



Marine Aggregate Dredging and the Historic Environment



ENGLISH HERITAGE

Assessing, evaluating, mitigating and monitoring the
archaeological effects of marine aggregate dredging

Guidance Note

April 2003

Prepared by

 **Wessex
Archaeology**

This guidance note aims to provide practical guidelines on assessing, evaluating, mitigating and monitoring archaeological impacts of marine aggregate dredging in English marine waters. Whilst the general principles of this guidance apply throughout the UK Continental Shelf, a range of specific arrangements apply in respect of marine aggregate dredging in Scottish, Welsh and Northern Irish waters.

The guidance is targeted at marine aggregate developers, archaeological consultants, curators and contractors, and at regulators. However, it is hoped that the guidance will be relevant and interesting to a broader audience.

The guidance elaborates, in respect of marine aggregate dredging, the Code of Practice for Seabed Developers produced by the Joint Nautical Archaeology Policy Committee.

The guidance should be read in conjunction with English Government policies set out in Marine Minerals Guidance Note 1.

Part of today's maritime cultural heritage



Working in the marine environment, members of the British Marine Aggregate Producers Association (BMAPA) cannot fail to be aware of the heritage that comes from being part of a maritime trading nation. Indeed, through our own industry's presence and operations, we form an integral part of today's maritime cultural heritage.

As responsible developers, the members of BMAPA have recognised the need for clear guidance to assist in identifying and understanding issues of archaeological importance when developing dredging areas.

This guidance provides all stakeholders including developers, regulators, consultants and heritage professionals with a well-defined approach and clear statement of policy with respect to marine archaeology and marine aggregate extraction. Against this background, effective measures can then be put in place to provide effective mitigation and monitoring regimes, ensuring the protection of our cultural heritage.

Developing our understanding of marine archaeological issues and promoting best practice are consistent with the principles contained within Government's Marine Stewardship initiative, and BMAPA is pleased that this guidance has been prepared in partnership with English Heritage.

A handwritten signature in black ink, appearing to read 'Barry Dennett', written over a white background.

Barry Dennett
Chairman
BMAPA



Common ground and interests



With the recent Royal Assent to the National Heritage Act (2002) English Heritage's remit has been extended to include archaeological sites of all types from the low-water-line out to the 12-mile limit around England. English Heritage's initial policy on maritime archaeology, *Taking to the Water* (available from www.english-heritage.org.uk), details our

approach to the management, preservation and protection of marine archaeology in the Territorial Seas adjacent to England.

By working in partnership, English Heritage and the British Marine Aggregate Producers Association have identified areas of common ground and common interests, and have created a mechanism by which archaeological remains underwater can be taken fully into account in assessing the environmental impact of winning marine aggregates. I am pleased to be able to endorse this document, which I believe frames an approach that is effective, practicable and sustainable, and offers a model for other coastal and marine industries.

A handwritten signature in black ink that reads "David Miles". The signature is written in a cursive style and is underlined with a single horizontal line.

David Miles
Chief Archaeologist
English Heritage



ENGLISH HERITAGE

The importance of the marine historic environment

For the purposes of this guidance, the historic environment encompasses:

- landscapes of historical, cultural or archaeological significance; and
- material assets including the archaeological heritage (such as artefacts, wrecks, prehistoric sites, and deposits of palaeo-environmental interest); and
- the inter-relationships between the archaeological heritage and other aspects of the environment.

Both within and beneath sands and gravels on the seabed, artefacts and deposits may be found dating to Lower, Middle and Early Upper Palaeolithic periods (from before 500,000 BC to 150,000 BC; 150,000 to 40,000 BC; and 40,000 to 20,000 BC respectively). These are the earliest periods during which people occupied Britain. Remains such as stone tools, butchered animal bone and associated deposits from these times can reveal details of human evolution and social development.

As the last ice sheets started to retreat about 18,000 years ago, some aggregate deposits provided inhabitable, terrestrial landscapes that have since been drowned by sea-level rise. Archaeological and palaeo-environmental remains related to these surfaces indicate how Britain and Ireland were re-inhabited during the Late Upper Palaeolithic (12,500 to 10,000 BC), Mesolithic (10,000 to 4000 BC) and later prehistoric periods.

Following the last glaciation rising sea-level permitted seafaring first in logboats and then in increasingly sophisticated watercraft. Maritime transport has played a tremendous role in the history of Britain, Ireland and their neighbours. The study of shipwrecks and seafarers can provide insights into lifestyles, trade, communication, combat, technology, industry, economics, and many other aspects of society from the Mesolithic period to modern times.

It is true to say that the marine historic environment of the UK Continental Shelf is still little known and its importance as yet poorly understood. The need for fundamental research and survey is widely accepted. The guidance provided here is necessarily provisional, and it should be applied in the light of such new data, interpretations and methodologies as become available.



BURIED EVIDENCE

Archaeological material can be situated in many different contexts within marine aggregate deposits. *In situ* material, left behind by Palaeolithic predecessors at times of lower sea-level, can be buried by deposits which themselves contain derived artefacts, washed downstream from higher ground in

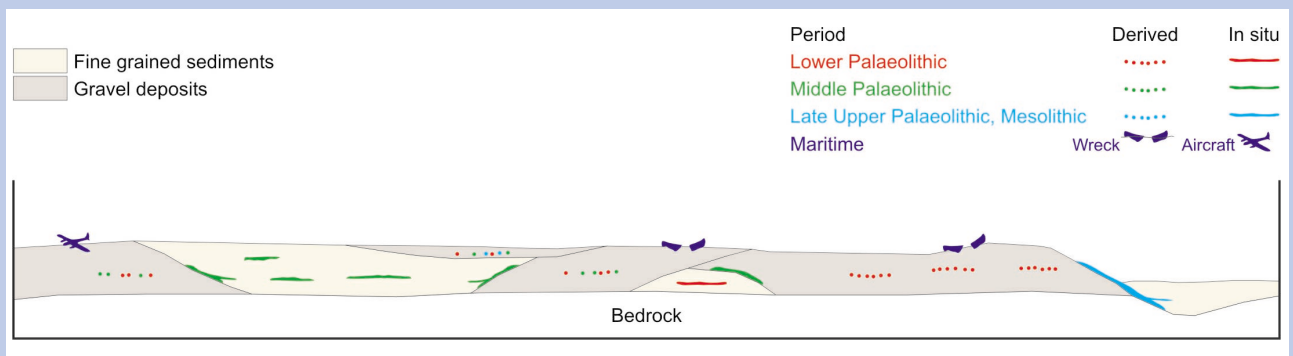
warm periods. The surface created by these later deposits may then have been inhabited, before being inundated once more by rising sea-levels and becoming the site of shipwrecks and aircraft crashes.

The importance of marine aggregates in the UK economy

A substantial proportion of Britain's need for aggregates is satisfied from the seabed. At a time when land based quarrying is under increasing environmental pressure, this vital marine resource is growing in importance as a means of sustaining the built environment.

Around 21 per cent of the sand and gravel used in England and Wales is now supplied by the marine aggregates industry. Marine aggregates are also exported to the near continent.

Marine aggregates provide the only viable source of material for large scale beach nourishment. During the 1990s over 20 million tonnes of marine aggregate was used in this way.



The current regulatory framework

Background

The non-energy mineral rights to the seabed are vested in the Crown Estate. At present, licences to carry out aggregate dredging are only granted by the Crown if the application receives consent from the Government through an informal 'Government View' procedure, administered by the Office of the Deputy Prime Minister (ODPM). Since 1989, every new application has had to be accompanied by an Environmental Impact Assessment (EIA).

Government's policies on marine mineral extraction from the English seabed are set out in Marine Minerals Guidance Note 1 (MMG 1).

A statutory equivalent to the informal 'Government View' procedure is to be introduced shortly, but the new regulations will continue to be administered by ODPM.

Application

MMG 1 states that all applications for dredging permissions in previously undredged areas will require EIA. ODPM can also ask the Applicant to provide such further information relating to environmental effects as might reasonably be required, bearing in mind current knowledge and methods of assessment. Among the types of information that can be requested is a description of the aspects of the environment likely to be significantly affected by the proposed project, including the archaeological heritage and landscape. Information should be provided on the likely significant effects of the proposal on the environment, including direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects. Information should also be provided on the measures envisaged to prevent, reduce and where possible offset any significant adverse effects.

