a geoarchaeologist into the geotechnical team on board a vessel, the engineers responsible for collecting the cores and samples must be fully briefed in advance by a professional archaeological consultant with marine

Geoarchaeology

Poole Harbour is a large natural harbour inshore of the southern end of Poole Bay. Palaeolithic artefacts (*c.* 970,000 to 10,000 years BP) in the form of lithics have been discovered from the Poole Harbour area and its approaches and Mesolithic lithic artefacts (10,000 to 5500 years BP) are known from the wider area. Peat horizons identified in geophysical survey data and in cores taken in advance of a channel deepening scheme in the harbour included the remains of *Phragmites*, a reed that lives in mud or shallow water, such as marshes, fens, and the edges of shallow water lakes or rivers, and *Alnus* (alder) a typical stream-side tree tolerant of waterlogged soil conditions, also found in 'wet woodlands' known as alder carr (Wessex Archaeology 2004). These peat horizons, found at depths between 8 and 14 m OD, represent land surfaces around a freshwater river valley and it is likely that the valley edges and alder carr of Poole Harbour would have been exploited by humans prior to its inundation. The deposits correspond to a period during the Mesolithic when sea level is known to have been rising rapidly around what is now Britain.

experience. The briefing may take place at a laboratory or office prior to the mobilisation of the geotechnical team, or through a dockside briefing prior to departure from port. A dockside briefing invitation should also be extended to the national curatorial body (Historic England). The briefing aims to ensure that material and data capture by marine geotechnical survey contractor is of a sufficient standard to support archaeological analysis and interpretation and should include:

- An overview of the archaeological potential of the survey area and a detailed explanation of why the geoarchaeological assessment is required:
  - as a condition of licencing/consent set by the regulator;
  - to provide additional data relevant to identifying the archaeological potential of the survey area in order to prevent damage to/destruction of important heritage assets; and
  - to answer explicit questions about the archaeological remains present within the survey area as specified by the curator/regulator.
- A description of the deposits within the survey area that have archaeological potential;
- A detailed description of the archaeological samples required from the geotechnical cores or samples in order to meet archaeological aims and objectives;
- Practical guidance on how to avoid contamination and provide appropriate storage for archaeological samples that will be subject to palaeoenvironmental analysis and the application of scientific dating methods; and
- An explanation of the agreed methodology for communication between the geoarchaeologist (on shore), the geotechnical team (on board) and the developer and curator as required.

5.4.10 Relative and absolute dating techniques are applicable to the samples provided in cores and grabs. Relative dating techniques enable the relative order of a stratigraphic sequence to be determines and thus are confined to establishing the sequential order of events. Stratigraphic relationships allow for the relative dating of geological deposits and of remains themselves, if they are located within secure contexts (ie, they have not been removed or re-worked from their original context). In comparison, absolute dating is the process of determining the stand-alone age of archaeological material without reference to a sequence of events. The most commonly used absolute dating techniques in archaeological studies include radiocarbon dating, dendrochronology, and optically stimulated luminescence.

5.4.11 Further guidance on geoarchaeological investigations can be found in *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector* (Gribble and Leather 2011). Although intended as guidance for the renewable energy sector, the research agendas and survey techniques outlined in the guidance are considered to be applicable to port and harbour developments.

5.5 Ground-truthing

5.5.1 Following desk-based assessment, including geophysical and geoarchaeological assessment, uncertainty may still remain that can be wholly or partially resolved through ground-truthing and evaluation.

5.5.2 In the intertidal zone a walkover survey, using GPS pre-loaded with records identified during the desk-based assessment, can help to clarify the nature of the known and potential heritage assets. In certain environments it may also be possible to undertake test-pitting, augering, or trial trenching, to either test for the presence of sub-surface archaeological remains, or gain a record of the below ground stratigraphic sequence.

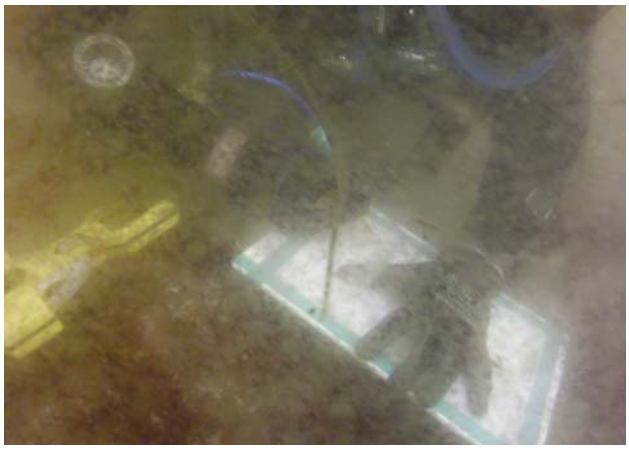
5.5.3 In the marine environment, ground-truthing anomalies or target points of interest can be undertaken through diver survey or remotely using an ROV.

5.5.4 Locating target points in the marine environment can be challenging. Port and harbour environments can often suffer from reduced levels of visibility from higher levels of particulate matter in the water column. This is further exacerbated when the port or harbour is affected by riverine or estuarine dynamics which can carry their own sediment burden. Further complications arise from tidal access and activity that may be restricted to narrow tidal windows in the overall tidal cycle and weather patterns. The use of an experienced archaeological contractor with expertise in low visibility diving conditions will ensure that objectives are met as far as is practicable. Constraints upon archaeological

operational windows may also occur in terms of access. For example, archaeological works may not be permitted at times when marine traffic in an approach channel to a port is anticipated to be high, and the time available for a range of archaeological works may be limited accordingly.

5.5.5 The use of archaeological divers represents the most effective way to ground-truth targets in terms of the level of information that can be retrieved. Placing a diver at the site of the target allows for interpretation to be made *in situ* utilising touch as well as sight to assess what is found, even in relatively low levels of visibility. Divers can undertake minimal intrusive excavation, such as probing and light digging or fanning of sediment to uncover further material that may help with assessment. They will also be able to identify a range of diagnostic features and finds that can help to define the character of the target following the dive. Further records can be taken during the diving using specialist equipment fitted to the diver such as acoustic tracking, lights, video camera (either live or recorded for subsequent review), and communications.

5.5.6 Ground-truthing in this respect relies on the deployment of archaeological divers with the competency and skills necessary to undertaken the investigation, interpretation and evaluation of archaeological material in submerged environments. Archaeological divers can be deployed as part of a specialist archaeological team or can be integrated into a team of commercial divers operated by, for example, the port authority. Diving operations must be agreed in consultation with the regulator. All diving must also meet the requirements of the diving at work regulations, and must adhere to an appropriate Approved Code of Practice sanctioned by the Health and Safety Executive (HSE).[25] The developer should satisfy themselves that any archaeological contractor employed has the necessary experience and competencies to operate in the specific environment in which they will be employed.



Archaeologist operating in low visibility conditions caused by phytoplankton

Diving Investigations for the London Gateway project

The archaeological assessment of desk-based and survey data undertaken for the London Gateway project to clarify, as far as possible, the significance of material on the sea bed yielded thousands of potential targets. Further discrimination and professional judgement was used to identify a final group of 29 sites of Certain, Probable and Possible archaeological interest and a further 325 sites considered to be of Uncertain Archaeological Interest. It was clear that, whilst diving was realistically the only way to establish whether or not a site was archaeological in origin, only a small sample were able to be assessed in this way and those which could be assessed had to be prioritised.

With the agreement of the regulator (in this case the Port Authority), the 29 sites falling into the Certain, Probable and Possible categories were the focus of diving operations. A Clearance Mitigation Statement (CMS) was developed to address each of the 29 sites to provide a focus for further investigation and ultimately provided a comprehensive collated record of work undertaken. These diving operations and the production of CMSs enabled a number of sites to be managed without further archaeological intervention, either by avoidance or resettlement. A number of sites were also selected for further investigation by diving in order to determine their significance and the need for any further mitigation. This approach enabled the management of heritage assets throughout the duration of the project and limited the need for archaeological works in areas considered to have low archaeological potential.

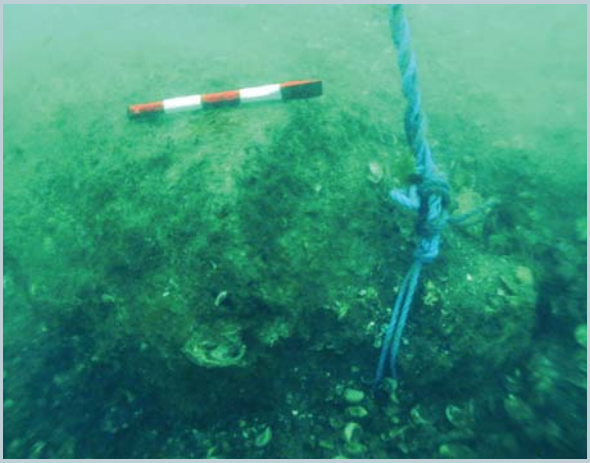
25. http://www.hse.gov.uk/diving/acop.htm

Diving Investigations in Portsmouth Harbour and Approaches

During geophysical survey undertaken for the Portsmouth Approach Channel and Harbour EIA, hundreds of anomalies were located within the proposed dredge area (Marine Archaeology Ltd 2007). These anomalies were subject to a robust archaeological assessment developed in liaison with the Port Authorities. The application of professional judgement and discrimination enabled a large number of anomalies to be interpreted as of non-anthropogenic origin without further need for investigation. Of the hundreds of anomalies first identified, the assessment highlighted 567 anomalies of possible archaeological interest.

Throughout Portsmouth Harbour and its approaches a total of 58 anomalies identified as being of high archaeological potential and 37 of medium potential were ground-truthed by diver inspection. All of the anomalies were identified and none were found to be recognisable archaeology of any potential or significance. In addition, a sample of 93 anomalies originally classified as being of low archaeological potential were dived, where they lay close to sites of medium or high potential, and none were found to be of archaeological significance. Divers also investigated four known wreck sites within the harbour, including HMS *Boyne*. No other wrecks or significant material were found within the area of direct dredging impact or throughout the harbour and its approaches.

The results achieved by this approach enabled the developer to demonstrate with a high level of confidence that the proposed development was unlikely to result in impacts upon the archaeological resource and disruptions to the scheme as the result of unforeseen archaeological discoveries throughout the duration of the project. The diving operations therefore provided quality assurance of the geophysical interpretation and were proportionately both 'best value' and 'best practice' in achieving the specific aims and objectives for this project, in terms of use of diving resources and archaeological assessment. Although subject to an initial outlay, the results of this approach benefitted the project as a whole as it was thereafter possible to reduce the precautionary approach accordingly throughout the duration of the project.



Cannon on seabed

5.5.7 The main drawbacks to diver surveys are associated with limitations such as those associated with sea conditions, daylight restrictions, tidal windows, depth and time dependant limitations, visibility, team size and structure and the risk from large vessel traffic and other harbour operations.

5.5.8 An alternative to diver surveys are remote operated vehicles (ROVs). An ROV can be mounted with the same equipment as a diver plus further equipment that will increase its utility such as sector-scanning sonar (forward-looking imaging sonar), manipular arms and jetting gear. Some ROVs will be able to operate in tidal conditions that exceed diver tolerances and can thus be deployed for longer and more efficiently. However, higher specification ROVs are larger and more costly which also affects the type and size of vessel required for their launch. ROVs are also limited by low visibility restrictions and the utility of this technique may be limited to ports and harbours with demonstrably higher levels of visibility than is generally encountered. Should an ROV be considered to have advantages over the deployment of divers for a particular project, an experienced archaeologist should nonetheless be integrated with the ROV deployment team to provide an assessment of the targets located and to direct the ROV pilot to ensure that sufficient information for each survey is obtained.

