Wessex Archaeology

Dudgeon Offshore Wind Farm

Archaeological Desk Based and Geophysical Assessment

Updated Final Report

Ref: 69680.08

May 2009

DUDGEON OFFSHORE WIND FARM

Archaeological Desk Based and Geophysical Assessment

Updated Final Report

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Summary

Wessex Archaeology was commissioned by Dudgeon Offshore Wind Limited (DOW) to prepare an archaeological desk based and geophysical assessment for the offshore elements of the Dudgeon Offshore Wind Farm (Dudgeon) project including the export cable route and landfall. This assessment will inform the Environmental Statement.

The Dudgeon site is located within the Greater Wash Strategic Environmental Assessment (SEA) area, approximately 32km north east of Cromer, off the north Norfolk coast. To provide archaeological context, a marine study area and a coastal study area were created. The marine study area includes the offshore wind farm and export cable routes, while the coastal study area consists of the export cable route landfall and onshore transition pit locations.

Searches for known archaeological material were conducted for both the marine study area and coastal study area. Information was sought from a wide range of local and national bodies, including the Norfolk Historic Environment Record, the National Monuments Record and the UK Hydrographic Office. Various secondary sources were used as part of a wider assessment of the areas' archaeological potential.

Archaeological interpretation and assessment of sidescan sonar, magnetometer and sub-bottom profiler data was undertaken by Wessex Archaeology and is included in this report.

This report describes the potential archaeological resource that may be impacted by the Dudgeon project including submerged landscapes, terrestrial archaeology, known shipwrecks and reported losses.

The known and potential archaeology in the study areas consists of:

- 12 known wrecks and obstructions;
- 243 geophysical anomalies within the geophysical survey data collected by Gardline Geosurvey in 2007 and 2008;
- 31 documented losses;
- Unknown and undocumented wrecks from various periods;
- Stray finds of ship borne debris from various periods;
- The potential for the presence of submerged palaeo-landscapes, dating from 700,000 BP to the Romano-British Period, possibly containing archaeological sites and finds;
- 133 terrestrial find spots, sites and archaeological activities; and

- The potential for previously unknown terrestrial archaeological material from the Palaeolithic to the present.

An outline of the policy and legal framework affecting archaeological sites in the UK is provided, as is the methodology employed in carrying out the study. An appraisal of likely impacts has been carried out and recommendations have been made regarding monitoring and mitigation.

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Data sets were provided by the National Monuments Record, the UK Hydrographic Office and the Norfolk Historic Environment Record. Wessex Archaeology is grateful to the staff of all of these organisations for their co-operation.

Andrea Hamel carried out the desk based assessment and compiled this report. Louise Tizzard carried out the geophysical audit and review. Tina Michel carried out the processing and interpretation of the geophysical data. Kitty Brandon prepared the illustrations. The project was managed for Wessex Archaeology by Euan McNeill and Paul Baggaley. Quality Assurance was conducted by Steve Webster.

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1 INTRODUCTION

1.1 PROJECT BACKGROUND

1.1.1 Wessex Archaeology (WA) was commissioned by Dudgeon Offshore Wind Limited (DOW) to prepare an archaeological desk based and geophysical assessment of the potential impacts to the historic environment from the construction of an offshore wind farm, including export cable routes and landfall sites.

1.1.2 This assessment analyses the known historic environment receptors within the marine and coastal study areas and assesses the potential for previously unknown receptors. The assessment consists of an archaeological desk based study, a geophysical assessment, a review of the impacts of the Dudgeon Offshore Wind Farm (Dudgeon) project on the historic environment and an assessment of the significance of the effects, and suggests appropriate measures for mitigation.

1.1.3 The terrestrial cable route and the visual impact of Dudgeon will be assessed in separate reports.

1.2 THE STUDY AREA

1.2.1 The Dudgeon site will be situated approximately 32km off the coast of north Norfolk, with an export cable route running from the site to the north Norfolk coast, north of Weybourne (**Figure 1**).

1.2.2 In order to assess the historic environment data, two study areas were created:

- The marine study area, which comprises the offshore wind farm marine study area and the cable route marine study area; and
- The coastal study area, which comprises the export cable route landfalls and onshore transition pit locations.

1.2.3 The offshore wind farm marine study area was developed by placing a 1km buffer around the Dudgeon site. Co-ordinates for the Dudgeon site, based on the WGS84 UTM Zone 31N system are:

Point	Easting	Northing
1	388024	5902772
2	388363	5907516
3	395321	5901875
4	394988	5897127

Table 1.1: Co-ordinates for the Dudgeon site

1.2.4 The cable route marine study area was developed by placing a 1km buffer around the northern export cable route corridor and main cable route, and by drawing a box around the area where the export cable routes diverge towards the landfall. The cable route marine study area consists of the area below Mean Low Water Springs (MLWS).