The application process itself is currently characterised by a series of consultation stages. Comments on the proposal and the accompanying environmental information are sought by the applicants from a wide range of interests and organisations, identified as consultees by the ODPM.

Decision

The ODPM can give a positive Government View, subject to conditions, or may give a negative Government View, in which case no licence is issued. In making the decision, ODPM has to take into account the EIA, any further information supplied by the Applicant, and any representations received from consultation bodies and others. Notice of the decision is given to the applicant, and to any person that has made representations.

CHANGING TIMES

For much of the time that humans have inhabited Britain, sea-level has been lower than today. Only in warm periods such as the present have the shallow seas around Britain been inaccessible. Even at times when ice sheets were at their maximum, today's seabed may have attracted mobile

bands of hunter-gatherers in summer months. Stone tools and associated debris are the main evidence for human effort over many thousands of years. The interplay of technological development, human evolution and environmental change is central to understanding these ancient societies.

Transboundary Effects

The EIA procedure includes provisions for consulting other European Economic Area (EEA) member states on dredging proposals that are likely to have significant effects on their interests.

The Future

The Government View procedure is to be replaced shortly by a statutory procedure. Applications will be determined by ODPM which will, where appropriate, issue dredging permissions separately from the Crown Estate licences.

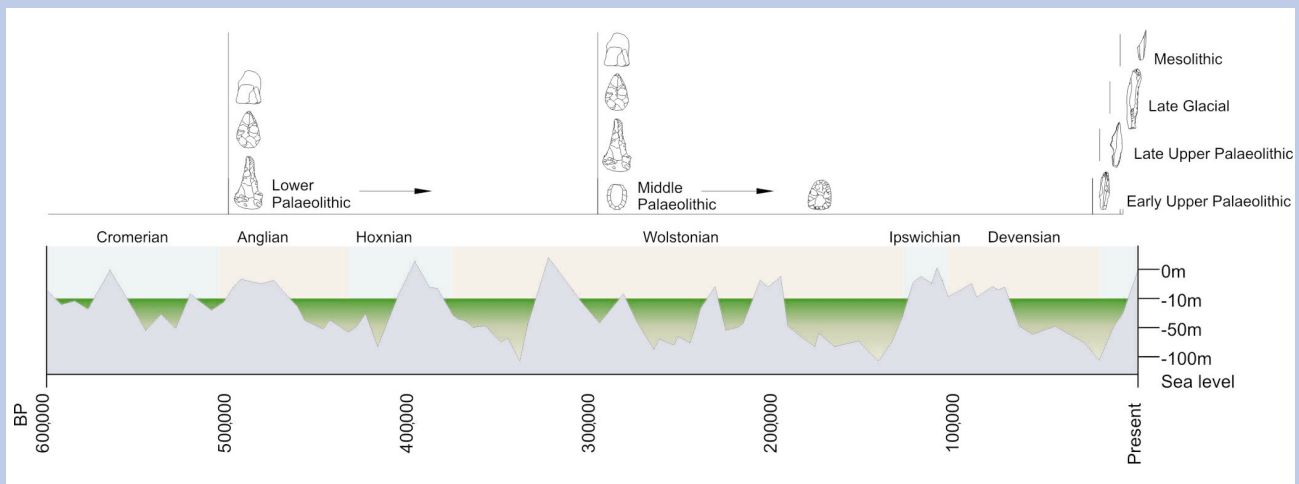
Archaeology Policy

In England, government policy towards archaeology in marine waters was set out in *England's Coastal Heritage (1996)*, which stated that 'coastal archaeological interests should be...consistently and comprehensively included in Environmental Assessment procedures for coastal and marine developments (including...mineral extraction...)'.

England's Coastal Heritage also stated that 'the principles set out in Planning policy guidance note 16: archaeology and planning [PPG 16] should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice'.

PPG 16 advises that the preservation of archaeological remains is a material consideration within the planning process and sets out a presumption in favour of the physical preservation of nationally important archaeological remains. Where preservation *in situ* is not justified, PPG 16 states that it is reasonable to require the developer to make appropriate and satisfactory provision for excavation and recording.

The broader context of archaeology policy is set out in *Taking to the Water: English Heritage's Initial Policy for the Management of Maritime Archaeology in England* (English Heritage 2002).



Existing statutory controls on archaeological material and wrecks in UK waters

Protection of Wrecks Act 1973

Under the 1973 Act, wrecks and wreckage of historical, archaeological or artistic importance within UK territorial waters can be protected by way of designation. It is an offence to carry out certain activities in a defined area surrounding a wreck that has been designated unless a license for those activities has been obtained from the Government. Generally, the relevant Secretary of State must consult appropriate advisors prior to designation, though it is also possible to designate a wreck in an emergency without first seeking advice.

Ancient Monuments and Archaeological Areas Act 1979

Monuments that are of national importance can be protected by being added to the schedule (list) of monuments protected under the Ancient Monuments and Archaeological Areas Act 1979. It is an offence to damage such a 'scheduled monument' or to carry out a range of specified activities, unless a license for these activities has been obtained, in the form of 'scheduled monument consent'. 'Monument' is a wide term that covers many types of archaeological site, including buildings, structures, works, caves, excavations and their sites. Monument can also mean the site of any vehicle, vessel, aircraft or other movable structure, hence the 1979 Act can be used to protect wrecks.

Merchant Shipping Act 1995

The ownership of underwater finds that turn out to be 'wreck' is decided according to procedures set out in the Merchant Shipping Act 1995. Finders should assume at the onset that all recovered wreck has an owner. Ownership of wreck lies in the original owner or their successor, unless they fail to make a claim to the Receiver of Wreck within one year of notification. Ownership of unclaimed wreck from within territorial waters lies in the Crown or in a person to whom rights of wreck have been granted; unclaimed wreck from beyond territorial waters is returned to the salvor.

The Receiver of Wreck has a duty to ensure that finders who report their finds as required receive an appropriate salvage payment. In the case of material considered to be of historic or archaeological importance, a suitable museum is asked to buy the material at the current valuation and the finder receives the net proceeds of the sale as a salvage payment. If the right to, or the amount of, salvage cannot be agreed, either between owner and finder or between competing salvors, the Receiver of Wreck will hold the wreck until the matter is settled, either through amicable agreement or by court judgement.

EVIDENCE OF ANCIENT LANDSCAPES

Protection of Military Remains Act 1986

Under the Protection of Military Remains Act 1986, all aircraft that have crashed in military service are protected, and the Ministry of Defence (MOD) has powers to protect vessels that were in military service when they were wrecked. MOD can designate named vessels as 'protected places' even if the position of the wreck is not known. In addition, MOD can designate 'controlled sites' around wrecks whose position is known. In the case of 'protected places', the vessel must have been lost after 4 August 1914, whereas in the case of a wreck protected as a 'controlled site' no more than 200 years must have elapsed since loss. In neither case is it necessary to demonstrate the presence of human remains. It is an offence to tamper with, damage, move or remove sensitive remains at a 'protected place'. Diving, salvage and excavation are all prohibited on 'controlled sites', though licences for restricted activities can be sought from MOD.

MOD has stated that a limited number of vessels within UK jurisdiction will be designated as controlled sites, and that it intends to carry out a rolling programme to identify and assess against criteria as protected places all other British vessels in military service when lost.

Animal bones recovered by marine aggregate workers provide direct evidence of landscapes that are now submerged but were once populated. Tusks and teeth show that mammoths once roamed the Thames Estuary. These remains have survived the millennia, suggesting not only that they were originally deposited on land that is now sea rather than having been washed down rivers, but also that terrestrial material can withstand the waves and currents that accompanied marine inundation. If animal bones survive, then why not the bones and stones of humans?



Vigilance by wharf staff can lead to archaeological discoveries. The rounded stone with a hole through the middle shown on the right was reported from a reject stone pile. Its age and purpose are uncertain, but it may have been used as a weight for a fishing net or lobster pot a hundred, a thousand, even ten thousand years ago.



Possible effects of aggregate extraction on the marine historic environment

Dredging may cause derived artefacts such as tools, flakes and other material contained within aggregate deposits to be removed from their context and lost within the volume of dredged material. The scope for intercepting such material in the course of dredging and processing is very limited.