5.5.9 There may be specific circumstances where neither a diver nor an ROV will be able to locate an anomaly on the seabed. Specifically this may occur where a magnetic anomaly has been

identified without a corresponding surface expression suggesting that material may be buried. In this instance, it may be possible to use a grab to retrieve a sample of the seabed at this location, although this is a destructive and imprecise method that should only be used with due consideration and where other techniques cannot be applied.

A Strategic Approach to Ground-truthing

5.5.10 For some schemes, high numbers of unidentified targets may preclude ground-truthing in every instance and it may be necessary to select a sample to ground-truth in the first instance. This is of particular relevance in consideration of an inevitable degree of modern contamination, anthropogenic material of non-archaeological origin such as general debris, defunct moorings or construction waste. Traditionally, only the most obvious targets have been selected for ground-truthing, but often this is at the expense of potentially important remains that may be more ephemeral or difficult to interpret in their geophysical signature, such as smaller wooden vessels or aircraft. In these cases a sampling strategy/methodology, to reflect as far as possible the distribution of different types of assets or potential assets, should be agreed through consultation with the archaeological contractor and the curator and clearly set out within the Written Scheme of Investigation and supporting method statement prior to the commencement of works.

5.5.11 The sampling strategy should adequately allow, using appropriate fieldwork techniques, a robust understanding of anomaly types, their nature and distribution to be amassed so that risk to potential heritage assets can be sufficiently assessed.

5.5.12 The method employed for ground-truthing anomalies of potential archaeological interest depends not only on the environment in which the proposed development is sited, but also on the scale of the project, the feasibility of these investigations and whether or not they are considered to be proportionate to the scheme in question. To ensure that the level of work undertaken is both appropriate and proportionate to the level of assessment required, it is essential that archaeological advice and guidance be sought from heritage specialists and consultants for port or harbour developments of any size, in addition to the early and ongoing consultation between the developers and archaeological contractors/curators.

5.5.13 As well as achieving archaeological objects, ground-truthing can also benefit a proposed development scheme through the identification of potential threats to operational activities such as those that may arise from the presence of modern debris considered to be of little or no archaeological significance.

5.6 Reporting

5.6.1 As previously stated the level of detail required for the provision of baseline information is dependent upon the stage of the application and the scale of the scheme, as advised by curators. For each stage or project, however, it will be necessary to collate the results of any desk-based assessment, survey and field assessment that have been carried out and present the results in an illustrated report. For some packages of work this may result in a stand-alone technical report, or series of individual technical reports, while for others the results may be compiled within a chapter or section of the project Environmental Statement, for example. 'Reporting' can occur during the pre-application to support completion of EIA and post-consent as a condition/article of any necessary and relevant permission.

5.6.2 Guidance on reporting can be found within the Chartered Institute for Archaeologists' Standard and Guidance documents although[26] reports typically include:

- An executive summary;
- The aims and objectives of work carried out;
- The methodology(ies) employed in carrying out the work;
- The results and a discussion of the potential of the results and the character and importance of identified heritage assets;
- A discussion of further work or questions that have arisen from the work; and
- Supporting illustrations and appendices.

5.6.3 For projects requiring EIA a report will also include the results of the impact assessment and an outline of the agreed mitigation and monitoring requirements for the development.

26. http://www.archaeologists.net/codes/ifa

Unknown Marine Assets and Landscapes in the Approaches to Liverpool

In 2012–2013 Wessex Archaeology undertook a project funded through the English Heritage National Heritage Protection Plan to investigate the use of existing geophysical and geotechnical survey data. The objective of this project was to map and characterise unknown marine archaeological assets and palaeo-landscapes in the marine approaches to the Port of Liverpool.

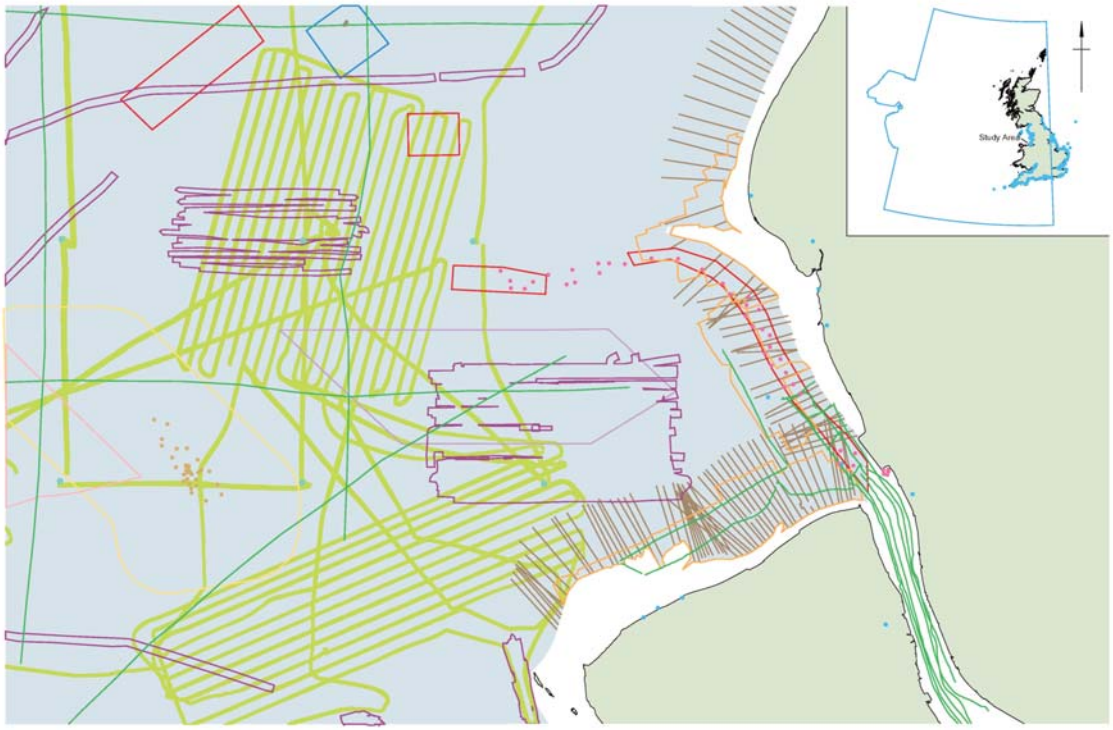
The Port of Liverpool has an extremely rich maritime history based upon trade. From the 18th until the mid-20th century Liverpool played a central role in the remarkable expansion in both overseas and home trade occasioned by both the slave trade and Britain's Industrial Revolution. As a result it became one of the largest and busiest ports in the world.

A total of 166 sidescan sonar anomalies, two magnetic anomalies and five Lidar anomalies were identified within the study area (Wessex Archaeology 2013). After anomaly grouping and discrimination, 139 seabed features of archaeological potential were identified. Of these only five wrecks, or less than 4%, can be correlated with existing UKHO records. The remaining 96% are therefore potentially unknown marine heritage assets.

Analysis of existing sub-bottom profiling datasets evidenced a palaeochannel system (the palaeo-Dee) within Liverpool Bay comprising a wide central palaeochannel with a series of surrounding, and possibly connected, smaller palaeochannels (Wessex Archaeology 2013). The data also produced evidence of marine transgression in Liverpool Bay and indicated that deposits of high archaeological potential may be associated with the Surface Sands formation.

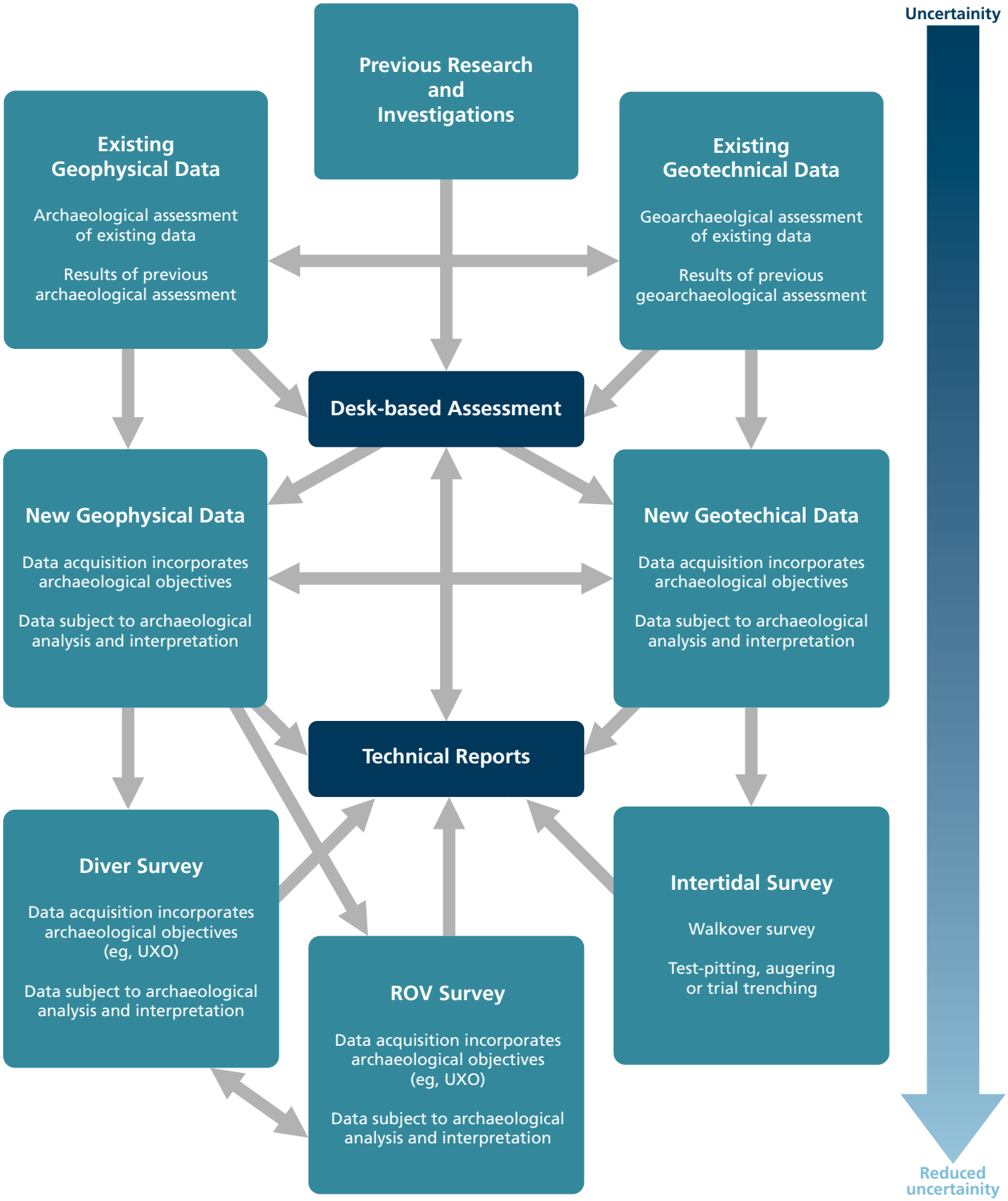
The geotechnical data revealed several localities of organic material which directly contribute to the assessment of the palaeo-environment. Alluvial deposits representing a once terrestrial environment were identified with laminations of clay and silt suggestive of mudflats and horizons of marine sediment illustrative of marine transgression.