1.2.5 At the northern end of the cable route, the export cable route corridor has been buffered by 1km, and the buffer has the following co-ordinates (based on the WGS84 UTM Zone 31N system):

Point	Easting	Northing
1	389046	5901944
2	388791	5901336
3	389345	5898621
4	390164	5897782
5	391204	5897834
6	392812	5897953
7	393378	5898430

Table 1.4: Co-ordinates for the northern export cable route corridor buffer

1.2.6 For the main section of the cable route, south of the northern export cable route corridor and before the export cable routes diverge, a 1km buffer was placed around the following co-ordinates (based on the WGS84 UTM Zone 31N system):

Point	Easting	Northing
1	390847	5900291
2	389476	5895361
3	385814	5887090
4	381815	5877350
5	380659	5875773

Table 1.2: Co-ordinates of the main cable route, before the cable routes diverge

1.2.7 At the southern end of the cable route where the cable routes diverge, the cable route marine study area has the following co-ordinates (based on the WGS84 UTM Zone 31N system):

Point	Easting	Northing
1	380414	5877134
2	381818	5875663
3	379418	5872275
4	376932	5870866
5	377112	5869529
6	376439	5867964
7	374684	5868186
8	372829	5868799
9	373417	5874654
10	376949	5876777
11	379978	5876539

Table 1.3: Co-ordinates for the southern part of the cable route marine study area where the cable routes diverge

1.2.8 The coastal study area was developed to include both of the export cable route landfalls and onshore transition pit locations. The coastal study area consists of the area above MLWS. Although the impact of the cable route landfall will be limited to

the area immediately adjacent to the landfall, a larger study area was implemented in order to provide context for the known archaeology in the vicinity and to assess the potential for previously unknown archaeology. In addition, as the precise location of the cable route landfall has not been confirmed, the larger study area allows for a full assessment of options.

1.2.9 The coastal study area consists of a 1km buffer placed around the following point. The co-ordinates are provided below in the OSGB36 British National Grid co-ordinate system, as this is the co-ordinate system that will be used for the onshore cable route archaeological assessment, and it is intended that the two reports should be compatible.

Point	Easting	Northing
1	610702	343625

Table 1.5: Centre point of the coastal study area (in British National Grid)

2 RELEVANT LEGISLATION AND PLANNING

2.1 INTRODUCTION

2.1.1 The United Kingdom's heritage related planning guidance and legislation is currently undergoing a period of major review. As a consequence, it is appropriate to highlight that changes, to both legislation and the planning process, may be made over the next five years. This report reflects the situation as of May 2009.

2.1.2 The draft Heritage Protection Bill, which applies to England and Wales, was published in April 2008 and is designed to unify the terrestrial and marine heritage protection systems. As currently drafted, the Heritage Protection Bill will replace the provisions of the Planning (Listed Buildings and Conservation Areas) Act (1990), the Historic Buildings and Ancient Monuments Act 1953, the Ancient Monuments and Archaeological Areas Act 1979 and the Protection of Wrecks Act (1973). However, the draft Heritage Protection Bill was not included in the Queen's Speech in December 2008 and therefore is not expected to come into effect in 2010 as planned. A new date for implementation has not yet been proposed.

2.1.3 The UK Government has also declared an intention to review the regulatory framework affecting development in the coastal area. Through Integrated Coastal Zone Management (ICZM), everyone involved in the management and use of a particular stretch of coast will be brought together within a framework that works to achieve common goals. The principles of ICZM are embedded throughout the proposals of the Marine and Coastal Access Bill, which had its Second Reading in the House of Lords in December 2008 and is now in its Committee stages.

2.2 PROTECTION OF WRECKS ACT (1973)

2.2.1 Under Section 1 of the Protection of Wrecks Act (1973), wrecks and wreckage of historical, archaeological or artistic importance 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 licence for those activities has been obtained. Generally, the relevant Secretary of State must consult appropriate advisors prior to designation, generally English Heritage (for English waters), although it is also possible to designate a wreck in an emergency without first seeking advice.

2.2.2 Section 2 of the Protection of Wrecks Act provides protection for wrecks that are designated as dangerous due to their contents and is administered by the Maritime and Coastguard Agency (MCA) through the Receiver of Wreck (RoW).

2.3 MERCHANT SHIPPING ACT (1995)

2.3.1 Within the context of the Merchant Shipping Act (1995), 'wreck' refers to flotsam, jetsam, derelict and lagan found at sea or on the seabed, or on the shores of the sea or any tidal water. It includes ships, aircraft and hovercraft, or parts of these, their cargo or equipment.

2.3.2 The Merchant Shipping Act sets out the procedures for determining the ownership of underwater finds that turn out to be 'wreck'. If any such 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. This applies whether material has been recovered from within or outside UK Territorial Waters,

unless the salvor can prove that title to the property has been vested in him / her (e.g. by assignment to him / her of rights devolving from the owner of the vessel or its contents at the time of loss). Even if ownership can be proved, the salvor is still required to notify the Receiver.

2.3.3 Outside of UK Territorial Waters, the Crown makes no claim on wreck that remains unclaimed at the end of the statutory one year period and the property is then returned to the salvor. Within UK Territorial Waters the ownership of unclaimed wreck vests in the Crown or in a person to whom rights of wreck have been granted.

2.3.4 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 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 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.

2.4 PROTECTION OF MILITARY REMAINS ACT (1986)

2.4.1 Under the Protection of Military Remains Act (1986), all aircraft that have crashed while in military service are protected. The Ministry of Defence (MoD) also has powers to protect vessels that were in military service when lost. The MoD can designate named vessels as Protected Places, even if the position of the wreck is not known, although the vessel must have been lost after 4 August 1914. The MoD can also designate Controlled Sites around wrecks. It is not required to demonstrate the presence of human remains for either Protected Places or Controlled Sites.