Dredging may also cause any *in situ* artefacts and/or deposits of palaeo-environmental interest within or beneath aggregate deposits to be seriously disrupted and individual elements lost. Again, the scope for intercepting such material in the course of dredging and screening is very limited.

Dredging may seriously disrupt *in situ* archaeological and palaeo-environmental material lying at or close to the surface of aggregate deposits. The relationship between artefacts and their surroundings may be destroyed and individual elements lost within the volume of dredged material.

As dredging typically takes place at depths of 15m to >30m, and in areas where dredging is unlikely to affect adjacent coastlines, the possible effects of aggregate extraction on formerly terrestrial archaeological sites are generally limited to early prehistory (i.e. Palaeolithic, Mesolithic). However, as the formerly terrestrial areas became submerged, so they are likely to have been traversed by ships and - more recently - aircraft, losses of which may survive as wrecks.

Possible impacts to both known and unknown wrecks include:

- direct damage to wreck structure and contents;
- disturbance to relationships between structures, artefacts and their surroundings;
- destabilisation of sites prompting renewed corrosion, decay etc.;
- loss of artefacts within the general volume of dredged material;
- erosion leading to damage, disturbance and instability in the medium to long term.

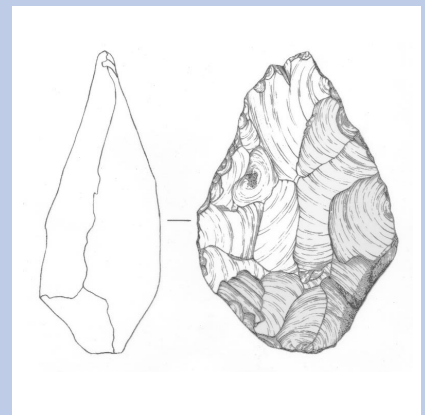
Dredging may impact upon discrete items of ship-borne debris which, depending on their size, may be lost within the volume of dredged material. The distribution and possible importance of such items is difficult to anticipate. Debris continues to be deposited on the seabed, and many items may prove to be modern and of little archaeological interest.

Dredging may have an impact on artefacts, wrecks, prehistoric sites and deposits of palaeo-environmental interest outside dredging areas, depending on regional patterns of erosion, deposition and sediment transport. Increases in suspended sediments from dredge plumes may also be deposited beyond the dredging area.

ANCIENT TOOLS

As noted above, the marine historic environment is still little known and its importance poorly understood. Equally, the effects of aggregate dredging – direct, indirect, cumulative etc. – warrant further research, as do methodologies for assessing, evaluating, mitigating and monitoring these effects. Relevant research supported by the Aggregate Levy Sustainability Fund is being undertaken. The application of this guidance should be informed by the results of such research as they become available.

Flint handaxes are the characteristic tool of nearly half-a-million years' inhabitation of Britain. They appear simple in form, but point to skilfulness in their manufacture and use. Handaxes survive within aggregate deposits because they are so robust, providing a direct link to the hands and minds of our forebears many millennia ago.



Archaeological advice

Archaeological advice should be sought by Applicants at the earliest opportunity. English Heritage – the Government’s statutory advisors on heritage – are consulted by ODPM as a matter of course on all marine minerals dredging applications and will provide advice on the information that should accompany an application. English Heritage may make representations during the course of the application process, informed by its maritime team. ODPM also consults other agencies with incidental interests in historic material as consultation bodies, such as the Receiver of Wreck (Maritime and Coastguard Agency), the Ministry of Defence, and the UK Hydrographic Office. Additionally, where local planning authorities are recognised as consultation bodies, these authorities will have access to the advice of local government archaeological officers. Collectively, the archaeologists serving consultation bodies and thus providing advice or representations to ODPM can be termed ‘Archaeological Curators’.

In regulating the effects of marine aggregate extraction on the historic environment, the Archaeological Curators will play a key role in advising ODPM, and Applicants are encouraged to seek early, constructive and ongoing dialogue with them.

Prospective Applicants are also advised to obtain independent archaeological advice before making an application, by employing an ‘Archaeological Consultant’ and/or an ‘Archaeological Contractor’. Generally speaking, an Archaeological Consultant will guide the Applicant through archaeological aspects of the entire proposal whereas an Archaeological Contractor will carry out specific studies or investigations, though both these roles can be played by a single organisation. There are numerous private and charitable organisations able to provide professional archaeological services. Additionally, some environmental consultants/contractors employ professional archaeologists who can provide the necessary advice. The standard of professional archaeological services can be gauged by individual or institutional membership of the Institute of Field Archaeologists (IFA), but Applicants should also ask potential archaeological consultants/contractors to demonstrate that they have skills and knowledge appropriate to advising on marine aggregate extraction.

Additionally, there is a wide range of other organisations and individuals whose interest in archaeology should be considered. Some may own or have interests in specific wrecks, whereas others may have a more general concern for marine archaeology. The transparent and public nature of the application process allows anyone with an interest in a particular proposal to make a representation. Prospective Applicants are therefore strongly advised to take account of the full range of archaeological interests in preparing their application.

10,000 YEARS AGO

For thousands of years following the last ice age, Britain was a peninsula of the European continent. Extensive lowlands existed beyond most of today's shores, and much of the English Channel and Southern North Sea were land. It is likely that our predecessors, re-inhabiting Britain as the climate improved, made extensive use of these areas, possibly concentrating on the river valleys that once traversed these lands.



source: Coles and Rouillard (1998)

The application

Prospective Applicants are strongly advised to seek archaeological advice as soon as possible, as part of the scoping process that informs the context of a formal EIA. In particular, prospective Applicants should contact the Archaeological Curators likely to be consultation bodies in respect of the application, notably English Heritage's maritime team.

Archaeological Curators will be able to provide general guidance, but they may not be able to provide detailed advice or information. Equally, Archaeological Curators will not be able to recommend an Archaeological Consultant /Contractor, but they will be able to provide a list of Archaeological Consultant/ Contractors who have had satisfactory involvement in comparable projects in the past.

When preparing the application, Applicants should ensure that the likely effects of the proposal on the historic environment are fully considered in the EIA. Guidance on assessing the historic environment is given below. It may be appropriate to set out details relating to the historic environment in a separate report, though the conclusions of the supplement should be fully integrated within the EIA report.

Applicants should expect to undertake specific studies of the historic environment in the course of the EIA. These studies might be desk-based and focus on information (such as geotechnical or geophysical data) already collected for other purposes. However, in some instances it may be necessary to commission new archaeological field investigations. The need for archaeological field investigations may be reduced by incorporating archaeological issues within the scope of investigations required for other environmental purposes.

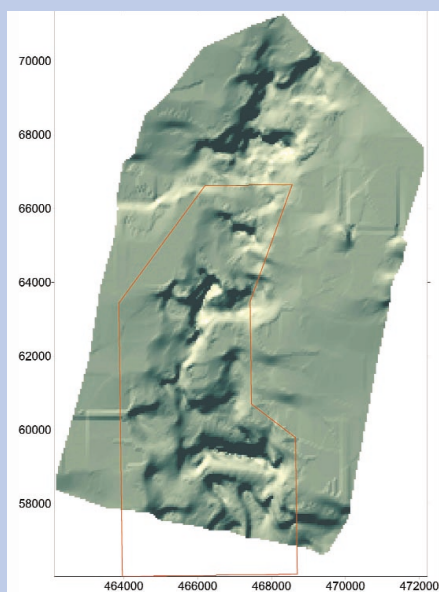
Applicants are encouraged to discuss their interim findings with Archaeological Curators in the course of the EIA, either directly or via their Archaeological Consultant/Contractor. Such discussion should enable potential difficulties to be resolved prior to formal submission of the application.

Upon formal application, the EIA report submitted by the Applicant to Archaeological Curators (as consultation bodies) should be accompanied by all relevant details relating to the historic environment, notably any specialist reports (see above). Copies should also be provided to any further persons specified by ODPM.

BUILDING A PICTURE

Depth soundings can be built up to provide an overall picture of the existing bathymetry of the seabed. Taking account of erosion and deposition that has occurred since marine inundation, a virtual surface can be constructed that represents the former topography of the area. The images shown here are all based on actual bathymetric data provided by an aggregate dredging company, as modelled in the course of Environmental Assessment.