The Liverpool Approaches project demonstrated that the use of existing datasets can prove archaeologically effective and also highly cost effective.



Liverpool Approaches project data coverage

Establishing a Baseline: Interrelationships between Techniques



6. Identifying Effects

6.1.1 In EIA, effects arise as the predicted outcome of an environmental impact resulting from proposed development works. Significant effects are identified by comparing the sensitivity of an asset against the magnitude of impact. Often presented as a 'significance matrix', this allows a measure of significance to be assigned to an effect, with medium and major effects generally being regarded as 'significant'. Effects will be considered to be either adverse (negative) or beneficial (positive).

6.1.2 The sensitivity of an asset is an expression of its ability to accommodate change and of its capacity to recover if it affected. This will include consideration of the adaptability, tolerance and recoverability of an asset as well as its importance. However, all damage to, or disturbance of, heritage assets and their physical surroundings is permanent. Heritage assets are finite in that they have no recoverability, and they cannot change and adapt in the way that biogenic resources are able to. In practical terms, therefore, the sensitivity of a heritage asset in EIA terms is most often expressed solely as a direct reflection of its importance.

6.1.3 Assessments of the magnitude of an impact may consider the extent, duration and frequency of an effect as well as the severity of that impact in terms of the degree of change relative to the baseline. However, once damage occurs or an asset is lost it is not possible to retrieve the information that is correspondingly lost. Therefore, all impacts that result in damage to, or disturbance of, heritage assets are considered to be of high magnitude. Hence, it is nearly always the case that the effect of direct impacts to archaeological material will be considered significant in EIA terms. However, standard mitigation strategies may be adopted to reduce this significance to levels deemed to be acceptable in EIA terms.

6.1.4 If marine heritage assets are present, significant adverse effects may result from the direct impacts of the activities listed in Table 1.

Table 1: Key activities and the effects of direct impact

Activity	Possible Effect
Dredging	Physical damage to archaeological material and disturbance of intact and coherent sites from the physical impact of the dredge head, removal of archaeological material within dredged sediment
Land reclamation and beach replenishment	Displacement of archaeological material present within infill materials, loss of context
Piling	Physical damage to archaeological material and deformation of the surrounding seabed deposits
Coffer dam installation	Physical damage to archaeological material and deformation of the surrounding seabed deposits
The construction of harbour walls and sea protection schemes	Damage to archaeological material on or within seabed surficial sediments from the physical placement of construction materials (compression), damage from pre-construction seabed preparation such as levelling and clearance
Maintenance and clearance operations	Physical damage to, disturbance of and removal of archaeological material
Resettlement of wrecks and obstructions	Dislocation of physical relationship between historic material and its original location, loss of wrecking context, damage to wreck during resettlement
Propeller wash and dynamic positioning	Damage to or disturbance of archaeological material exposed or undermined by propeller wash
Anchoring and jack-up barges	Physical damage to archaeological material and deformation of the surrounding seabed deposits, unexpected retrieval of archaeological material caught on anchors etc.
Dredge spoil disposal	Displacement of archaeological material present within disposed materials, loss of context

Table 2: Key activities and the effects of indirect impact

Activity	Possible Effect
Dredging	Removal of sediments resulting in exposure, physical dispersal and destabilisation of sites due to hydrodynamic effects
Land reclamation	Removal & deposition of sediments resulting in changes to physical processes beyond the range of natural variation, restricted access to surviving archaeological material within footprint
Piling	Increased scour around piles, destabilisation of sites
Coffer dam installation	Increased exposure of archaeological material within drained areas and through short term localised scour
The construction of harbour walls and sea protection schemes	Changes to physical processes due to blocking effect, increased scour, restricted access to surviving archaeological material within footprint, destabilisation of sites, physical damage
Maintenance and clearance operations	Physical damage to, disturbance of and removal of archaeological material
Resettlement of wrecks and obstructions	Destabilisation and changes in scour patterns due to hydrodynamic effects, physical damage to and disturbance of archaeological material
Propeller wash and dynamic positioning	Removal of sediments by propeller wash resulting in exposure and destabilisation of sites
Dredge spoil disposal	Deposition of sediments resulting in changes to physical processes beyond the range of natural variation, restricted access to surviving archaeological material within footprint

6.1.5 The effect of indirect impacts upon heritage assets is directly linked to any changes that can be predicted to occur to the prevailing physical processes within a study area. If these changes lie beyond the range of what might be expected to result from natural variation, they may be considered significant. In general, archaeological material exposed to marine processes will deteriorate faster than those buried within seabed sediments; so increased scour, slumping, destabilisation or sediment stripping can result in a negative effect upon buried heritage assets. New construction such as land reclamation and sea defences may also have the indirect effect of preventing access to archaeological material for future research or altering sediment stability locally. Conversely, increased sediment cover can result in a positive effect upon exposed heritage assets that become buried and are afforded increased protection from erosion and deterioration.

6.1.6 Significant adverse effects from indirect impacts to intertidal and marine heritage assets, if present, may occur during the activities listed in Table 2.

6.1.7 Beneficial effects from indirect impacts to intertidal and marine heritage assets may occur during the activities listed in Table 3.

6.1.8 Cumulative effects are those which can result from multiple impacts associated with multiple past, present or reasonably foreseeable projects. The effects of individual development may not be significant when considered alone but the combined effect of impacts of the project considered alongside other plans or projects may be significant. For example, the expected changes to physical processes from a proposed harbour installation may lie within the range of natural variation. Predicted changes associated with the construction of another harbour wall and port

Table 3: Potential beneficial effects

Activity	Possible Effect
Land reclamation	Potential accretion of protective sediments overlying exposed archaeological material
Coffer dam installation	Exposure of archaeological material within drained areas providing opportunities for recording and investigation
Dredge spoil disposal	Potential accretion of protective sediments overlying exposed archaeological material
All activities	Potential increase in available archaeological data/knowledge through survey, mitigation and dissemination activities

facilities in the same area may also be expected to lie within the range of natural variation. The construction of both elements, however, may increase changes to physical processes to a point where the removal of sediment from an area exposes buried heritage assets resulting in erosion and decay.

6.1.9 Palaeolandscapes may extend across the boundaries of project areas and may be interlinked with the paleogeography of varying period and climatic phases. Likewise, maritime installations, shipwrecks and aircraft form part of a wider body of data relating to maritime and aviation networks which will extend beyond the boundary of a project area. If multiple unavoidable impacts occur from the construction, operation and maintenance of multiple ports and harbours, then cumulative effects will occur. It is possible that unique aspects of former landscapes and seascapes may be lost as a result of multiple projects, plans and activities. Also, if a site is damaged or destroyed, comparable sites elsewhere may increase in importance as a result of greater rarity and any future direct impacts will be of greater significance.

6.1.10 However, the accumulation of data that results from the development process, through desk-based assessments, archaeologically assessed geophysical and geotechnical data and through the chance discoveries of significant archaeological sites and artefacts during the course of development activities, will contribute significantly to a greater understanding of the offshore archaeological resource. Consequently, these unavoidable impacts, and the data and records produced in mitigating their effects, can also be regarded as a significant, positive cumulative effect. As set out in the NPS for Ports (Department for Transport 2012, 68), this must be demonstrated by the completion of studies to professional archaeological standards, by the publication and dissemination of results and the deposition of the archive, all to the standards set out by the regulator.

7. Mitigating Effects and Managing Risk

7.1 Conditions of Consent and the Written Scheme of Investigation

7.1.1 If consent for development is granted, the project will be subject to an agreed set of conditions that mitigate, remedy or offset potential significant impacts identified through the EIA exercise. The consenting process as directed by the requirements of the Harbour Order (under the *Harbours Act* 1964) or Development Consent Order (DCO) (including any deemed Marine Licence) under the *Planning Act* 2008 (as amended) will set out the conditions necessary to deliver the mitigation proposed in the environmental assessment as agreed between the developer and the regulator.

7.1.2 As set out in the required consent document, the approach to mitigation, and thus the conditions imposed, will be scheme specific and will be tailored to address the identified environmental impacts of the proposed project. A frequent consent condition common to port development schemes is the requirement for a detailed and project specific archaeological WSI that sets out the methods and standards for archaeological mitigation strategies, produced in discussion with curators and agreed with the regulator. This requirement is set out in the NPS which states:

> *Where appropriate, the decision-maker should impose requirements on a consent to ensure that such work is carried out in a timely manner in accordance with a written scheme of investigation that meets the requirements of this section and has been agreed in writing with the relevant local authority (and, where the development is in English waters, the Marine Management Organisation and English Heritage)* (National Policy Statement 2012, 68–9).

7.1.3 The WSI is a key document that sets out the agreed mitigation measures for a development with the overall aim of reducing risk and uncertainty. The WSI utilises the information presented in the environmental assessment to describe pre-development conditions as determined by review of desk-based sources of information and corroboration with marine survey data (eg, identification of anomalies of possible archaeological interest). The WSI will also clearly set out the techniques and methodologies for subsequent investigations (ie, high resolution geophysical, geotechnical and diver surveys) that are programmed post-consent, to support confirmation of features of known or possible archaeological interest that might be affected by the proposed development. It is, therefore, important to acknowledge that the production of a WSI is one distinct activity to be completed. Once agreed, the WSI will inform the production of technical reports to be produced as surveys are commissioned and as archaeological analysis and interpretation are completed; these draft reports are sent to curators prior to agreement with the relevant regulatory body.

7.1.4 The WSI should include:

- A description of the development;
- An overview of the historic environment within the defined area;
- A summary of the potential impacts to the historic environment from the development;
- A detailed outline of the mitigation agreed by the developer with the regulator, as advised by the curator including:
  - details of any exclusion zones that have been implemented to prevent direct impacts;
  - details of works agreed to provide further information required to reduce the risk of direct impacts (such as further geophysical or geotechnical surveys, field evaluation/ground-truthing);
  - details of works agreed to offset direct impacts (such as recording or intrusive investigation); and
  - details of an agreed discoveries protocol.
- The mitigation measures agreed by the developer with the regulator, as advised by the curator including:
  - details of any archaeological exclusion zones that have been implemented to prevent direct impacts;
  - the techniques and methodological approach to optimise historic environmental analysis of marine surveys commissioned post-consent to reduce the

risk of direct impacts (such as further geophysical or geotechnical surveys or ground-truthing);
    - details of work programmes (such as archaeological recording and/or intrusive investigation standards) to offset direct impacts; and
    - details of an agreed protocol for the reporting of discoveries of possible archaeological interest.
- A clear description of the respective responsibilities of the developer, main contractors, and archaeological consultants/contractors, to include contact details and formal lines of communication between the parties and with the curator;
- A scheme of investigations that sets out accepted standards and methodologies for the agreed archaeological works, including provision for the production of method statements for each piece of work;
- A commitment to reporting, publication, conservation and archiving requirements for the archaeological works undertaken in the course of the scheme;
- Provision for monitoring, reviewing and updating the WSI; and
- Details of health and safety considerations applicable to archaeological works.