2.4.2 Diving is not prohibited at a Protected Place but it is an offence to tamper with, damage, move or remove items from the wreck. Diving, salvage and excavation are all prohibited on Controlled Sites, though licences for restricted activities can be sought from the MoD. Additionally, it is an offence to carry out unauthorised excavations for the purpose of discovering whether any place in UK waters comprises any remains of an aircraft or vessel which has crashed, sunk or been stranded while in military service.

2.4.3 In November 2001, the MoD reported on the Public Consultation on Military Maritime Graves and the Protection of Military Remains Act 1986. The report recommended that a rolling programme of identification and assessment of vessels against the criteria be established to designate all other British vessels in military service when lost, as Protected Places. There have been three statutory instruments designating wrecks under the Protection of Military Remains Act, in 2002, 2006 and 2008, with it being expected that future statutory instruments will continue to expand the number of wrecks protected under this Act.

2.4.4 In October 2006, the Appeal Court substantially increased the types of vessel that can be protected under the Protection of Military Remains Act, following a decision to designate the *SS Storaa*, an armed merchant vessel torpedoed and sunk with the loss of 22 lives off the Sussex coast in 1943 following an E-boat attack, as a war grave.

2.5 ANCIENT MONUMENTS AND ARCHAEOLOGICAL AREAS ACT 1979

2.5.1 The Ancient Monuments and Archaeological Areas Act provides for the scheduling of monuments, which encompasses buildings, structures or work, cave or excavation, vehicle, vessel, aircraft or other moveable structure. In order to be eligible for scheduling, a monument must be of national importance. Sites range from standing stones to deserted medieval villages and include more recent structures such as collieries and wartime pillboxes.

2.5.2 In relation to maritime scheduled monuments, once a wreck is scheduled, it is an offence to demolish, destroy, alter or repair it without scheduled monument consent.

2.5.3 Although primarily land based, in recent years the Ancient Monuments and Archaeological Areas Act has also been used to provide some level of protection for underwater sites.

2.6 PLANNING (LISTED BUILDINGS AND CONSERVATION AREAS) ACT 1990

2.6.1 Works affecting Listed Buildings or structures and Conservation Areas are subject to additional planning controls administered by Local Planning Authorities (LPAs). English Heritage is a statutory consultee in relation to works affecting Grade I/II* Listed Buildings.

2.7 THE BURIAL ACT (1857)

2.7.1 If human remains, including cremated remains, are discovered in the course of site investigations or construction, they must not be exhumed unless a licence has been obtained under the Burial Act 1857. The Ministry of Justice is responsible for burials in England and it advises that anyone disturbing buried remains accidentally is advised to leave the remains in place and to contact them immediately.

2.8 THE TREASURE ACT (1996)

2.8.1 In England, all finders of 'treasure' are under a legal obligation in terms of the Treasure Act 1996 to report such items to a coroner for the district in which they were found. There is also a voluntary scheme for all forms of archaeological find, known as the Portable Antiquities Scheme. Its website (www.finds.org.uk/index.php) provides a summary of what constitutes treasure:

- Any metallic object, other than a coin, that consists of at least 10% precious metal;
- Any group of two or more metallic objects of prehistoric date, including base-metal assemblages, that come from the same find, if they were found after 1 January 2003;
- All coins that are at least 300 years old. However, if the coins contain less than 10% precious metal, there would need to be at least ten coins from the same location in order to be considered treasure;
- Any object associated with other objects deemed to be treasure; and
- Any object that would previously have been 'treasure trove' but does not fit into the above (i.e. gold and silver objects less than 300 years old, but that have been deliberately hidden with the intention of recovery and whose owners or heirs are unknown).

2.9 PLANNING POLICY GUIDANCE

Planning Policy Guidance Note 16: Archaeology and Planning (PPG 16)

2.9.1 Planning policy such as the Planning Policy Guidance Note 16: Archaeology and Planning (PPG 16) (Department of the Environment, 1990) applies only within local authority regions, which as a general rule extends only to the mean low water mark. However, local councils can apply this to sub-tidal archaeological remains in order to secure best practice. PPG16 acknowledges the potentially fragile and finite or irreplaceable nature of such remains (paragraph 6) and states that the desirability of preservation of archaeological remains and their setting is a material consideration within the planning process (paragraph 18). It notes that where preservation *in situ* is not justified, it is reasonable for planning authorities to require the developer to make appropriate and satisfactory provision for excavation and recording of remains (paragraph 25).

Planning Policy Guidance Note 15: Planning and the Historic Environment (PPG 15)

2.9.2 This provides guidance on the protection and enhancement of the historic environment including built heritage and historic landscape through Local Development Plans (LDPs). Local Planning Authorities (LPAs) administer special consents, in addition to regular planning controls, for planning applications involving Listed Buildings, Conservation Areas, Historic Parks and Gardens and Registered Battlefields.

North Norfolk Planning Policies

2.9.3 The North Norfolk Core Strategy Development Plan Document and Proposals Map were adopted by North Norfolk District Council on 24 September 2008. The Core Strategy outlines the vision, objectives and spatial development strategy and overarching policies that will guide development to 2021.

England's Coastal Heritage: a statement on the management of coastal archaeology (1996)

2.9.4 This statement sets out a number of principles for managing coastal archaeology. These include the promotion of preservation *in situ*, that finds should be managed in accordance with the principles which apply to terrestrial archaeological remains, that marine and terrestrial remains must be considered seamlessly, that a precautionary approach should be adopted and that PPG16 should be applied to the treatment of sub-tidal archaeological remains in order to secure best practice.