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A complex former river course revealed by bedrock topography

The routes of major rivers and their tributaries rising both in Britain and on the Continent are still easily recognised, incising the plains as they flowed to seas distant from our present shores.

The application of models of sea-level change indicates which areas may have been inhabitable at certain periods. They also enable archaeologists to gauge the availability of marine, intertidal and terrestrial resources to our predecessors, and provide insights into the ways that sea-level change may have impacted former landscapes and their inhabitants.

Representations about the application from Archaeological Curators and any further persons will have to be made within a prescribed timescale (normally 10 weeks). On receipt, the Applicant will respond to clarify or expand any issues raised, either through further correspondence or by direct discussions with the parties concerned.

Where dredging is approved subject to archaeological conditions, the Applicant should discuss the measures required to implement the conditions with the relevant Archaeological Curators. In practice, one condition may be that the proposed implementation measures relating to archaeology are formally accepted by the Archaeological Curators prior to dredging commencing.

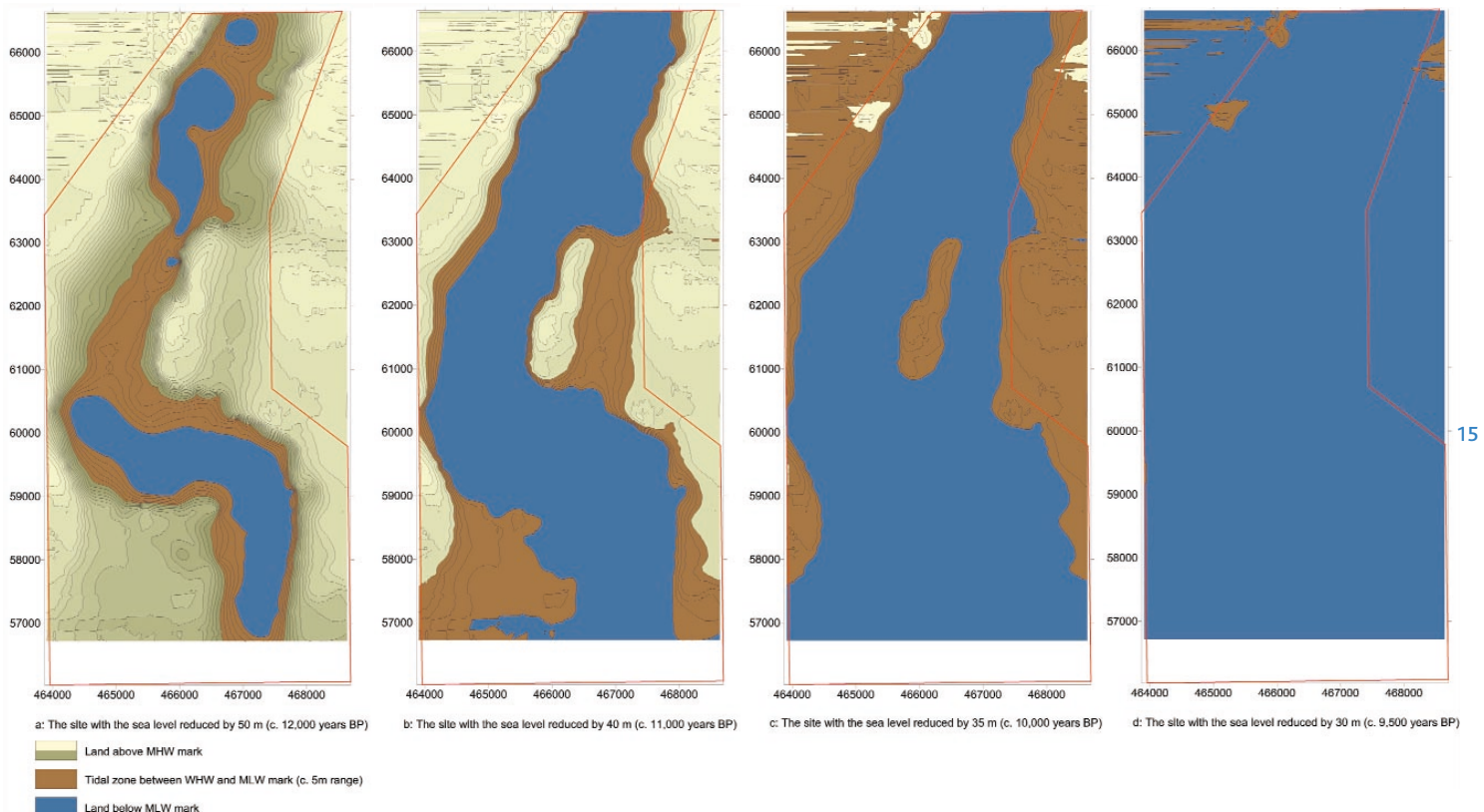
In some circumstances, conditions may require Applicants to undertake further desk-based or field investigations. Alternatively, conditions may require that investigations carried out for other environmental purposes be adapted or interpreted to address archaeological issues. Further guidance on the implementation and monitoring of archaeological conditions is provided below.

Example dredging conditions

'No dredging shall take place within exclusion zones around wrecks within the Licence Area, as follows:...'

'Pre-dredge and monitoring surveys of the Licence Area shall be undertaken in accordance with specifications approved by the relevant archaeological authorities. Wrecks subject to exclusion zones shall be targeted to confirm their location, extent and morphology. The survey data shall be assessed archaeologically and scanned for any other features that may of archaeological interest. Dredging exclusion zones shall be implemented around new features of acknowledged archaeological importance.'

'A formal protocol shall be prepared for reporting finds of archaeological interest encountered in the course of dredging. The protocol shall include provision of prompt archaeological advice and, if necessary, inspection of significant features prior to further dredging in the vicinity.'



Assessment

The archaeological aspect of EIA equates with the process of 'desk-based assessment' that is broadly recognised in other forms of development-related archaeology. Desk-based assessment has been defined as follows (IFA 1999):

Desk-based assessment is a programme of assessment of the known or potential archaeological resource within a specified area or site on land, inter-tidal zone or underwater. It consists of a collation of existing written, graphic, photographic and electronic information in order to identify the likely character, extent, quality and worth of the known or potential archaeological resource in a local, regional, national or international context as appropriate.

However, while the archaeological assessment can be addressed through a supplementary desk-based report, it is important that the conclusions be incorporated within the main EIA report.

In order to fulfil the requirements of the EIA Directive, the archaeological assessment should include:

- A non-technical summary.
- A description of the historic environment likely to be significantly affected by the proposal.
- A description of the likely significant effects of the proposal on the historic environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects.
- A description of the forecasting methods used to assess the effects of the proposal on the historic environment.
- A description of the measures envisaged in order to avoid, reduce and if possible, remedy significant adverse effects on the historic environment.
- An indication of any difficulties (technical deficiencies or lack of knowledge) encountered in compiling the required information.

Applicants are strongly advised to employ the services of a suitably competent Archaeological Consultant/Contractor to undertake the archaeological aspects of EIA.

It is worth noting that other studies carried out in the course of EIA are likely to generate results that are relevant to assessing impacts of, for example, sediment transport and dredge plumes on the marine historic environment. Applicants should encourage and facilitate collaboration between Archaeological Consultants/ Contractors and other specialists in the EIA team.

Archaeological Consultant/ Contractors will need the Applicant to provide them with a detailed description (including maps) of the project, with particular reference to the physical characteristics of the application area and the main characteristics of production processes. The description should encompass:

- The position, extent and any zoning of the application area;
- Basic environmental information including bathymetry, sediment type and tidal regime;
- Details of the proposal including period, aggregate type and volume and dredging methodology;
- Names of the applicants.

As information relating to the marine historic environment is relatively coarse, and the assessment should consider effects that may extend beyond the application area, then it is advisable to define a broad 'Study Area' to which the archaeological assessment refers. The extent of the Study Area will depend on the availability of archaeological and other information and the anticipated extent of effects beyond the application area. Where there is potential for formerly terrestrial archaeological and palaeo-environmental material, it may be appropriate to extend the Study Area to encompass adjacent coastlines in order to provide appropriate contextual information.