7.1.5 The WSI, if required, will be agreed as a licence condition and signed off by the regulatory or competent authority (ie, the Marine Management Organisation). Within the WSI, method statements describe programmes for archaeological investigation (eg, geophysical survey and diver investigation) which utilise the high-resolution data capture which enables the final design of the consented development to be delivered. Each method statement supports the production of archaeological technical reports for review and agreement based on the final surveys and investigations necessary to deliver the project. In this way, the WSI provides a succinct package containing all the necessary methodologies that should mitigate for any impact. In this way, the WSI acts as an umbrella to guide the production of additional technical reports produced as a result of post-consent assessment exercises that are required to support delivery of the proposed development. The important principle is that the conditions of consent provide for the production of a WSI. The actions identified within the WSI are then realised through the delivery of the consented project and thereby should implement the mitigation measures contained within the project's EIA.

7.1.6 Responsibility for the implementation of the WSI, as for any article or condition within any consent obtained, is the party granted permission (ie, the developer). However to effectively implement the WSI the developer may want to appoint a Retained Archaeologist. Individual packages of work may be undertaken by alternative professional archaeological contractors although the project Retained Archaeologist will be responsible for ensuring that this work complies with the standards and methodologies set out in the WSI. This responsibility is retained through all phases of the proposed development, inclusive of any post-construction survey.

7.1.7 The conditions of consent will detail the timeframe in which documents such as the WSI should be delivered to the regulator (eg, the MMO or local authority) for agreement. Conditions will also address how the historic environment is factored into any relevant post-consent works, to demonstrate adherence to the principles agreed for development, such as demonstrable avoidance of Archaeological Exclusion Zones (AEZs) throughout a projects lifetime.

7.1.8 The conditions will also secure commitment to archiving, publication and dissemination of the results of archaeological works within a set timeframe, as proportionate to the importance of the findings.

7.2 Avoiding Effects (Preservation *in situ*)

7.2.1 During port and harbour development, significant effects from direct impacts will not occur if heritage assets can be protected during the life of the project. An effective form of protection can be achieved through the implementation of exclusion zones around these heritage assets, including designated or protected sites, which preclude development activities within their boundaries, including the anchoring or vessels, where avoidance is practicable. Adding positive protective measures, such as burial/reburial, to consolidate an asset and prevent accidental impacts, would enhance avoidance strategies.

7.2.2 Archaeological exclusion zones (AEZs) can be placed around known heritage assets, geophysical anomalies of potential archaeological interest or areas identified as being of high potential. The position, extent and design of an AEZ should take

Lymington Harbour Protection Project

Lymington Harbour Commissioners applied for a works order (DC9798) on 23 September 2013. The proposed scheme involved the construction of two breakwaters in response to salt marsh erosion.

In support of the application Lymington Harbour Commissions commissioned a programme of archaeological assessment comprising a desk-based assessment, assessment of existing geotechnical borehole data and walkover survey. Only one site of archaeological significance was observed, the 'Boat Graveyard', a line of discarded vessels and watercraft structures 50 m long. This site, however, lay beyond the immediate footprint of the development.

A number of representations were received in response to the application including a request from English Heritage for additional information to be provided on setting impacts to the Lymington Sea Water Baths. In addition, English Heritage requested licence conditions to ensure the protection of known archaeology and reporting of unknown archaeology over the course of works.

Lymington Harbour Commissioners provided additional information, including the production of an archaeological protocol for reporting finds. The proposed mitigation was placed as conditions in the Marine Licence (L/2012/00288/2) issued by the MMO on behalf of the Secretary of State:

> *3.2.15 During construction the archaeological protocol in schedule 1 should be adhered to at all times.*
> *Reason: To protect the archaeological environment.*
>
> *3.2.16 An exclusion zone, defined by the following coordinates (WGS84), must be implemented around the extent of the 'Boat Graveyard'*
> *Reason: To prevent disturbance of heritage assets within this area.*

The Lymington Harbour (Works) Revision Order 2014 came into force on 5 February 2014.

Deep Sea Container Terminal, Port of Bristol

As an example of good practice, this project benefitted from the engagement between both the Port and the Archaeological Curator (English Heritage) at the onset of the project and throughout the development of the scheme.

Schedule 7 of the Harbour Revision Order sets out conditions for the protection of the historic environment during development of a new deep water container terminal on brownfield and reclaimed land at Avonmouth Dock.

> *The Schedule (7.2) states that:*
> *2. The Company shall not commence construction of a relevant work until the Company has:*
> *(a) appointed the Retained Archaeologist to ensure the delivery of the Scheme; and*
> *(b) carried out the pre-construction archaeological work applicable to that relevant work.*

As set out in the Harbour Revision Order:

> *'Scheme' means the Written Scheme of Investigation relating to the works agreed between the Company and English Heritage prepared by Wessex Archaeology under reference 70440.5 and dated 18 December 2008 and including a Dredge Reporting Protocol, and the definition shall include all method statements and generic method statements agreed pursuant to the Scheme and all amendments and revisions to the Scheme from time to time.*

The WSI sets out the agreed programme of works for design phase investigations comprising:

- Review of existing geophysical data;
- Geoarchaeological investigation, including the development of a deposit model taking account of previous discoveries;
- Design of Archaeological Exclusion Zones;
- Diver-based investigations;
- Additional documentary research;
- Review of the impacts of predicted changes to the hydrodynamic and sedimentary/erosion regimes;
- Refinement of the Dredge Reporting Protocol.

The WSI also makes provision for the revision of the WSI on the basis of these works to inform construction phase mitigation which may include:

- Archaeological excavation;
- Recording and recovery of archaeologically important material;
- Implementation of Dredge Reporting Protocol;
- Call-out investigations in response to discoveries arising from Dredge Reporting Protocol;
- Land-based watching briefs;
- Marine-based watching briefs; and
- Call-out investigations in response to discoveries arising from watching briefs.

The WSI includes a draft protocol for reporting discoveries of archaeological interest and sets out how the monitoring activities required for archaeological purposes should be included in a Historic Environment Monitoring Plan. Proposals are also included for post-investigation activities that may be required such as post-investigation assessment, conservation, analysis and interpretation, dissemination and archiving.

Maritime Wrecks – The *London*

The *London*, a second rate warship of the commonwealth navy and later the Royal Navy, suffered a catastrophic explosion in March 1665 whilst lying at anchor. The wreck lies in the Thames Estuary off Shoeburyness and would have been within the area of the navigation channel marked for deepening as part of the development proposals for London Gateway Port.

However, as part of the London Gateway Port archaeological mitigation strategy, AEZs were implemented around sites identified in the EIA as being of special archaeological interest. The AEZs were defined to provide a sufficient area around the sites where no seabed disturbance, including dredging, could take place and, therefore, protect the sites from damage. The principle that underpinned the definition of the AEZs was that a minimum distance of 50 metres from any known or potential archaeology on the riverbed should be maintained.

During the planning phase for the London Gateway capital dredge programme, the *London* was identified as a nationally significant wreck and was designated under the *Protection of Wrecks Act* 1973. The protected area, comprising two distinct areas of wreckage, now lies outside the navigation channel, following a redesign to avoid impact, and the restricted area is regularly monitored to determine condition and the impact of indirect effects (Firth *et al.* 2012).

into account all available information including geology, hydrology and sediment transport and should extend around the boundaries of the asset rather than around a centre-point within the site.

7.2.3 An AEZ will incorporate a buffer in order to ensure that all material associated with that asset is encapsulated within its boundary and to reduce the risk of accidents and unintentional impacts. There is no standard for setting the size of this buffer and the requirements for each AEZ will be assessed on an individual basis, particularly if the potential level of significance of the receptor is uncertain. The size of the buffer will also take into account local seabed conditions, such as the prevailing current, the nature of the activity for which mitigation is required and will also allow for an appropriate margin of error in the positioning of an asset. AEZs can be reduced, enlarged or removed at a later stage when further information is available to support these actions. Equally, additional exclusions zones can be added at any stage of the development process if new discoveries are made.

7.2.4 AEZs should be incorporated into the development proposal at an early stage and the size and design should be determined, based on the available knowledge of the site, by a suitably experienced archaeologist and through consultation with the curator. Details of the location and extent of all AEZs within a scheme footprint must be distributed to all staff and contractors with operational responsibilities in the environs of an AEZ and adherence to them must be enforced by the developer who will be responsible for their observance, as well as the curator. It is important that AEZs are retained throughout the project lifetime and monitoring of AEZs may be required by the regulator to ensure adherence both during construction and in the future.

7.3 Offsetting Effects

7.3.1 The NPS for Ports (Department for Transport 2012, 67) recognises that 'a documentary record of our past is not as valuable as retaining the heritage asset'. However, sometimes harm is accepted if it is demonstrated that there are substantial public benefits attributable to the development that outweigh the loss or harm of a heritage asset, wholly or in part. The decision on

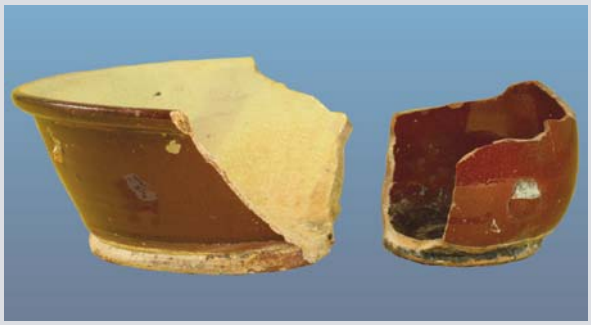
Preservation by Record

As part of the mitigation strategy for the London Gateway port development a number of wrecks were identified that required recording before being cleared or moved in advance of dredging for channel deepening (Firth *et al.* 2012).

Site 5204 ('Pottery Wreck') was located 1 km east of Sea Reach 3, 4 km due south of Shoeburyness in a depth of 14.5 m. This site was first located during a Port of London Authority (PLA) channel extension survey in 1999 and was subsequently detected as a low complex mound as a result of a multibeam survey in 2005. In advance of clearance, the site was subject to further geophysical survey, diving investigations, including intrusive diving work, and timber and pottery samples were recovered for identification and analysis.

In 2005, small timber frames were recovered and identified as oak and two sherds of pottery were identified as post-medieval coarse redware fabrics, one a white slipped flared bowl and the other a handle stump from a large cup or porringer. Both are 19th- or early 20th-century in date. Further dives in 2006 revealed partially intact framing with inner and outer flush-laid planking covered by soft metal sheeting. Nearly 300 finds were recovered to the surface including stone, glass, ceramics, brick, metal, wood and bone. Possible personal items included a bone knife handle incised with criss-cross decoration, the sole of a leather shoe, and a sailor's palm thimble.

The form of the frames suggested that the vessel was a bawley, a form of fishing smack of the 19th–20th centuries. Gravesend bawleys



were generally clinker-built, primarily used for shrimping, and were equipped with a copper for boiling the shrimps. Bawleys of Southend and the Medway were larger and carvel-constructed to allow them to fish further out in the estuary. Medway bawleys often had a removable mast to allow them to pass under Rochester Bridge, and were also used in dredging for Medway oysters.

The pottery recovered suggests that this bawley was probably lost in the first half of the 20th century. However, it has not been linked to any known loss. The investigation is thought to represent the first archaeological recording of the wreck of this type of regional vernacular boat, once common in the Thames Estuary. Fishing vessels, particularly those of small size, are very poorly represented in the national stock of wrecks and bawleys are not recorded, although there are a number curated in national collections, including a Gravesend bawley (National Small Boats Register). Site 5204 was therefore an important discovery and demonstrates the need for the investigation of fishing vessels to be integrated within existing regional research frameworks.

whether or not this loss is warranted lies with the regulator but it is the responsibility of the developer to provide sufficient information for the decision-maker to identify and assess the significance of any heritage asset that may be affected by the proposed development.