Identifying and Protecting Palaeolithic Remains: Archaeological Guidance for Planning Authorities and Developers (English Heritage, 1998)

2.9.5 This draws attention to the importance of Palaeolithic remains and states that they must be considered in line with PPG16 when potentially affected by development proposals. Palaeolithic archaeological sites are defined as any land where artefacts or traces of a human presence of Pleistocene date have been found.

The Scope of Strategic Environmental Assessment of North Sea areas SEA2 and SEA3 in regard to prehistoric archaeological remains

2.9.6 In 2002 the Department of Trade and Industry (now defunct with previous responsibilities transferred to the Departments for Business, Enterprise and Regulatory Reform (BERR), Innovation, Universities and Skills (DIUS) and Energy and Climate Change (DECC)) produced this document and although not legislative,

it makes suggestions for discussion of protocols and a reporting regime for the commercial sector.

Code of Practice for Seabed Developers, Joint Nautical Archaeology Policy Committee 2006 (JNAPC)

2.9.7 This UK wide code is voluntary but provides a framework for seabed developers similar to the principles found in current policy and practice on land. The aim of the Code of Practice is to ensure a best practice model for seabed development. The Code of Practice offers guidance to developers on issues such as risk management and legislative implications.

Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE, 2007)

2.9.8 The guidance is intended to promote the development of best practice in relation to the marine historic environment for the offshore renewable energy sector. It is also intended to promote an understanding of the conservation issues arising from the impacts of offshore renewable energy projects on the historic environment and in this way develop capacity amongst developers, consultants and contractors (Wessex Archaeology, 2007a).

Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008)

2.9.9 The guidance was produced to examine the cumulative impacts on the historic environment arising from offshore renewable energy projects and applies to all areas that could be affected by development: the terrestrial, coastal and marine environments. It is intended for developers, environmental consultants, industry regulators and other authorities, historic environment curators and contractors, as well as the public.

3 METHODOLOGY

3.1.1 The methodology adopted reflects best practice in undertaking archaeological desk-based assessments, as codified by the Institute for Field Archaeologists (IFA) *Standard and Guidance for Archaeological Desk-based Assessment* (IFA, 1994 (Revised 2008)). The approach adopted also reflects the requirements of Environmental Assessment arising from European Council Directive 85/337/EEC as amended by Directive 97/11/EC.

3.2 SOURCES

3.2.1 The principal sources consulted in this assessment are as follows:

- Records of wrecks and obstructions collated by the UK Hydrographic Office (UKHO) (accessed 3 July 2008 and 4 September 2008);
- Records of known wreck sites and recorded losses held in the maritime section of the National Monuments Record (NMR) (accessed 5 September 2008);
- Records of known terrestrial archaeological sites and finds held by the NMR (accessed 5 September 2008);
- Records of known archaeological sites held by the Norfolk Historic Environment Record (NHER) (accessed 9 September 2008);
- Various secondary sources relating to the historic environment from the Palaeolithic to modern period;
- Secondary sources relating to known and potential wreck sites and casualties, as well as historical charts and sailing directions held by the UKHO;
- The MoD (Naval Staff Directorate) was approached with respect to the PMRA (1986); and
- The Receiver of Wreck (RoW) at the Maritime and Coastguard Agency was approached with regards to finds from historic wrecks (data accessed 19 September 2008).

3.3 PREVIOUS ARCHAEOLOGICAL WORK

3.3.1 Research and Archaeology: a Framework for the Eastern Counties, 2. research agenda and strategy (Brown and Glazebrook, 2000) identified the importance of coastal survey along the coast of Norfolk. Following this report, the Norfolk Rapid Coastal Zone Archaeological Survey (Norfolk Archaeological Unit, 2005) was conducted, which covered the entire coast of Norfolk, including the coastal study area.

3.3.2 The Dudgeon site lies in an area off the Lincolnshire and Norfolk coasts, in which a number of other offshore wind farms have been constructed or are in various stages of development. Wessex Archaeology (WA) has conducted studies in the following areas and the results from these studies were consulted in order to provide context for the Dudgeon project:

- The Lynn and Inner Dowsing Data Search Area (WA, 2002a, 2002b, 2005, 2006g, 2007d and 2007e);
- The Wash Cable Route Corridor (WA, 2006a);

- The Docking Shoal Study Area (DSSA) – created for the Race Bank and Docking Shoal Offshore Wind Farms (WA, 2006b, 2006d, 2007b and 2007c);
- The Lincs Offshore Wind Farm Area (WA, 2006c); and
- The Sheringham Shoal Offshore Wind Farm Area (WA, 2006e and 2006f).

3.3.3 The Sheringham Shoal offshore wind farm archaeological desk based assessment (WA, 2006e) was of particular interest. The site lies 15km to the south of the Dudgeon project and the export cable route (western landfall) corridor coincides with the Sheringham Shoal export cable route as they approach the shore. In August 2008, Sheringham Shoal received consent from the Department of Business, Enterprise and Regulatory Reform (BERR) (now the Department of Energy and Climate Change (DECC) (www.scira.co.uk). Further assessment conducted for this development could inform on the known and potential historic environment receptors that could be impacted by the Dudgeon project.