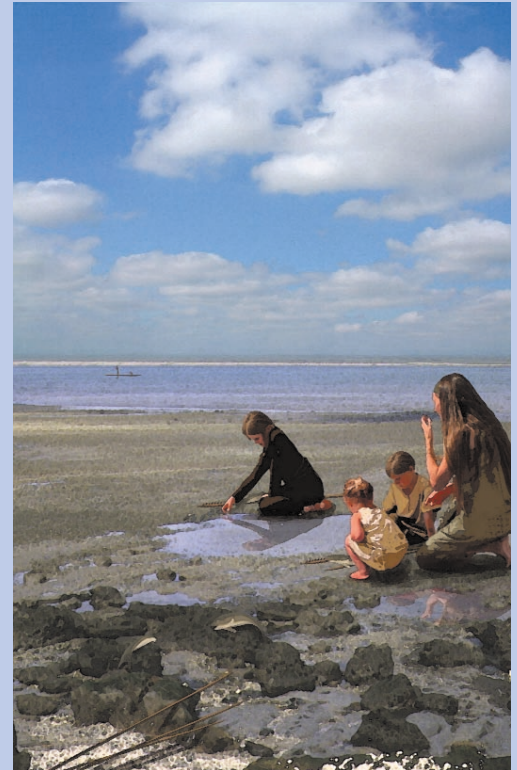
ANCIENT LANDSCAPES

The assessment should present a chronology of possible sites in the Study Area, covering former terrestrial and maritime activity as appropriate. Care should be taken to acknowledge the specific difficulties of interpreting archaeological and shipwreck records in the marine environment. The assessment should address the scope for prehistoric sites to be highly concentrated or diffuse, for wrecks to occupy an extended area beyond the confines of any remaining hull, and for stray items lost or thrown overboard to indicate preferred sea routes through the centuries. The assessment should address differences in former topography, bathymetry, geology and seabed type across the application area, with a view to characterising variation in archaeological potential arising from patterns of human activity or from differential preservation. Where possible sites are identified, the assessment should consider their level of importance and susceptibility to dredging impacts.

An appendix summarising the known and potential archaeological features that have been referred to should accompany the assessment, including index numbers, positions, descriptions, legal status and cross-references. Other appendices can be included setting out cartographic, geotechnical, geophysical and other sources, for example. The assessment should be illustrated with figures showing the area of the proposal in relation to known and potential archaeological features.

Unlike the landscapes with which we are familiar on land today, the former lands surrounding Britain were relatively flat. The overall form of the landscape can be 'dressed' with what we know of the climate, vegetation and fauna of the time, and of overall patterns of contemporary human activity. This process enables us to identify areas that might have been preferred by our predecessors, and where their remains may yet survive on the seabed.

Ultimately we are seeking to conserve and understand the things that people left behind so many thousands of years ago, and through these relics to appreciate the lives of the people themselves.



Sources of archaeological data

National Monuments Record

English Heritage maintains a National Monuments Record (NMR), which includes a maritime section that contains records of wrecks, obstructions, casualties (documented losses), aircraft and other related archaeological material. Where dated, the majority of records date from the mid-18th to mid-20th century. This is not a true reflection of actual shipping losses through time, but is a product of the co-ordinated recording of shipping losses from the mid-18th century. The NMR also contains records of terrestrial monuments that may give an indication of overall patterns of prehistoric and maritime activity on adjacent coasts. The NMR can also provide access to air photographs which may be a useful source where sandbanks etc. are exposed at low tide.

Sites and Monuments Records

Local authorities maintain Sites and Monuments Records (SMRs). SMRs comprise a database and archive of information about archaeological sites of all types and periods within the region. An increasing number of SMRs include records of marine sites.

UK Hydrographic Office

The UKHO has been responsible for charting wreck since 1913 and maintains a Wreck Index comprising data on 60,000 wrecks worldwide. Each entry has to be of charting value i.e. be a structure which is considered to pose, or have posed a potential threat to navigation. For this reason the information held is largely of features that are reasonably substantial and tends to be biased towards relatively modern wrecks or large unidentified obstructions.

The UKHO is also the national archive for hydrographic material and holds an extensive collection of charts and sailing instructions that date back to the 16th century. In the majority of cases, material dating from the late 18th century onwards is sufficiently accurate to be used with modern GIS systems. There is little direct information for shipwreck as it was general policy not to mark them, however there is much information on maritime landscapes and perceived hazards.

The Receiver of Wreck (Maritime and Coastguard Agency)

It is a legal requirement in the UK that all recovered wreck material is reported to the Receiver of Wreck. The Receiver may therefore hold information on recently recovered material that is not recorded elsewhere. However until recently reporting of material was not widespread and the information available from this source may be limited.

Existing Bathymetric, Geotechnical and Geophysical Data

The Applicant is likely to hold existing information relating to the application area, including bathymetric (water depth) and geotechnical (stratigraphic and sediment) data. This information can be interpreted to generate models of the application area at times of lower sea-level, which may have a bearing on the potential for Late Upper Palaeolithic and Mesolithic sites. Seismic survey data can be interpreted to produce a model of the overall Quaternary development of the area, which may have a bearing on the potential for *in situ* and derived material of Lower Palaeolithic date. Raw and/or interpreted sidescan survey data can be examined to identify wrecks and other anomalies that may be of archaeological interest.

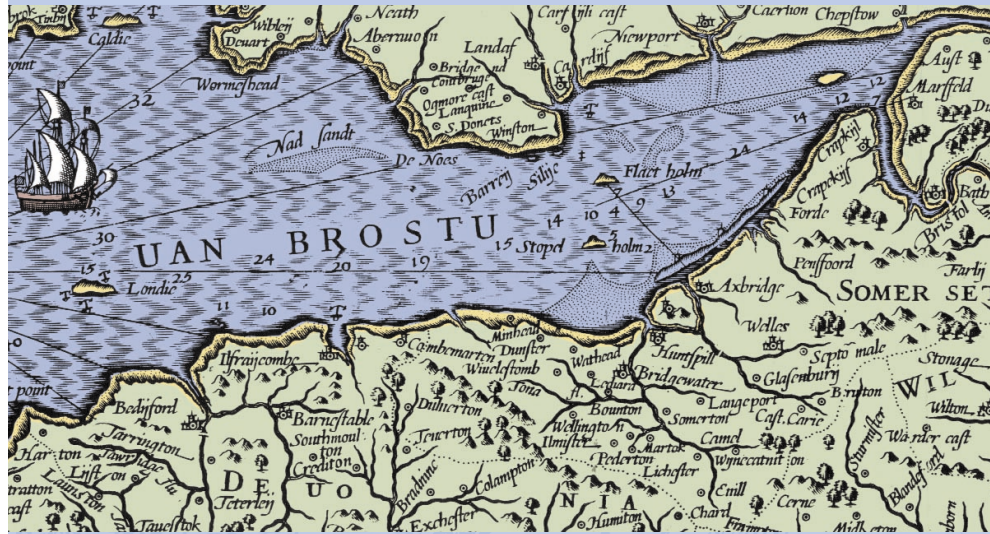
HISTORIC SHIPPING

Secondary Sources

Among the numerous secondary sources that should be considered, the 'Diver' series of guides to known sites can provide useful clarification of the position, form and identity of wrecks on the seabed. Information relating to sea-level and shoreline change can be gathered from academic monographs and journals. The UK Offshore Regional Reports and accompanying maps produced by the British Geological Survey provide an invaluable overview of the Pleistocene and Holocene development of the sea floor, which has a direct bearing on the potential for the survival of prehistoric material in application areas.

Local Record Offices, Museums and Libraries

Additional information may be obtained from local Record Offices, museums and libraries, in the form of charts, documents and artefacts recovered by trawlers or divers.