7.3.2 Prior to any intrusive works targeted desk-based research, geophysical and geoarchaeological assessment and evaluation may be necessary, in addition to the assessments undertaken in establishing the baseline. In particular, site specific assessment may help to establish significance if uncertainty remains following environmental assessment.

7.3.3 Where there is clear and convincing justification that loss of a heritage asset is warranted, the decision-maker will require the developer to record and advance understanding of the asset's significance before this is lost (National Policy Statement for ports 68). This requirement should be proportionate to the nature and level of the asset's significance and will involve recording to a level and standard, potentially including intrusive investigation and excavation, considered acceptable to the regulator, as advised by the curator. Indicative recording levels for heritage assets in the marine environment are included in Appendix III.

7.3.4 By virtue of their rarity in the marine environment there is little precedent for the level of recording that may be required for *in situ* prehistoric sites. However, as these sites will be, if discovered, of national and possibly international significance, consent for a development proposing the destruction of such a site is only likely to be granted in exceptional circumstances. In this instance a research and recording strategy should be developed through consultation with experts and curators and is likely to involve extensive investigation, which is both resource and time intensive. The high costs and time delay which may be envisaged for such work suggests that preservation *in situ* will often be the preferred option by both developers and curators.

7.3.5 For palaeolandscapes and palaeo-environmental evidence, geophysical and geoarchaeological assessment already carried out in support of an application may provide sufficient information so that no further work is required, dependent on the significance of the features assessed. If only minimal work has been done to support an application, the curator may request further pre-construction surveys to reduce the risk that valuable information will be lost.

7.3.6 Standard and guidance for recording nautical marine archaeology has been issued by the Chartered Institute for Archaeologists (2014a, 4). The guidance sets out that the primary aim of recording nautical archaeological remains is to complete an 'accurate as-found record of the vessel or parts thereof so they can be properly interpreted by a nautical specialist'. The specifications for all fieldwork must be set out in a project design to be agreed by all relevant parties before work commences and work must be processed according to the agreed specification.

7.3.7 Fieldwork to record a wreck or aircraft may include both geophysical survey and diver survey comprising drawings and records of dimensions and the relationships between features and components, underwater video and photography. Diver survey may also include variable levels of excavations from probing, to gauge sediment depth, and hand fanning to uncover specific details to trench excavation and full scale excavation using a water-dredge or air lift. Anyone wishing to recover a military aircraft, or excavate a military aircraft crash site in the UK is required to obtain a licence from the Joint Casualty and Compassionate Centre, part of the Defence Business Services.[27]

7.3.8 Provision will need to be made for the conservation of archaeological material collected during the process and for its deposition with a suitable institution. All recovered materials may require special measures to ensure their conservation and survival. This will include both first aid for finds, which can often mean simply keeping a recovered artefact submerged in water, and longer term specialist conservation. Deposition of the materials with an appropriate holding facility or institution should take place in accordance with *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (CIfA 2014b). This will often occur along with the deposition of a project archive in line with accepted standards laid out in *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives* (CIfA 2014c).

7.3.9 Any work carried out in respect of the historic environment should also be disseminated into the public domain for the benefit of the public interest. By disseminating the results of development led archaeology into the national and local records, both academic and public awareness and knowledge will be greatly enhanced.

7.3.10 Access to archaeological grey literature (informally published written material such as reports) is facilitated through OASIS (Online AccesS to the Index of archaeological investigationS).[28] The data captured through OASIS is designed to help the flow of information from data producers (archaeological contractors and community groups) to data managers (HERs and NRHE) and researchers. Online access to the archives is hosted through the Archaeological Data Service.[29] Developers and archaeological contractors should ensure that reports are uploaded to OASIS on completion of a project.

7.3.11 Formal publication of the results of investigation of significant discoveries, where considered appropriate by the curator, is the ultimate expression of this process of public dissemination. Through publication, considerable opportunities are also provided to developers to

27. https://www.gov.uk/joint-casualty-and-compassionate-centre-jccc
28. http://oasis.ac.uk/pages/wiki/Main
29. http://archaeologydataservice.ac.uk/

demonstrate the public benefits of their projects. As set out in the MPS, and reiterated in the NPS for Ports (Department for Transport 2012), 'opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available' (Marine Policy Statement 2011, 21).

7.4 Reducing Effects

7.4.1 In addition to planned recording, on rare occasions, unintentional or accidental impacts may occur that prompt the need for remedial recording. These may become apparent during scheduled monitoring of protected sites or exclusion zones, or may be reported in relation to a previously unknown discovery. In cases where the significance of the heritage asset warrant it, and in order to ensure that as little archaeological information as possible is lost, it will be necessary to instigate remedial mitigation. The level of investigation and recording (Appendix III) should be agreed between the developer and the curator.

7.4.2 In order to further reduce the risk of unintentional or accidental impacts, and consequently the need for remedial mitigation, a watching brief may be instigated. The presence of an archaeologist during a defined work stage, can reduce the risk of losing valuable information if an unknown heritage asset is encountered during development works. Archaeological material can easily be lost or destroyed during works. Material brought to the surface, for example, may be erroneously identified and discharged as waste, removed by individuals before assessment or destroyed through inappropriate retrieval, 'first aid' conservation or storage methods.

7.4.3 As outlined above, where there is clear and convincing justification that loss of a heritage asset is warranted, and sufficient work has been undertaken in advance to offset the effects of that loss, in agreement with the regulator, clearance operations may be permitted to meet the objectives of development. In some cases, full excavation by archaeologists may be the only permitted option for clearance, for example, where an asset has been assessed as being of particular significance with regard to the criteria set out in Section 3. In others, however, the competent authority, following advice from curators may determine that a non-designated heritage asset does not warrant archaeological excavation and may undertake

Grab deployed in wreck clearance

clearance operations themselves, in accordance with any consent requirements as may be necessary from another regulatory body. An alternative approach to wholly destructive clearance may also be provided through resettlement, whereby a heritage asset (a wreck or other obstruction), is moved from an area of seabed that will be subject to impact to an area that will not. This approach, however, does not negate the need for pre-disturbance records. The level of detail required to ensure that relevant data is not lost will should be discussed in advance with curators.

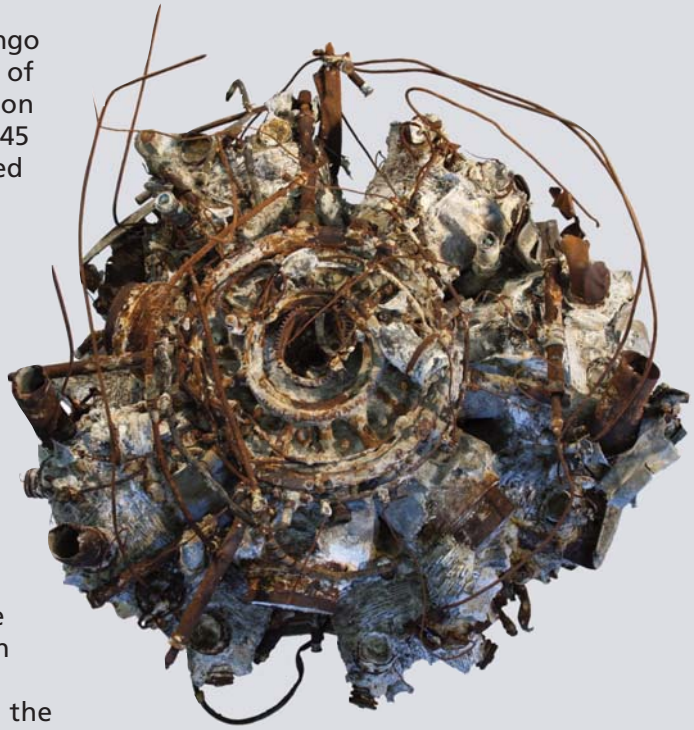
7.4.4 The presence of an archaeologist on board is often a condition of agreed clearance or dredging operations, for example where a contractor or a port authority are removing a wreck or other obstructions or lowering the sea bed in order to maintain safe navigation. During clearance, material will be removed from the seabed to the vessel using a grab. Material may be placed directly on to the deck or on to a grid where it can be washed off, with mud and sand falling back into the sea. During a watching brief the archaeologist can record the retrieved wreck, using photographs, video footage, drawings and written descriptions, and can intervene if any unexpected discoveries come to light. While some of the material salvaged may have scrap value, the archaeologist will be able to retrieve diagnostic artefacts that may be of use if further research is planned as part of the agreed works.

7.4.5 In planning clearance operations careful consideration should be given to the size of the grid selected to ensure that archaeologically sensitive material is not being lost. Important

Wreck Clearance

In August 2011, the suction dredger Congo River encountered a number of items of airframe while dredging the London Gateway navigation channel. In total, 45 pieces of aircraft wreckage were removed from the drag-head by crew and reported to Wessex Archaeology. An assessment determined that the aircraft was likely to be a Second World War German twin-engine Junkers 88 multi-role aircraft.

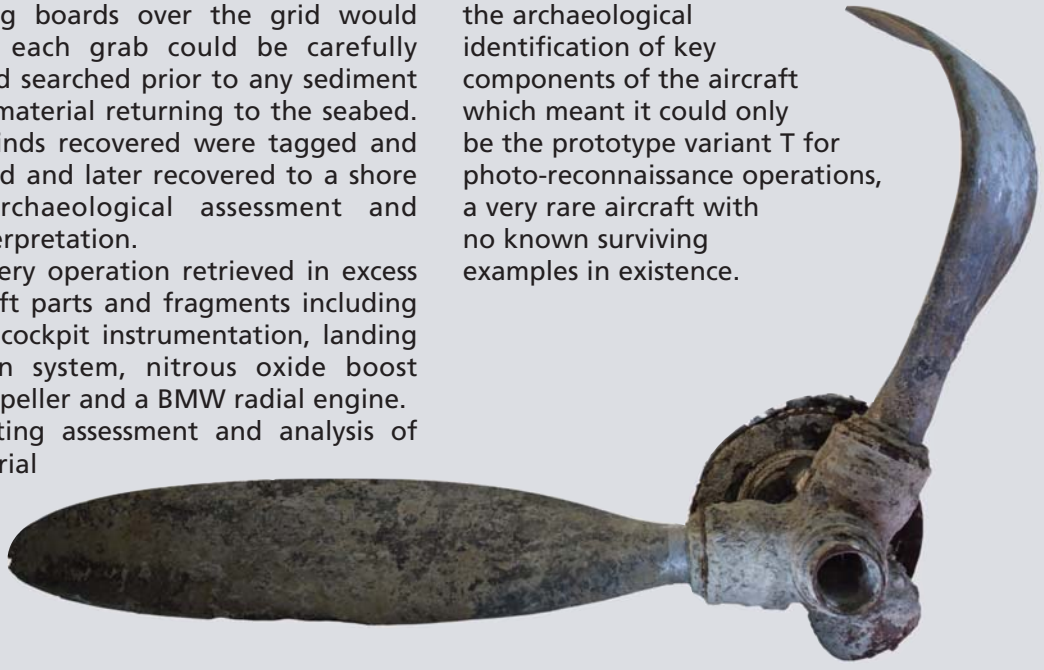
The track-plot of the dredger was cross-referenced with previously identified geophysical anomalies, but none matched the location and so a geophysical survey was instigated. The survey identified several anomalies of interest, and a diving operation was mounted to ground-truth them. The diving confirmed that two of the anomalies, close together, were part of an aircraft crash site.