3.3.4 There have also been a number of terrestrial investigations within the coastal study area, which have been used to inform the 'coastal study area: known archaeology' section later in the report, but are listed here individually. The NMR lists eight activity reports in the coastal study area:

- 639936: Muckleburgh Hill excavation;
- 639941: Excavation at All Saints Church;
- 640431: Excavation at All Saints Church, Priory;
- 1185497: Evaluation trenching north of Sheringham Road, which recovered Iron Age and Roman pottery;
- 1267411: Watching brief at the Mill, Sheringham Road. Monitoring of ground works following evaluation (Event 1185497) recovered further Roman pottery;
- 1336580: Excavation at Beach Road, Weybourne for the Kelling-Sheringham Pipeline. Excavation in advance of pipeline construction revealed prehistoric, medieval and undated features;
- 1381722: Evaluation at Abbey Farmhouse, Weybourne. Two trenches excavated within the surviving structures of Weybourne Priory, recording surviving monastic features; and
- 1443257: Evaluation at Abbey Farm, Weybourne. Four trenches excavated around the 17th century barn, recording its primary floor level only.

3.4 DATA USE

3.4.1 Throughout this project, the Universal Transverse Mercator (UTM Zone 31N) co-ordinate system based on the WGS84 datum was used to integrate data delivered by the NMR, UKHO and other sources. Where applicable, co-ordinates were converted using Quest Geodetic calculator by Quest Geo Solutions Limited.

3.4.2 Records of known terrestrial sites and find spots, in addition to maritime wrecks and obstructions, were collated from the NMR, NHER, UKHO, MoD and RoW between June and September, 2008. These records were superimposed on a base map of the Study Areas in ArcView 9.2 Geographical Information System (GIS) software package.

3.4.3 Terrestrial records are listed in gazetteer form in **Appendix I**. In addition to the UTM Zone 31N, the British National Grid co-ordinates received from the NMR and NHER are also included. Known wrecks and obstructions are listed in **Appendix II** and a list of recorded losses can be found in **Appendix III**.

3.4.4 In order to assess the potential for the discovery of additional wrecks on the seabed, data regarding shipping losses (for which there are currently no known seabed remains) was reviewed alongside an assessment of historic shipping patterns and navigational hazards. The recorded crash sites of military aircraft were also considered.

3.4.5 Secondary sources were consulted to provide background for the known terrestrial and marine archaeology and also to suggest areas of archaeological potential. In particular, studies regarding glaciation, sea level change and geomorphology were consulted to provide an indication of the potential for submerged prehistory.

3.5 GEOPHYSICAL DATA PROCESSING AND ANOMALY CHARACTERISATION

3.5.1 Geophysical surveys for the Dudgeon project were undertaken by Gardline Geosurvey in 2007 and 2008. The geophysical datasets consist of sidescan sonar, sub-bottom profiler (boomer), multibeam echosounder (MBES) and magnetometer data. Although the data were not collected specifically for archaeological purposes, they were audited and reviewed by Wessex Archaeology (WA) and were considered suitable for archaeological interpretation (WA, 2008a).

3.5.2 WA was commissioned to archaeologically assess and interpret the geophysics within the offshore wind farm and cable route study areas. The data were analysed for anomalies of archaeological potential by WA in December 2008 and January 2009. All anomalies were plotted in ArcMap9 and compared with existing records of wrecks and obstructions from the UKHO and NMR.

3.5.3 Details of the methodology employed and quality of each dataset are discussed in more detail below.

Sidescan Sonar Data

3.5.4 The sidescan sonar data were processed by WA using Coda Geosurvey software. This allowed the data to be replayed with various gain settings in order to optimise the quality of the images. The data were initially scanned to give an understanding of the geological nature of the area and were then interpreted for any objects of possible anthropogenic origin: the position and dimensions of any such objects were recorded into a gazetteer (**Appendix II**).

3.5.5 During this stage of the interpretation the sidescan sonar anomalies were ascribed an archaeological flag in order to record the geophysicists' initial assessment of the sidescan sonar anomaly. These flags were ascribed as follows:

High	Ascribed only where the geophysical anomalies clearly represent a wreck site or were very near to a previously known site.
Medium	Geophysical anomalies with no directly corroborating data but being of a size, shape or amplitude such as to suggest that they possibly relate to archaeological sites or features.
Low	Small, isolated, geophysical anomalies of uncertain origin, which are likely to be 'artefacts' in the data or natural features.
Very Low	Anomalies that are known or are highly likely to be of modern origin, and which are not archaeologically interesting (e.g. moorings etc)

Table 3.1: Criteria for assigning Archaeological Potential Rating

3.5.6 The form, size and/or extent of anomalies is a guide to their potential. A single small but prominent anomaly may be part of a much more extensive feature that is largely buried. Similarly, a scatter of minor anomalies may define the edges of a buried but intact feature, or it may be all that remains as a result of past impacts from, for example, dredging or fishing. The application of a ratings system is therefore a means of prioritising sites in order to inform further stages of the interpretation process and on its own is not definitive.

3.5.7 For the offshore wind farm marine study area, the sidescan sonar data cover most of area (including the 1km buffer) apart from a corridor approximately 310m wide parallel to the southern limits of the survey area and the north west corner of the survey area where an area of approximately 350m by 500m is not covered, see **Figure 2**. Line spacing varies between 70 – 120m; data quality is average to good. All data lines within the study area were interpreted during the archaeological evaluation. However, the results listed in **Appendix II** are unlikely to reflect all of the archaeological sites in the area because of the presence of sand waves.