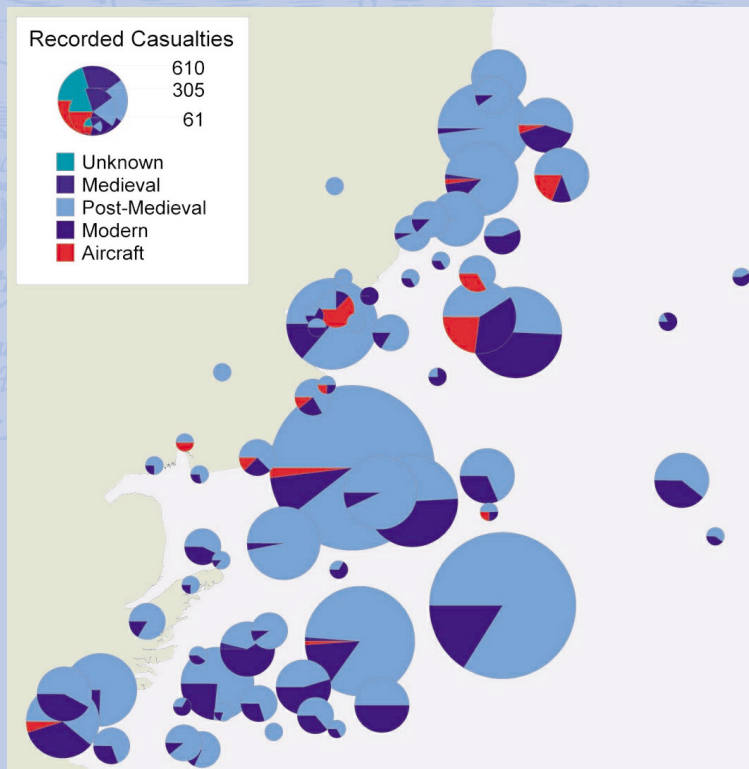


Above

While early charts might be regarded as more decorative than accurate, they do provide insights into the importance of the anchorages, ports and sailing routes of their day. Historic charts also show the known hazards upon which ancient ships may have wrecked, including sandbanks that are now dredged for aggregate.

Below

The National Monuments Record contains details of thousands of 'casualties' – ships whose loss is known only through documentary references – mainly from the last 250 years. This map indicates the volume and age of casualties off Essex and Suffolk. It indicates both the importance of shipping to the regional economy in the past, and also the scope for wrecks arising from these losses to be discovered in aggregate dredging areas.



Evaluation

Where fieldwork is carried out for the purpose (primary or otherwise) of gathering data relating to the historic environment, the exercise amounts to 'archaeological field evaluation', which has been defined as follows (IFA 1999):

Archaeological field evaluation is a limited programme of non-intrusive and/or intrusive fieldwork which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area or site on land, inter-tidal zone or underwater. If such archaeological remains are present field evaluation defines their character, extent, quality and preservation, and enables an assessment of their worth in a local, regional, national or international context as appropriate.

Decisions regarding the need for and timing of any evaluation will depend on many factors. The key benefit of evaluation is that it provides direct evidence of the actual presence (or absence) of archaeological remains in the application area, thus increasing confidence in the measures envisaged to reduce any adverse effects. The key costs of evaluation are, as in the case of all marine investigations, the time and expense of carrying out the work.

In seeking to match the benefits and costs of evaluation, Applicants may find it useful to adopt a staged approach. In essence, initial low-cost extensive investigations are used to identify specific targets for intensive investigation.

The implementation of a staged approach will be subject to the requirements of the application process. Some evaluation results may be required in the course of EIA so that they can inform ODPM's decision. It may be acceptable for later stages of evaluation to be deferred until permission has been granted, with conditions requiring the detailed design of mitigation measures to be informed by fieldwork. Applicants are advised to discuss their anticipated evaluation programme with Archaeological Curators at an early stage.

The staged approach to evaluation can be made even more cost-effective by integrating preliminary archaeological evaluation with investigations for other purposes, such as resource mapping or environmental sampling. In particular, specifications for surveys should be drawn up with archaeological advice. Survey results should be interpreted by suitably competent archaeologists working in collaboration with the other specialists engaged in the survey. In specifying survey work, known wrecks and features can be targeted to confirm their location, extent and morphology, and the entire application area should be scanned for any other features that may be of archaeological interest.

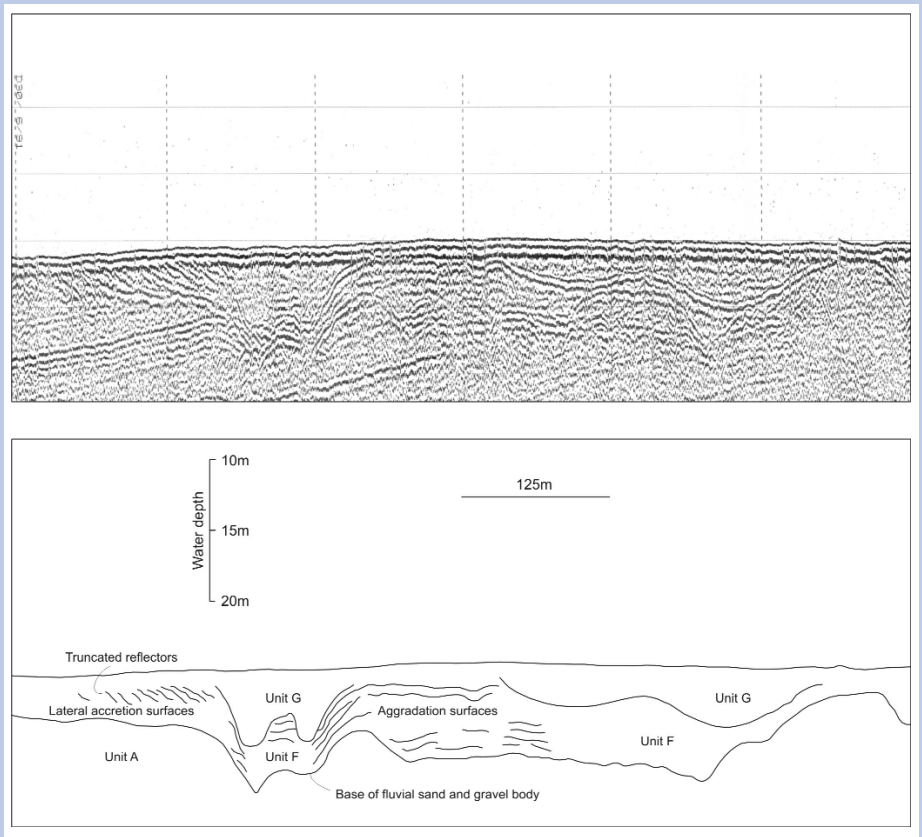
SEA-BED PROFILING

Where dredging is to take place in areas that are known or likely to contain archaeological material, archaeological inspection by diving or remote vehicle may be warranted to confirm the presence, character and extent of archaeological deposits.

The results of evaluation should be archived according to current professional standards and suitable reports prepared. Copies of each report should be lodged with the appropriate Curators.

Applicants may wish to make results available over the World Wide Web.

Shallow seismic techniques, such as sub-bottom profiling, can be used to identify reflective boundaries between units of sediment. The character of these units and the relationships between them can be interpreted to understand the sequence of deposition and erosion. In turn, such sequences indicate the archaeological potential of different units, including whether artefacts and environmental data are likely to be present, the possible quality of survival, and the probable date of such material.



Methods of Archaeological Investigation

Bathymetric Survey

Bathymetric data is gathered routinely in prospecting and monitoring aggregate projects. It can be used archaeologically in addressing the existing submerged topography and in postulating former topographies in periods of lower sea level. Dense bathymetric data may indicate localised topographic anomalies such as wreck mounds. Swath (e.g. multibeam) bathymetric surveys are being used increasingly in the marine aggregate industry and have considerable potential for investigating both extensive and localised archaeological features.

Sidescan Survey

Sidescan surveys are also undertaken routinely, to identify bedforms indicative of sediment transport and to identify hazards such as rock outcrops and obstructions. In order to be adequate for archaeological purposes, coverage has to be at least 100% and the instrument set suitably, though data acquired historically may also be worth examining. Sidescan survey data can be scanned archaeologically to examine obstructions and other anomalies that may indicate wrecks. Where sites of firm archaeological interest are identified, additional high-resolution sidescan in a 'box' around the anomaly can help in establishing extent, morphology and character. Sidescan survey can also be used to monitor the effects of dredging on known sites.

Sub-bottom Profiling

Sub-bottom surveys are usually conducted at resolutions appropriate to the identification of major sediment units. The results can be interpreted geo-archaeologically to identify sequences of deposition and erosion that may indicate potential for formerly terrestrial archaeological and palaeo-environmental deposits. High-resolution sub-bottom profiling can also be applied to investigating the structure of deposits in more detail, including the buried extents of known wreck sites.