After detailed discussions between the developer, English Heritage, the Ministry of Defence, the port authority and Wessex Archaeology, agreement was reached on a methodology for clearance of the aircraft crash site by a grab dredger under archaeological supervision. The methodology would utilise dGPS to establish precise positioning of each grab recovered and the archaeologist would have unhindered access to the recovered material to ensure that as little as possible was lost. Crawling boards over the grid would ensure that each grab could be carefully inspected and searched prior to any sediment and smaller material returning to the seabed. All aircraft finds recovered were tagged and photographed and later recovered to a shore base for archaeological assessment and specialist interpretation.

The recovery operation retrieved in excess of 350 aircraft parts and fragments including parts of the cockpit instrumentation, landing gear, oxygen system, nitrous oxide boost system, a propeller and a BMW radial engine.

The resulting assessment and analysis of aircraft material determined the variant and exact aircraft, a unique prototype. It had been shot down in April 1943 by a Mk IX Spitfire piloted by a Norwegian fighter ace serving with the RAF. Only the pilot of the German aircraft survived and the aircraft was being operated by a special operations unit of the Luftwaffe. This conclusion could not have been reached without the archaeological identification of key components of the aircraft which meant it could only be the prototype variant T for photo-reconnaissance operations, a very rare aircraft with no known surviving examples in existence.



material lost through a 0.40 m grid, for example, may be retained through the use of a 0.30 m minimum. Small finds, such as equipment or personal possessions, are often crucial to understanding aspects of the vessels use, as opposed to the larger items of the vessels fabric which provide details on the form and construction. Diagnostic items such as pottery may provide the key to discovering a vessel's identity, through identification of a shipping line for example.

7.4.6 Where the material is of sufficient archaeological sensitivity it may be necessary to remove the material directly to the deck or on to boards overlying the grid to ensure that only minimal amounts of material are lost. During a watching brief consideration should also be given to access by the archaeologist to the material and also for storage on board. Some finds, for example, may require first aid conservation and water tanks may be needed on board to allow for finds to be kept wet during transit. Consideration also needs to be given to the storage of archaeological materials following discharge at a wharf, including arrangements for security to prevent archaeologically, or commercially, valuable materials being lost or stolen. Logistical arrangements are likely to be specific to the vessel, wharf or contractor(s) involved in dealing with this material and it is important that an appropriate strategy is agreed between the developer, curator and contractor(s) prior to the commencement of clearance activities.

7.4.7 The presence of an archaeologist may also be recommended during activities that are taking place in proximity to a known heritage asset or in areas identified as being of high potential. The success of a watching brief in these cases is limited by the extent to which an impact can actually be discerned during an activity and for which intervention is possible. Typical activities may include open trenching through the intertidal zone and dredging. A watching brief will have limited application for activities such as pile driving or rock placement, for example, where sub-surface impacts are less likely to be observed and no material is recovered.

7.4.8 Activities which are not suitable for watching briefs, will include resettlement (the moving of wrecks into deeper water) and certain types dredging where no material will be recovered to the surface (such as plough dredging). These activities have to potential to be very damaging to heritage assets that may be present. It is likely that a suitable level of assessment and mitigation will be required well in advance in areas where activities such as this are to take place, to prevent unmitigated, significant impacts to heritage assets.

7.4.9 When an unintentional strike occurs (for example, when a drag-head or other trailing equipment on a vessel impacts an unknown object or an obstruction is noted during piling) it is important that the vessel crew, or the archaeologist on board if present, should take an accurate position. This will allow for cross-referencing with desk-based research to identify the significance of a potential new discovery. It is often the case that archaeological material becomes trapped in a drag-head and is only recovered some time later when the crew retrieve the drag-head for inspection. The precise location from which that material has come can thus be difficult to identify. However, through cross referencing the vessel's digital track-plot with desk-based research it may be possible to identify the most likely position of the strike since the previous drag-head retrieval. In areas of high potential it may be of benefit to limit the transit of the dredger between drag-head recoveries, by kilometres travelled, hours of deployment or by limiting the dredger to a zone or area, for example.

7.4.10 In all instances, discoveries should be reported promptly. When an archaeologist is not present this process is greatly enhanced by the implementation of an active reporting protocol established specifically to deal with unexpected discoveries.

7.5 Reporting Protocols

7.5.1 Reporting protocols are a mechanism designed to allow for the efficient reporting and recording of archaeological material that is inadvertently found by developers or their contractors during the course of site investigation or construction work. They are a 'safety net' for catching unexpected finds that may otherwise have been ignored by staff working on the development project, and in no way replace the proper process of addressing the historic environment through planning controls.

7.5.2 Protocols have been proven to be an effective means of ensuring the inclusion of unanticipated finds and heritage assets within

regional and national databases (HERs, SMRs and NRHE, for example). They have been successfully used within the offshore renewables industry, the marine aggregates industry and for both small-scale harbour works and large-scale port development in recent years.

7.5.3 The operation of the protocol, on a day-to-day basis, will need to be overseen by an archaeological contractor experienced in the operation of protocols and with access to sufficient storage facilities and internal specialists to provide conservation and assessment expertise.

7.5.4 The archaeological contractor implementing the protocol will ensure that all finds are recorded and assessed, details of the assessment are passed to the developer, and that reports are fed back to the developer, contractors and staff involved. They will also ensure that the developer is aware of other legal and reporting requirements such as submissions to the Receiver of Wreck, NRHE, HER and, where requested by the curator other reporting mechanisms.

7.5.5 Typically, the developer will nominate an individual point of contact (usually an environmental manager or similar) known as the 'nominated contact' who will act as the link between the archaeological contractor and the contractors undertaking work. Training will be provided by the archaeological contractor so that the procedures in respect of the protocol are fully understood.

7.5.6 All contractors working in the marine environment and that have the capacity to interact with known or unknown heritage assets, however unlikely, should be trained in the operation of the protocol. Work team leaders (for example vessel masters, or foremen) will act as 'site champions'. The site champions will act as a conduit for finds reported by staff to the nominated contact, having been provided the necessary detail about the find.

7.5.7 Upon encountering archaeological material, the nominated contact of the developer will inform the archaeological contractor by way of reporting the find through the protocol service. As part of the protocol service, the archaeological contractor will provide an initial response to acknowledge the report that will underline any action required by the developer in light of the discovery (eg, initial conservation methods such as the immersion of an artefact in sea water). Where the report is urgent, the initial response will include an assessment of archaeological potential and, where necessary, a decision on whether or not a temporary exclusion zone is required to prohibit further work in the discovery location. The archaeological contractor will continue to liaise with the nominated contact, relevant curators and (where appointed) the retained archaeologist for the project and will advise of the implications of the discovery and of further actions that might be required on part of the developer. The subsequent handling, retention or disposal of finds will be subject to applicable law and to arrangements between the developer and the institution receiving the archive arising from the scheme.

7.5.8 For a protocol to operate effectively, the three key elements are the technical support of the retained archaeologist, the effectiveness of the awareness training and the action of the contractor/developer. If any one of those components is not properly in place and adequately supported then the protocol may not function effectively and heritage assets may be put at risk and information pertaining to the marine historic environment may be lost as a result.

7.5.9 The protocol will detail that periodic reporting is to be instigated once investigative and intrusive activities start, inclusive of null reports, through to conclusion of operations. This way the effectiveness of the protocol can be gauged in consideration of any prior assessment of risk regarding the likelihood of encountering material of possible archaeological interest.

7.5.10 Further information on existing industry-wide protocols and how they operate is available from:

- *Offshore Renewables Protocol for Archaeological Discoveries*;[30]
- *Marine Aggregate Industry Protocol for the Reporting of Finds of Archaeological Interest*.

7.5.11 Project specific discoveries protocols, proportionate and tailored to the nature of the scheme, should be developed and set out in a separate stand-alone document to the archaeological Written Scheme of Investigation (WSI), this document will clearly set out the responsibilities of the developer, contractors, sub-contractors and the retained archaeologist.

30. http://www.wessexarch.co.uk/projects/marine/tcerenewables

7.6 Education, Outreach and Public Benefit

7.6.1 Social enhancement is at the core of policy set out in the NPS for Ports (Department of Transport 2012). The measures necessary for the management and protection of the marine historic environment in light of port and harbour development proposals often yield a significant amount of data which contributes significantly to the research of England's underwater cultural heritage. This data may be further regarded as having significant value in outreach and education programmes. Public engagement with the results of investigations undertaken for a particular project has the potential to enable local communities and visitors to give significance to the proposed project as well as their underwater cultural heritage.

7.6.2 In addressing the marine historic environment in line with best practice as outlined in this document, developers can promote public benefit as part of their Corporate Social Responsibility strategy, through the preservation of knowledge and an appreciation of the past. This engagement has the potential to reduce opposition to high profile projects and improve the reputation of developers. It also conforms to the principles that underpin the approach to the historic environment marine environmental assessment through 'constructive conservation' through recognising and reinforcing the historic significance of places while accommodating the changes necessary to make sure that people can continue to use and enjoy them. It also underpins the aims of the NPS for Ports that development 'must be aligned with environmental protection, social enhancement and improvement wherever possible' (Department for Transport 2012, 12). Social enhancement in the form of outreach and engagement is always possible, and may be undertaken in a wide variety of forms, including research, synthesis, publication, workshops, exhibitions, talks to local interest groups and schools and guides.

Corporate Social Responsibility

Through their London Gateway Environmental and Social Policy, DP World (2013) set out their obligation to the core values of 'Commitment', 'Responsibility, 'Innovation' and 'Growth', to continuous engagement with stakeholders and to:

> Identifying objectives and targets to ensure that the environmental and social impacts are managed effectively and that continuous improvement is achieved through fulfilling measures and actions that minimise and offset unfavourable consequences, along with facilitation and strengthening beneficial outcomes of the Project.

Consequently, DP World has developed a successful education and outreach programme, built on the archaeological discoveries unearthed during the development. Finds recovered during the pre-consent diving assessment were conserved with a view to being accessioned by local museums in the near future. The London Gateway scheme has funded archaeologically themed school workshops and instigated a series of archaeological publications that, on one level, allow for the dissemination of the results of archaeological assessment, but, on another, actively promote community appreciation of the local heritage.

The results of the extensive programme of archaeological work that was carried out as part of the London Gateway project are presented in two monographs published in 2012 funded by DP World and authored by Oxford Archaeology (Biddulph *et al.* 2012) and Wessex Archaeology (Firth *et al.* 2012). In addition, DP World has also funded the publication of a series of publicly available popular booklets:

- *London Gateway: A Maritime History* (Wessex Archaeology)
- *Time and Tide: The Archaeology of Stanford Wharf Nature Reserve* (Oxford Archaeology)
- *Archaeology from the Sky: The Air War over the Thames Estuary* (Wessex Archaeology)

Further dissemination of project data was delivered by a BBC production entitled *Thames Shipwrecks: A Race Against Time*, which aired in 2008. The programme examined a series of wrecks in the main navigation channels under the authority of the Port of London Authority, including those investigated as part of the London Gateway project.