3.5.8 For the cable route marine study area, the sidescan sonar data cover a corridor 600m wide from the offshore wind farm to approximately 3.3km north of the coastline with the centre line extending to approximately 2km north of the coastline. Two additional wing lines were run over a length of 1.5km approximately 26km south of the offshore wind farm increasing the width of the corridor to approximately 890m, see **Figure 2**. A small data gap of less than 15m width and approximately 750m length has been observed in the northern part of the cable route. In the southern part, there is limited coverage after the cable routes diverge. Line spacing is 75m; data quality is average to good. All data lines within the study area were interpreted during the archaeological evaluation. However, the results listed in **Appendix II** are unlikely to reflect all of the archaeological sites in the area because of the presence of sand waves.

3.5.9 Large sand waves were observed in both the offshore wind farm and the cable route marine study areas (**Figure 3**). They cover approximately a third of the area at the wind farm site and they cover less than 10% of the area of the cable route. Archaeological sites may be buried within these sand waves and due to the potential thickness of the sand even quite large sites may not be visible on the surface of the seabed or detected by sidescan sonar.

3.5.10 The presence of large sand waves has implications for the survival and condition of archaeological sites, as well as the identification of their presence. The presence of sand waves indicates that the environment may be mobile, with archaeological sites possibly subject to cycles of exposure and burial which will make them vulnerable to deterioration.

3.5.11 Furthermore, anomalies that are not upstanding and are highly degraded, particularly those made of wood, can be difficult to identify even with data acquired at high frequency.

Magnetic Data

3.5.12 The magnetic data were processed to give an xyz file comprising of grid co-ordinates (xy) and total magnetic field strength (z). Each line of data was then processed to remove the regional magnetic field and also any large diurnal variations, which may have masked small magnetic anomalies of interest to this survey. The data were then gridded to produce a contour map of the survey area and plotted with the magnetic field strength values represented by graded colour bands to show changes in the magnetic field strength.

3.5.13 The magnetic anomalies were then assessed and the position and magnitude of all anomalies with an amplitude of 5nT or more were recorded into a gazetteer (**Appendix II**).

3.5.14 The magnetic data was of generally good quality for both datasets and has been assessed for all lines provided.

Seismic Data

3.5.15 The shallow seismic data was studied in order to detect any infilled palaeo-channels, ravinement surfaces and peat / fine grained sediment horizons that may have archaeological potential. Features within the study area were mapped and digital images created for illustration purposes.

3.5.16 The shallow seismic data were processed by WA using Coda Geosurvey software. This software allows the data to be replayed with user selected filters and gain settings in order to optimise the appearance of the data for interpretation. The software then allows an interpretation to be applied to the data by identifying and selecting a sedimentary boundary that might be of archaeological interest.

3.5.17 The shallow seismic data were interpreted with two way travel time (TWTT) along the z-axis. In order to convert from TWTT to depth, the velocity of the seismic waves was estimated to be 1,600m/s. This is a standard estimate for shallow, unconsolidated sediments.

3.5.18 Also any small reflectors which appear to be buried material, such as a wreck site covered by sediment, will be recorded and the position and dimensions of any such objects recorded into a gazetteer and an image of each anomaly acquired (**Appendix II**). It should be noted that anomalies of this type are rare as the sensors must pass directly over such an object in order to produce an anomaly.

3.5.19 For the purpose of this project, every fourth line of data (25%) was assessed. Where palaeo-features or other features were identified, the adjacent lines were assessed in order to trace the features of interest. Data coverage is the same as for the sidescan sonar coverage apart from eight main lines in the north eastern edge of the offshore wind farm survey area.

Anomaly Grouping and Discrimination

3.5.20 Sidescan sonar, magnetic and seismic anomalies were then grouped together along with the results of the desk-based study of the areas known archaeology. This allows one ID number to be assigned to a single object. A discrimination flag is then added to the record in order to discriminate against those which are not thought to be of an archaeological concern to the details of the Dudgeon project. These flags were ascribed as A1: Anthropogenic origin of archaeological interest; A2: Uncertain origin of possible archaeological interest; and O1: Outside geophysical footprint.

3.6 CHRONOLOGY

3.6.1 Where mentioned in the text, the main archaeological periods are broadly defined by the following date ranges:

- Modern (1800 – present);
- Post-medieval (1500 – 1799);
- Medieval (AD 1066 – 1499);

- Anglo-Saxon (AD 410 – 1066);
- Romano-British (AD 43 – 410);
- Iron Age (700 BC – AD 43);
- Bronze Age (2,400 – 700 BC);
- Neolithic (4,000 – 2,400 BC);
- Mesolithic (8,500 – 4,000 BC); and
- Palaeolithic (700,000 BP – 8500 BC).

4 BASELINE CONDITIONS

4.1 MORPHOLOGY, GEOLOGY AND SEASCAPE

Offshore Wind Farm Marine Study Area

4.1.1 In general, the underlying geology in the offshore wind farm marine study area is Upper Cretaceous chalk (British Geological Survey (BGS) 1992), which is overlain by the Swarte Bank, Egmond Ground and Bolders Bank Formations (BGS 1991).