Magnetometer Survey

Magnetometer surveys are not used routinely in marine aggregate dredging surveys, but trials have shown that magnetometer survey may add to the results of bathymetric/sidescan survey, particularly in respect of substantial metal wrecks (obstructions) that are buried or have low relief. The results can be interpreted archaeologically in conjunction with sidescan survey, though the line spacing for magnetometer survey has to be appreciably closer than for sidescan if it is to be effective.

Borehole (Vibrocore) Survey

Borehole surveys are undertaken routinely to prove the character of seabed sediments and to indicate their shallow stratigraphy. The results can be interpreted archaeologically to gauge the presence of significant horizons such as Holocene or earlier alluvium.

Grab Survey

Grab surveys are undertaken to prove the character of seabed sediments. It is possible that the recovered samples could contain artefacts (either prehistoric or wreck) from the surface of the seabed.

Benthic Survey

Benthic surveys are undertaken to characterise marine flora and fauna. It is possible that the recovered samples could contain artefacts (either prehistoric or wreck) from the surface of the seabed.

Diving

Where the presence of sites of firm archaeological importance is suspected, it is of considerable advantage for archaeologists to visit the site to confirm their date, character and importance. Repeat visits may be required to sites of firm archaeological importance to confirm that they are not being destabilised by dredging in the vicinity. The cost-effectiveness of diving is likely to decrease as water-depth increases.

Remote Operated Vehicles (ROVs)

In view of environmental constraints, visual inspection and recording (using stills/video) by ROV under the direction of an archaeologist may be an acceptable alternative to diving.

Position-fixing

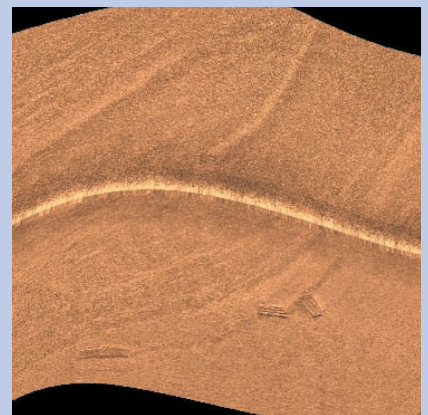
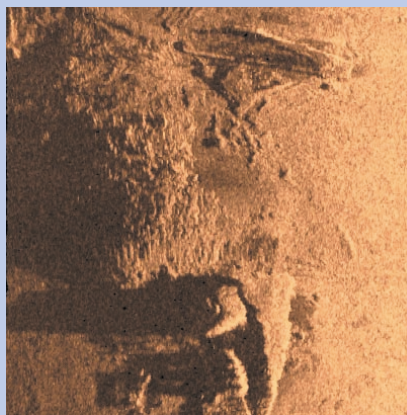
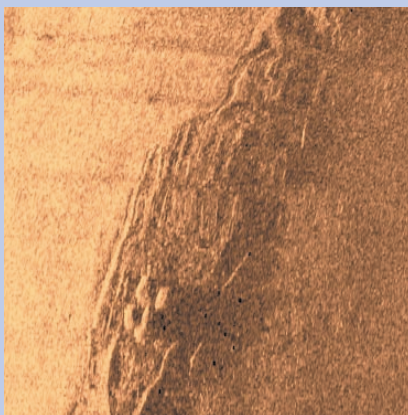
Whatever the means of investigation, it is essential that the position from which data is gathered be known. Where possible, positions should be fixed to an accuracy of 1m or better both horizontally and vertically. Position-fixing data is most useful if it is provided digitally as indexed points or track plots. In order to facilitate mapping, the projection, co-ordinate system and vertical datum of digital position-fixing data should be specified, together with details such as instrument lay-back.

GEOPHYSICAL TECHNIQUES

Geophysical techniques such as sidescan and magnetometer survey can prove useful in assessing and evaluating the possible effects of marine aggregate dredging on the historic environment. The magnetometer records the Earth's magnetic field, including localised anomalies caused by the presence of ferrous objects. Metal wrecks create large anomalies;

smaller anomalies might indicate iron guns, anchors or other fittings from wooden wrecks. Sidescan emits a fan of sound to either side; the returning echoes provide an image of the seabed. The interpretation of geophysical data for archaeological purposes requires considerable expertise and experience.

Sidescan data can be acquired as a paper trace or digitally. As well as showing seabed features such as sand waves and rock outcrops, sidescan can highlight wreckage of ships and aircraft where it protrudes above the seabed or causes local effects such as scouring.



High-resolution sidescan data can provide evidence not only of the presence of wreck material, but also its extent and likely character. This information is useful in understanding the possible archaeological importance of a wreck and in designing appropriate exclusion zones.

Shipwrecks vary considerably in their form. Some sites may be barely – if at all – perceptible. Others, such as this example may include extensive and upstanding remains. Some wrecks may be very coherent and easily related to the form of the original ship. Others may have been spread over a considerable area, either as a direct result of being wrecked, or because of subsequent salvage or clearance.

The marine historic environment also includes stray items lost overboard. This group of objects proved, as a result of diving inspection, to be hatch covers. They were probably lost from a ship whose wreckage is located c. 400m away.

Mitigation

Avoidance

As noted above, government policy sets out a presumption in favour of the preservation *in situ* of nationally important archaeological remains. Avoidance is, therefore, the preferred means of mitigation.

Additionally, encounters with wreck material are likely to damage suction gear, and the clay/peat associated with deposits of palaeo-environmental interest can contaminate dredged material, so it is in the interest of dredgers to avoid such encounters.

Dredging exclusion zones can be implemented to protect either discrete sites or more extensive areas. As exclusion zones preclude extraction of the resource within their area, specific evaluation may be warranted to confirm the presence, location and extent of archaeological and/or palaeo-environmental material. Each zone should be designed on the basis of available data on geology, hydrology and sediment transport to ensure the continued stability of the site throughout the licence period.

As with all mitigation measures, the design and implementation of exclusion zones should be discussed with Archaeological Curators.

Reduction

Notwithstanding all the precautions outlined above, it is possible that archaeological material may be encountered in the course of dredging. In such cases, the impact of dredging can be reduced by prompt archaeological advice and by recording and conserving objects that have been disturbed. Such means of reducing impact can be incorporated within monitoring procedures, discussed below.

There is scope for identifying and retrieving larger items of ship-borne debris when aggregate is being processed ashore, from debris magnets or oversize stone stockpiles. Such items should be stabilised, recorded and reported. Repeated discoveries of apparently discrete items from a specific area might indicate the presence of a coherent shipwreck.

Although it may be possible for a suitably experienced archaeologist to visit onshore screening plants periodically to carry out a visual search for Palaeolithic artefacts, such procedures appear unlikely to be productive.

Remedying and offsetting

In the case of previously unknown wrecks, the general practice of dredging material in a series of shallow layers will provide an interval following exposure during which further measures can be employed. Such measures might include instituting a dredging exclusion zone, or taking actions to record or re-stabilise a site that has been disturbed.

Where the presence of archaeological material can reasonably be assumed, but institution of a dredging exclusion zone is not justifiable, then measures may be taken to record the site prior to dredging in that area. Alternatively, measures could be taken to offset its loss by detailed analysis and safeguarding of otherwise comparable deposits elsewhere.

The results of mitigation should be archived according to current professional standards and suitable reports prepared. Copies of each report should be lodged with the appropriate Curators and with the NMR.

DIVING INSPECTION

Direct observation by a suitably experienced diving archaeologist is critical in assessing and evaluating possible sites. As well as offering safety advantages, commercial diving methods enable colleagues on the surface to see and discuss the archaeologist's observations via communications and video. Digital stills photography and diver tracking can be integrated through GIS to facilitate detailed recording against 'real-world' positions.



Monitoring

Monitoring protocols

Features of archaeological interest may be encountered in the course of dredging, or at onshore processing facilities. In anticipating such instances, dredging companies should prepare a formal protocol for notifying finds of archaeological interest, to include provision of prompt archaeological advice and, if necessary, inspection of significant features prior to further dredging in the vicinity.

Protocols must comply with the Merchant Shipping Act 1995, including notification of the Receiver of Wreck. Protocols should also provide for notifying national and local archaeological Curators of discoveries. A draft of each protocol should be circulated to the relevant Curators for comment.

Protocols should include guidelines for distinguishing debris of no archaeological merit from more significant finds which may warrant further investigation.