These publications, education and outreach initiatives have helped to foster a sense of local engagement with London Gateway, demonstrating both the high value of the data collected during the programmes of archaeological work as well as the contribution that development projects such as London Gateway can make to promoting understanding of heritage within local communities.

8. Conclusion

8.1.1 This document has set out the nature of the historic environment within ports and harbours, the key ways in which the historic environment is invested with value, both through the regulatory framework in England and in terms of value to society, and provided practical advice on how to assess and manage the historic environment during port and harbour development projects.

8.1.2 The fundamental message underlying the good practice approaches outlined above is that early and ongoing consultation with curators/regulators throughout the life of a project is essential to the successful management of marine archaeology within ports and harbours. It is through this communication that the commercial risk of unexpected archaeological discoveries can be minimised and that the historic environment can be appropriately conserved, for this and future generations.

9. Bibliography and Further Reading

BBC News, 2004, WWII fighter wreckage recovered, BBC News Article Thursday 22 July 2004. Available online (accessed on 21/05/2014): http://news.bbc.co.uk/1/hi/england/norfolk/3917503.stm

Biddulph, E., Foreman, S., Stafford, E., Stansbie, D. and Nicholson, R., 2012, *London Gateway Iron Age and Roman Salt Making in the Thames Estuary. Excavation at Stanford Wharf Nature Reserve, Essex*, Oxford Archaeology Monogr. 18

Buglass, J. and Brigham, T., 2008, *Rapid Coastal Zone Assessment Survey – Yorkshire and Lincolnshire: Whitby to Reighton*, English Heritage Maritime Reports, Humber Archaeology Report 238. Available online (accessed on 12/08/2014): http://archaeologydataservice.ac.uk/archiveDS/archiveDownload?t=arch-868-1/dissemination/pdf/RCZA_vol_4_Whitby_to_Reighton/Report238RCZASvol4WhitbytoReighton.pdf

Buglass, J. and Brigham, T., 2011, *Rapid Coastal Zone Assessment Survey – Yorkshire and Lincolnshire: Whitby to Reighton Phase 2*, English Heritage Maritime Reports, Humber Archaeology Report 327. Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/rczas-whitby-reighton-phase2/

Chartered Institute for Archaeologists, 2014a, *Standard and Guidance for Nautical Archaeological Recording and Reconstruction*, CIfA. Available online (accessed on 13/02/2014): http://www.archaeologists.net/sites/default/files/node-files/IfASG-Nautical.pdf

Chartered Institute for Archaeologists, 2014b, *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials*, CIfA. Available online (accessed on 13/02/2014): http://www.archaeologists.net/sites/default/files/node-files/IfASG-Finds.pdf

Chartered Institute for Archaeologists, 2014c, *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives*, CIfA. http://www.archaeologists.net/sites/default/files/node-files/IfASG-Archaeological-Archives.pdf

Cunliffe, B., 1991, *Iron Age Communities in Britain: an account of England, Scotland and Wales from the seventh century BC until the Roman Conquest*, 3rd edition, Routledge

Cunliffe, B., 2004, *Iron Age Britain*, Batsford

Department for Communities and Local Government, 2012, *National Planning Policy Framework*. Available online (accessed on 05/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Department for Transport, 2012, *National Policy Statement for Ports*. Available online (accessed on 05/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/3931/national-policy-statement-ports.pdf

Department for Transport, 2013a, *Port Freight Statistics, Statistical Release September 2013*. Available online (accessed on 05/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244717/port-freight-statistics-2012-final-figures.pdf

Department for Transport, 2013b, *Air Traffic at UK Airports (AVI01) Updated July 2013*. Available online (accessed on 13/02/2014): https://www.gov.uk/government/statistical-data-sets/avi01-traffic-passenger-numbers-mode-of-travel-to-airport

Department for Transport, 2013c, *Sea Passenger Statistics: 2012, Statistical Release November 2013*. Available online (accessed on 12/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/256353/sea-passenger-2012-final-figures.pdf

DP World, 2013, *DP World London Gateway Environmental and Social Policy*. Available online (accessed on 21/08/2014): http://www.londongateway.com/static/downloads/DP_World_London_Gateway_Environmental_Policy_Sept_2013_SignedSNM.PDF

English Heritage, 2002 *Military Aircraft Crash Sites: Archaeological guidance on their significance and future managemen*t, English Heritage Guidance. Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/military-aircraft-crash-sites/

English Heritage, 2007, *Geoarchaeology: Using earth sciences to understand the geological record*. Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/geoarchaeology-earth-sciences-to-understand-archaeological-record/

English Heritage, 2008a, *Conservation Principles, Policies and Guidance*. Available online (accessed on 30/08/2015): https://historicengland.org.uk/images-books/publications/conservation-principles-sustainable-management-historic-environment/

English Heritage, 2008b, *Geophysical Survey in Archaeological Field Evaluation*. Available online (accessed on 30/10/2015): https://historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/

English Heritage, 2011, *Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation* (2nd edition). Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/environmental-archaeology-2nd/

English Heritage, 2012, *Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes*. Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/marine-geophysics-data-acquisition-processing-interpretation/

Firth, A., Callan, N., Scott, G., Gane, T. and Arnott, S., 2012, *London Gateway: Maritime Archaeology in the Thames Estuary*, Wessex Archaeology Report 30

Firth, A., 2013, *Marine Spatial Planning and the Historic Environment*, Fjordr. Unpublished Report Ref. 16030 (English Heritage Ref. 5460). Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/marine-spatial-planning-historic-environment/

Gribble, J. and Leather, S., 2011, *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector*, EMU Ltd, Ref. GEOARCH-09

Hepper, D., 1994, *British Warship Losses in the Age of Sail*, Jean Boudriot Publications

Historic England, 2015, *The Setting of Heritage Assets: Historic Environment Good Practice Advice in Planning Note 3*, Historic England Guidance. Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/gpa3-setting-of-heritage-assets/

HM Government, 2011, *Marine Policy Statement, March 2011*. Available online (accessed on 05/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf

HM Government, 2013, *Offshore Wind Industrial Strategy Summary, Business and Government Action, August 2013*. Available online (accessed on 13/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/226457/bis-13-1092ES-offshore-wind-industrial-strategy-summary.pdf

McGrail, S., 1987, *Ancient Boats in North-West Europe*, Longman

McGrail, S., 2004, *Boats of the World: From the stone age to medieval times*, Oxford University Press

MDS Transmodal Limited, 2007, *Update of UK Port Demand Forecasts to 2030 & Economic Value of Transhipment Study, Final Report*. Available online (accessed on 13/02/2014): http://www.salford.gov.uk/corestrategy/iw/ME-ME08-Update-of-UK-Port-Demand-Forecasts-to-2030-and-Economic-Value-of-Transhipment-Study,-Final-Report.pdf

Maritime Archaeology Ltd, 2007, *HMNB Portsmouth Channel Proposed Dredge Field Activity and Site Inspection Report*, Unpublished Report Ref: 1776

Momber, G., Tomalin, D., Scaife, R., Satchell, J. and Gillesie, J., 2011, *Mesolithic Occupation at Bouldnor Cliff and the Submerged Prehistoric Landscapes of the Solent*, CBA Res Rep 164, Council for British Archaeology

Office of the Deputy Prime Minister, 2005, *A Practical Guide to the Strategic Environmental Assessment Directive*. Available online (accessed on 18/02/2014): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/7657/practicalguidesea.pdf

Oxford Economics, 2012, *The Economic Impact of the UK Maritime Services Sector: Ports, A report for Maritime UK, December 2012*. Available online (accessed on 13/02/2014): http://www.ukchamberofshipping.com/media/filer/2013/01/21/oxford_economics_2012_report_on_ports.pdf

Parfitt, S.A., Barendregt, R.W., Breda, M., Candy, I., Collins, M.J., Coope, G.R., Durbidge,P., Field, M.H., Lee, J.R., Lister, A.M., Mutch, R., Penkman, K.E.H., Preece, R.C., Rose, J., Stringer, C.B., Symmons, R., Whittaker, J.E., Wymer J.J. and Stuart, A.J., 2005, The earliest record of human activity in Northern Europe, *Nature*, 438, 1008–1012

Parfitt, S.A., Ashton, N.M., Lewis, S.G., Abel, R.L., Russell Coope, G., Field, M.H., Gale, P., Hoare, P.G., Larkin, N.P., Lewis, M.D., Karloukovski, V., Maher, B.A., Peglar, S.M., Preece, R.C., Whittaker, J.E. and Stringer, C.B., 2010, Early Pleistocene human occupation at the edge of the boreal zone in northwest Europe, *Nature* 466, 229–233

Poole Harbour Commissioners, 2012, D*raft Master Plan – Version Two*. Available online (accessed on 18/02/2014): http://www.phc.co.uk/masterplan/_downloads/phc-masterplan.pdf

Ramboll, 2012, *Port of Poole Masterplan, SEA Environmental Report, for Poole Harbour Commissioners*, Unpublished Report Ref. 19463, 26 September 2012. Available online (accessed on 18/02/2014): http://www.phc.co.uk/downloads/Sea-Environmental-Report.pdf

Ransley, J. and Sturt F., 2013, *People and the Sea: A Maritime Archaeological Research Agenda for England*, CBA Res Rep 171, Council for British Archaeology

Tapper, B, 2008, *National HSC Method Statement, Historic Environment Service, Environment and Heritage, Cornwall County Council*. Available online (accessed on 17/02/2014): http://archaeologydataservice.ac.uk/archives/archiveDownload?t=arch-466-1/dissemination/pdf/HSC_Method_Statement_2008R024.pdf

The Planning Inspectorate, 2012, *Screening and Scoping under the EIA Regulations (Advice note seven: Environmental Impact Assessment: screening and scoping)*. Available online (accessed on 19/02/2014): http://infrastructure.planningportal.gov.uk/wp-content/uploads/2013/04/Advice-note-7v2.pdf

Wessex Archaeology, 2004, *Poole Harbour Channel Deepening and Beneficial Use Scheme, Archaeological Assessment*, Unpublished Report Ref. 55990.03

Wessex Archaeology, 2008a, *Aircraft Crash Sites at Sea: A Scoping Study, Archaeological Desk-Based Assessment: Final Report*, Unpublished Report Ref. 66641.02, Available online (accessed on 29/08/2014): http://archaeologydataservice.ac.uk/archives/view/aircraft_eh_2008/

Wessex Archaeology, 2008b, *London Gateway Port: Channel Clearance and Dredging. Archaeological Exclusion Zones and Monitoring Regimes, Method Statement*, Unpublished Report

Wessex Archaeology, 2013, *Unknown Marine Assets and Landscapes in the Approaches to Liverpool Execution Stage 2 Report*, Unpublished Report Ref. 84591.03, Available online (accessed on 30/10/2015): http://historicengland.org.uk/images-books/publications/unknown-marine-assets-and-landscapes-approaches-to-liverpool/

Whitby Gazette, Wind Farm Team Declare Interest, 14 May 2014, Available online (accessed on 15/08/2014): http://www.whitbygazette.co.uk/news/business/wind-farm-team-declare-whitby-interest-1-6617577

Appendix I: Historic Environment and Other Relevant Legislation

Protection of Wrecks Act 1973: Section One

Wrecks and wreckage assessed to be of historical, archaeological or artistic importance can be protected by way of site specific designation. It is an offence to carry out certain activities within a defined area surrounding a designated wreck, unless a licence for those activities has been obtained through Historic England.