4.1.2 Swarte Bank consists of till, which is described as stiff dark grey to grey brown with lithoclasts of red sandstone, chalk and grey mudstone (BGS 1991). It is described as 'the first unequivocal record of the invasion of ice into the southern North Sea basin' (BGS 1992: 109) during the Anglian glaciation. This The Swarte Bank Formation cuts into pre-Pleistocene strata, filling a fan like array of valleys and can be up to 450m in depth.

4.1.3 Egmond Ground consists of sand and gravel with clay laminae, which is generally grey to greenish grey and shelly (BGS 1991). The Egmond Ground Formation is associated with the climactic amelioration following the Anglian glaciation (478,000 – 423,000 BP) and the associated sea level rise which led to the area being covered by a shallow sea (BGS 1992: 111). It was formed by the later deposits of that sea and the Egmond Ground Formation is associated with open marine conditions. The Egmond Ground Formation is generally between 8 – 20m thick and contains Hoxnian (423,000 – 380,000 BP) shallow water faunas and spores of a freshwater fern that indicate a cool temperate sea.

4.1.4 The uppermost layer is the Bolders Bank Formation, consisting of till, which is a stiff clay with silt and sand lithoclasts of chalk, red sandstone and grey mudstone (BGS 1991). This formation is associated with the growth, expansion and initial decay of ice sheets during regionally lowered sea levels of the late Devensian (late Devensian: 18,000 – 10,000 BP). The formation is a composite of subglacial and supraglacial deposits (BGS 1992: 113). In general, the formation is less than 5m thick, although it can be as thick as 15m to 20m in areas to the east of Lincolnshire.

Cable Route Marine Study Area

4.1.5 The Quaternary geology of the northern part of the cable route marine study area is characterised by the Bolders Bank Formation (discussed above). At the southern end of the cable route marine study area, there is bedrock at or near the surface with isolated patches of Quaternary sediments.

Coastal Study Area

4.1.6 The potential landfall areas consist of steep shingle beach. The inland boundary is marked by a low bluff, representing an earlier but now degraded cliff line (May 2003: 613). The shoreline consists of a thin band of Cretaceous chalk (Geological Survey of Great Britain and Wales, 1971).

4.1.7 Further south, the geology is characterised by boulder clays of various dates that were formed beneath the glaciers and ice sheets that covered the area during the Devensian glacial maximum. The soil south of the landfall consists of brown sands derived from glaciofluvial drift and associated loam cover. The soils are deep and well drained, characterised as coarse loamy or silty, with associated coarser textured sand and are locally stony (Soil Map of England and Wales 1975).

4.2 GLACIATION AND SEA LEVEL CHANGE

4.2.1 The archaeological potential of the marine study area and coastal study area is closely related to glaciation and relative sea level changes through time. Despite three major glaciations over the past 700,000 years, there have been long periods when the study areas and the North Sea Basin were dry land and suitable for human occupation (Wenban-Smith, 2002).

4.2.2 The North Sea Basin has been shaped by numerous periods of glaciation and marine transgressions and regressions, including three major glaciations: the Anglian (c478,000 BP – 423,000 BP), the Wolstonian (c380,000 BP – 130,000 BP) and the Devensian (c70,000 BP – 13,000 BP). Ice sheets would have affected the landscape through erosion by glaciers and glacial outwash, deposition of sediment caused by glacial outwash and isostatic changes resulting from the effect of the ice sheet upon the land mass.

4.2.3 Even relatively small changes in sea level would have had a marked effect on the coastline and therefore coastline models can only be approximate. **Table 4.1** provides an indication of the main warm and cold periods and an estimate of the sea level stands that prevailed during these periods.

Oxygen Isotope Stage	Age in Years BP / BC	British Conventional Chronology	Archaeological Period	Climate	Sea Level Age	Relative Sea Level
–	4,000 BC	Flandrian	Neolithic	Warm	c. 4000 BC	-6m
	5,500 BC		Mesolithic		c. 5500 BC	-10m
					c. 6000 BC	-17m
					c. 6300 BC	
					c. 6700 BC	-20m
					c. 9000 BP c. 7000 BC	-25m
	7,500 BC		Early Mesolithic		c. 9500 BP c. 7500 BC	-30m
1	10,000 BP (8,000 BC)	Devensian			c. 10,000 BP (c. 8,000 BC)	-35m
			Late Upper Palaeolithic		c. 11,000 BP (c. 9,000 BC)	-40m
						-50m
2	12,000 BP (10,000 BC)				c. 12,000 BP	-60m
					c. 13,500 BP	
	18,000 BP – 12,000 BP					
2	25,000 BP – 18,000 BP		Early Upper Palaeolithic	Mainly cold	c. 18,000 BP	-120m
3	50,000 BP – 25,000 BP				c. 40,000 BP	-50m
4	70,000 BP – 50,000 BP		Middle Palaeolithic (150,000 BP – 30,000 BP)			
5a-d	110,000 BP – 70,000 BP					
5e	130,000 BP – 110,000 BP	Ipswichian		Warm	c. 120,000 BP	+8m
6	186,000 BP – 130,000 BP	Wolstonian		Cold	c. 128,000 BP	-100m
7	245,000 BP – 186,000 BP		Lower Palaeolithic	Warm	c. 186,000 BP	High?