'Null' records can be submitted periodically to confirm that no obstructions or finds have been encountered on ships or wharves in the period to which the record refers.

A report should be prepared on the implementation of monitoring protocols, together with details of any notifications received and the action taken thereon.

Copies of the report should be lodged with the appropriate Curators.

Monitoring surveys

Archaeological interests can be integrated with surveys to monitor bathymetry etc. by drawing up the specifications for such surveys with archaeological advice.

Where necessary, monitoring surveys should target known wrecks and features to establish whether dredging has had an effect on site stability. Where stability has been affected, then appropriate mitigation measures should be instituted. Any exclusion zones should be confirmed or amended accordingly.

Data from monitoring surveys should be assessed archaeologically and scanned for any features that have been uncovered directly or indirectly as a result of dredging and which may be of archaeological interest.

A report should be prepared on the results of each annual monitoring survey. Copies of the report should be lodged with the appropriate Curators.

Post-dredging surveys

Specifications for surveys to be carried out after dredging has ceased should also be drawn up with archaeological advice.

Known sites or features should be targeted to establish whether dredging has had an effect on site stability. Where stability has been affected, then appropriate mitigation measures should be instituted.

Data from post-dredging surveys should be assessed archaeologically and scanned for any features that have been uncovered directly or indirectly as a result of dredging and which may be of archaeological interest.

A report should be prepared on the results of post-dredging survey. Copies of the report should be lodged with the appropriate Curators.

Archives and dissemination

The archives arising from assessment, evaluation, mitigation and monitoring should be consolidated according to current professional standards and deposited as agreed with Curators.

Applicants should seek to publish the results of the assessment, evaluation and mitigation in the form of a note in a suitable journal.

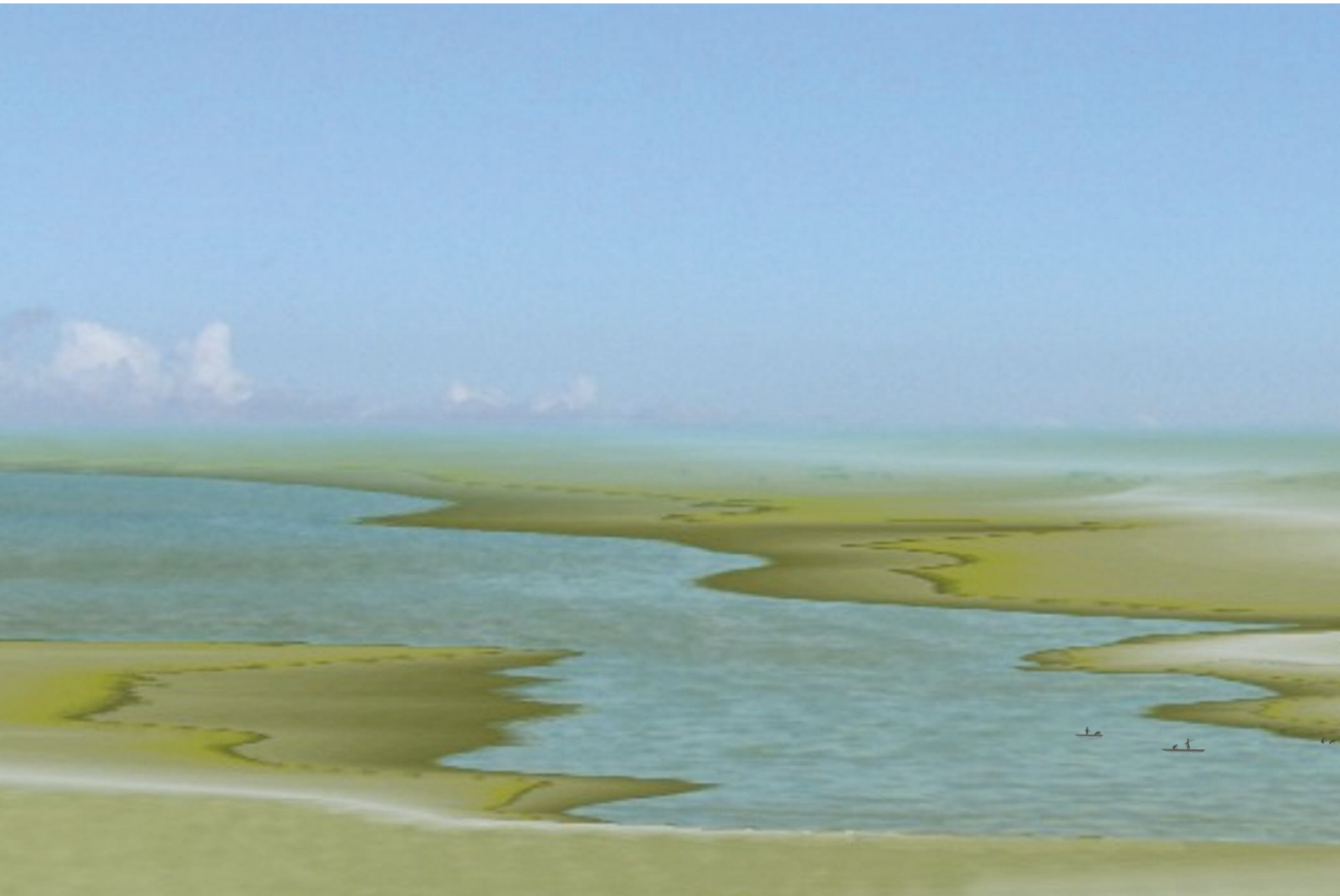
Substantive discoveries and/or investigations should be published as appropriate and as agreed with Curators.

Preparation

This Guidance Note has been prepared by Wessex Archaeology on behalf of BMAPA and English Heritage, based on a project in 2001 that was funded jointly by BMAPA and the Royal Commission on the Historical Monuments of England.

A Consultation Draft (October 2001) was circulated to the parties listed here. The Consultation Draft was also made available more widely on BMAPA's website. Comments made in the course of consultation have been incorporated as appropriate. BMAPA and English Heritage would like to thank all those who submitted comments.

Advisory Committee on Historic Wreck Sites	Nautical Archaeology Society
Association of Local Government Archaeological Officers	The Prehistoric Society
Association of Regional and Island Archaeologists	Quaternary Research Association
British Geological Survey	Royal Commission on the Ancient and Historical Monuments of Scotland
Cadw: Welsh Historic Monuments	Royal Commission on the Ancient and Historical Monuments of Wales
CIRIA/EMSAGG	The Countryside Agency
Council for British Archaeology	Countryside Council for Wales
Department for Culture, Media and Sport	The Crown Estate
Department for Environment, Food and Rural Affairs	UK Hydrographic Office
Department for Transport, Local Government and the Regions	National Assembly for Wales
English Heritage	WWF-UK
English Nature	The Wildlife Trusts
The Environment Agency	DTI Construction Directorate
Environment and Heritage Service	Hanson Aggregates Marine Ltd
Geological Society	RMC Marine Ltd
Geologists' Association	United Marine Dredging Ltd
Historic Scotland	Britannia Aggregates Ltd
Institute of Field Archaeologists	Robert Brett & Sons Ltd
Joint Nature Conservation Committee	Northwood (Fareham) Ltd
Joint Nautical Archaeology Policy Committee	Kendall Bros (Portsmouth) Ltd
Marine Conservation Society	Norwest Sand & Ballast
Maritime and Coastguard Agency	Westminster Gravels Ltd
Ministry of Defence	Volker Dredging Ltd
RAF Personnel Management Agency	Dredging International Ltd
National Trust	Llanelli Sand Dredging
	Crossavon Ltd



156 Buckingham Palace Road
London SW1W 9TR
Tel 020 7730 8194 Fax 020 7730 4355
bmapa@qpa.org www.bmapa.org

BMAPA is one of the constituent bodies of the Quarry Products Association, the trade association for the aggregates, asphalt and ready-mixed concrete industries.



ENGLISH HERITAGE

23 Savile Row
London W1S 2ET
Tel 020 7973 3002 Fax 020 7973 3001
customers@english-heritage.org.uk
www.english-heritage.org.uk



Portway House
Old Sarum Park
Salisbury
Wiltshire SP4 6EB
Tel 01722 326867 Fax 01722 337562
info@wessexarch.co.uk
www.wessexarch.co.uk