The Swash Channel wreck was discovered in 2004 during a geophysical survey by Wessex Archaeology in advance of dredging to deepen the approach to Poole Harbour. The wreck lies in approximately 6–9 metres of water and the site was designated as a protected historic wreck site in 2004. The wreck is currently identified as a 17th-century Dutch or German armed cargo vessel, which appears to have foundered in the Swash Channel after 1630.

A diver examines the Swash Channel wreck site

Ancient Monuments and Archaeological Areas Act 1979 (as amended)

This Act is primarily used to protect terrestrial sites, but has also been used to protect underwater sites. Scheduled Monuments and Areas of Archaeological Importance are afforded statutory protection by the Secretary of State, and consent is required for any major works. The law is administered by Historic England and the Department of Culture, Media and Sport.

Glasson Dock in Thurnham, south of Lancaster, is a Scheduled Monument, a rare example of a late 18th-early 19th-century commercial dockyard. The scheduled area includes the East Pier of 1785, the Harbourmaster's Office and Pier Head of 1789, the Wet Dock and Graving Dock of 1800, and the lock and entrance to the canal basin of 1824.

Protection of Military Remains Act 1986

Under the *Protection of Military Remains Act* 1986 all aircraft that have crashed whilst in military service are automatically protected. Maritime vessels (eg, ships and boats) lost during military service are not automatically protected. The Ministry of Defence can, however, designate wrecks lost within the last 200 years, whose position is known, as 'controlled sites', and can designate named vessels lost on or after 4 August 1914 (Britain's entry into World War I), whose location is unknown, as 'protected places'.

Panaramic view of Glasson Dock

It is not necessary to demonstrate the presence of human remains for wrecks to be designated as either 'controlled sites' or 'protected places'.

> In 2006 the PLA recovered part of a gearbox or tachometer drive, a gear wheel and an engine identified as a Jumo 211 unit. The engine does not appear to have been attached to any other wreckage and a coherent aircraft wreck has not been found. The Jumo 211 was an inverted in-line V-12 German aircraft engine used throughout World War II in Heinkel He 111 and Junkers Ju 88 bombers and Junkers Ju 87 'Stuka' dive bombers. Regardless of nationality, all aircraft which have been in the military service of any country and which lie in UK territorial waters are protected under the *Protection of Military Remains Act* 1986.

Jumo (Junkers Motorenwerke) 211 engine

Merchant Shipping Act 1995

This Act sets out the procedures for determining the ownership of underwater finds classified as 'wreck'; defined as any flotsam, jetsam, derelict and lagan found in or on the shores of the sea or any tidal water. It includes ship, aircraft, hovercraft, parts of these, their cargo or equipment. If any finds are brought ashore, the salvor is required to give notice to the Receiver of Wreck that he/she has found or taken possession of them and, as directed by the Receiver, either hold them pending the Receiver's order or deliver them to the Receiver. The Act is administered by the Maritime and Coastguard Agency.

Treasure Act 1996

This Act replaces the common law of treasure trove in England, Wales and Northern Ireland and, although primarily terrestrial, applies within the intertidal zone to low water, provided the finds do not constitute 'wreck', in which case the *Merchant Shipping Act* applies. Under the Act all finders of 'treasure' have a legal obligation to report such items. The Act addresses the definition of treasure, along with the payment of rewards in relation to permitted metal detecting. Items which are not defined as treasure and found in the course of metal detecting are in principle also owned by the landowner.

The Planning (Listed Buildings and Conservation Areas) Act 1990

Works affecting Listed Buildings or structures and Conservation Areas are subject to additional planning controls administered by Local Planning Authorities (LPAs).

> West Hoe Pier on the seafront at Plymouth is a Grade II listed structure built in 1880. The pier, built of Plymouth limestone rubble brought to course, comprises an irregular plan basin with retaining wall to the landward side, short shaped return walls and two jetties approximately parallel to the shore with harbour entrance between.

Enterprise and Regulatory Reform Act 2013

Given Royal Assent In April 2013, this Act has implications for listed buildings and conservation areas. A provision for the reduction of legislative burdens as part of the Act includes heritage planning regulation (Schedule 17) with amendments to the *National Heritage Act* 1983, the *Town and Country Planning Act* 1990 and the *Planning (Listed Buildings and Conservation Areas) Act* 1990.

Appendix II: Stages of Geoarchaeological Investigation

Stage 1: Planning

Desk-based archaeological assessment of core logs generated by geotechnical contractors. This assessment will establish the presence and location of sediment units with likely archaeological, palaeoenvironmental and/or dating potential, as a basis for deciding what Stage 2 archaeological recording is required. The Stage 1 report will state the scale of Stage 2 work proposed.

Stage 2: Core Recording

Each core containing sediment units identified as having archaeological, palaeoenvironmental or dating potential in Stage 1 will be split, and recorded. The stratigraphy of each core will be recorded, a basic sediment description for each of the units will be made and those units of particular archaeological/palaeoenvironmental interest will be highlighted. The Stage 2 report will state the nature and scope of any Stage 3 assessment required to characterise and interpret the sediment units in order to build an outline Quaternary deposit model and thus identify areas of potential archaeological significance.

Stage 3: Sub-sampling and Assessment

Sub-sampling and assessment of any units of archaeological and/or palaeoenvironmental interest. Sub-samples for the assessment of microfossil environmental indicators (eg, pollen, diatoms, ostracods and/or foraminifera) will be taken. Assessment will comprise identification and quality of preservation of a series of sub-samples to enable the value of the palaeoenvironmental material surviving within the cores to be identified. Scientific dating may also be warranted at this stage. The Stage 3 report will set out the results of each laboratory assessment together with an outline of the archaeological implications of the combined results, and will indicate whether Stage 4 work is warranted.

Stage 4: Analysis and Dating

Full analysis of microfossil environmental indicators (eg, pollen, diatoms, ostracods and/or foraminifera) assessed during Stage 3. Typically, Stage 4 will be supported by scientific (eg, radiocarbon) dating of suitable sub-samples. Should Stage 3 assessment indicate that there is no further analytical work required on the microfossil assemblages, consideration will still be given for a programme of radiocarbon analyses to provide a chronological framework for the deposits encountered unless no suitable samples could be procured. The Stage 4 report will provide an account of the palaeoenvironment(s) at each relevant coring location within a chronological framework (absolute or relative) and an outline of the archaeological implications of the analysis.

Stage 5: Final Reporting

If the archaeological results are sufficiently significant, a final report will be compiled covering all aspects of the palaeotopography and prehistory of the area affected by the development, incorporating the results of each stage.

Appendix III: Indicative Recording Levels for Heritage Assets in the Marine Environment

Level	Type	Objective	Sub-level	Character	Scope	Description
1	Assessment	A record sufficient to establish the presence, position and type of site	1a	Indirect (desk-based)	A basic record based on documentary, cartographic or graphic sources, including photographic (including AP), geotechnical and geophysical surveys commissioned for purposes other than archaeology	Documentary assessment/inventory of a site, compiled at the start of work on a site, and updated as work progresses
			1b	Direct (field)	A basic record based on field observation, walkover survey, diving inspection etc., including surveys commissioned specifically for archaeological purposes	Typically a 1–2 dive visit to the site (to assess a geophysical anomaly, etc.)
2	Evaluation	A record that provides sufficient data to establish the extent, character, date and importance of the site	2a	Non-intrusive	A limited record based on investigations that might include light cleaning, probing and spot sampling, but without bulk removal of plant growth, soil, debris etc.	Typically a 2–4 dive visit to assess the site's archaeological potential, backed up by a sketch plan of the site with some key measurements included
			2b	Intrusive	A limited record based on investigations including vigorous cleaning, test pits and/or trenches. May also include recovery (following recording) of elements at immediate risk, or disturbed by investigation	Either an assessment of the buried remains present on a site; the recovery of surface artefacts; or cleaning to inform for example a 2a investigation
3	*In situ*	A record that enables an archaeologist who has not seen the site to comprehend its components, layout and sequences	3a	Diagnostic	A detailed record of selected elements of the site	The first stage of a full record of the site. This would include a full measured sketch of the site and a database (or equivalent) entry for all surface artefacts
			3b	Unexcavated	A detailed record of all elements of the site visible without excavation.	Full site plan (ie, planning frame or equivalent accuracy) with individual object drawings, and full photographic record (possibly including a mosaic)
			3c	Excavated	A detailed record of all elements of the site exposed by open excavation of part or whole of the site	This may take the form of full or partial excavation of a site
4	Removal	A record sufficient to enable analytical reconstruction and/or reinterpretation of the site, its components and its matrix			A complete record of all elements of the site in the course of dismantling and/or excavation	
5	Intra-site	A record that places the site in the context of its landscape and other comparable sites			A complete record of all elements of the site, combined with selective recording of comparable sites and investigation of the surrounding area	

Appendix IV: Consultees Involved in the Formulation of Ports and Harbours Guidance

Ports, Harbours and Authorities

Able UK Ltd.
Associated British Ports
Berwick Harbour Commissioners
Bideford Harbour
Blyth Port
Boston Port
Bristol Port
British Waterways Marinas Ltd.
Brixham Harbour
Cowes Harbour Commission
Falmouth Port
Felixstowe Port
Great Yarmouth Port
Harwich port
Littlehampton Harbour
London Gateway Port
Lymington Harbour
Marina World
Medway Ports
Milford Haven Port Authority
Newlyn Harbour
PD Ports
Peel Ports
Penzance Harbour
Plymouth Port
Poole Harbour Commissioners
Port of Dover
Port of London Authority
Port of Ramsgate
Port of Southampton
Portland Harbour Authority
Portsmouth Port
Quay Marinas
Seaham Harbour
Sharpness Dock
Shoreham Port
Sunderland Port
Teignmouth Harbour Commission
Tilbury Port
Tyne Port
Whitehaven Harbour Commission
Workington Port
Yarmouth Harbour

Associations and Committees

Association of Local Government Archaeological Officers
British Ports Association
Central Dredging Association
Council for British Archaeology
Chartered Institute for Archaeologists
Joint Nautical Archaeology Policy Committee
The International Navigation Association (PIANC)
Portable Antiquities Scheme
UK Harbour Masters' Association
UK Major Ports Group
UK Seabed Users Group

Regulators/Statutory Consultees

Cadw
Department for Transport
Environment Agency
Historic England
Historic Scotland
Marine Management Organisation
Ministry of Defence
Ministry of Justice
Northern Ireland Department of the Environment
Receiver of Wreck
The Crown Estate

Archaeologists

Fjordr Ltd.
Gill Andrews Consultant Archaeologist
Sea Change Heritage Consultants
Wessex Archaeology

Contractors

Able UK Ltd.
Baggerbedrijf De Boer – Dutch Dredging
Boskalis
Dredging International
Jenkins Marine

Marine and Environmental Consultancies

Anthony D. Bates Partnership LLP
Arup
Atkins
Briggs Marine
Earth & Marine Environmental Consultants
EnviroCentre
Environmental Resources Management
Fisher Associates
HR Wallingford
Marine Ecological Surveys Ltd.
Marine Management Organisation
MarineSpace
Rohde Nielsen A/S
Royal Haskoning DHV
RPS Group
RSK Group
Seawork Marine Services
Terence O'Rourke Ltd.
UK Dredging
Van Oord

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Spithead, with the exact situation and appearance of the "Royal George", wrecked with above 600 people on board — 29 August 1782.

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