Oxygen Isotope Stage	Age in Years BP / BC	British Conventional Chronology	Archaeological Period	Climate	Sea Level Age	Relative Sea Level
8	303,000 BP – 245,000 BP			Cold	c. 250,000 BP	Low?
9	339,000 BP – 303,000 BP			Warm	c. 300,000 BP	High?
10	380,000 BP – 339,000 BP			Cold	c. 339,000 BP	
11	423,000 BP – 380,000 BP	Hoxnian		Warm	c. 380,000 BP	High?
12	478,000 BP – 423,000 BP	Anglian		Cold	c. 425,000 BP	-120m+?
13	478,000 BP	Cromerian		Variable	c. 480,000 BP	Varying
17 or 19?	700,000 BP				c.700,000 BP	

Table 4.1: Relative Sea Level Changes (after Wymer, 1999; Shennan *et al* 2000; Wenban-Smith, 2002; Coles, 1998; Jeglersma, 1979; Parfitt *et al*, 2005; and the work of the Land-Ocean Evolution Perspective Study (LOEPS))

4.2.4 During the Anglian glacial phase (478,000 BP – 423,000 BP) Britain experienced the most extensive ice cover. During the glacial maximum the study areas would have been completely covered by ice as the ice sheet is believed to have extended almost as far south as the Thames (Wymer, 1999:17). Before and after the glacial maximum, there were periods when the land was exposed and possibly habitable; however, the Hoxnian stage immediately thereafter may have seen a rapid rise of sea level that would have covered the area.

4.2.5 The full extent of the Wolstonian (c380,000 BP – 130,000 BP) ice sheet is unknown, but it is likely to have reached as far south as The Wash (May, 1976:17-18). The advance of the Devensian glaciation (c110,000 BP – 10,000 BP) is also likely to have reached past the southern limit of the present day Wash and the north coast of Norfolk (Brew *et al*, 2000:137; Wymer, 1999:17, 132). The areas not covered by ice would have been affected by harsh periglacial conditions.

4.2.6 The intervening warm period of the Ipswichian (c130,000 BP – 110,000 BP) is predicted to have had sea levels approximately eight metres higher than today, completely inundating the Study Areas.

4.2.7 At about 8,000 BC, the level of the North Sea was at least 36m lower than it is today and the coastline would have been correspondingly distant; somewhere near the present Dogger Bank (Wymer and Robins, 1994:13) (**Figure 4**).

4.2.8 By the late Mesolithic, due to rising sea levels, the marine study area would have become increasingly coastal. It is difficult to quantify the speed and effect of this last marine transgression, but a model developed by Shennan *et al* (2000:291) suggests that the study areas would have been most recently inundated around 4,000 BC, at the beginning of the Neolithic. From this time onwards, the coastline is generally considered to be similar to that of today (Murphy, 2005:6).

4.2.9 However, the rising sea levels in the Romano-British period led to considerable coastal erosion on the north coast of Norfolk and it has been postulated that parts of the Romano-British coast may have been as much as 2km further seawards (Murphy, 2005:7).

4.3 HISTORIC ENVIRONMENT BASELINE

4.3.1 This section provides a wide ranging and general background of the historic environment in north Norfolk, in order to provide context for the known and potential

historic environment in the marine and coastal study areas. This wide background is particularly important with regards to the earliest periods of occupation, when material remains are relatively sparse. It is also important to take a broad view of the socioeconomic history of the area in order to understand maritime activity, such as trading vessels passing the north coast of Norfolk on their way to other places. Details of the known and potential archaeology of the marine and coastal study areas will be provided in later sections.

Lower and Middle Palaeolithic (700,000 BP – 30,000 BP)

4.3.2 During the Lower and Middle Palaeolithic, there are likely to have been a number of periods when the both the marine and coastal study areas were dry land and suitable for human occupation. The evidence for occupation will be reviewed here in relation to glaciation and sea level change.

4.3.3 The landscape within the study areas has been repeatedly reworked by three major glaciations since the earliest known Lower Palaeolithic occupation of Britain. Due to glacial movements, archaeological remains are likely to have been moved from their original site of deposition (primary context) to other locations (secondary contexts). However, despite the extensive reworking of the landscape, some deposits from these earlier periods may survive *in situ*.

4.3.4 The Lower Palaeolithic landscape of Britain is difficult to reconstruct, but it is possible to make some generalisations based on existing evidence. Between 700,000 BP – 450,000 BP, there may have been a number of temperate phases possibly suitable for occupation by hominins, (the currently accepted term for our human ancestors) (Parfitt *et al,* 2005:1008). Fossil evidence from the West Runton Freshwater Bed on the north Norfolk coast indicates a temperate climate and palaeo-botanical material indicates a habitat of woodland and grass (Stuart and Lister, 2001:1678).

4.3.5 The discovery of worked flints dating to c700,000 BP at Pakefield, Suffolk, has revealed evidence for hominin occupation during this warm period (Parfitt *et al,* 2005). The finds were recovered from surviving deposits that have been identified as part of the Bytham river system, a pre-Anglian river that flowed from midland England and the southern Pennines through north central East Anglia (Rose *et al,* 2001:10).

4.3.6 At Happisburgh, to the east along the coast from the coastal study area, there have been discoveries of Palaeolithic artefacts *in situ* in riverine deposits. These provide evidence of the occupation before the Anglian glaciation and may provide a possible provenance, and suggest a later date, for many of the palaeoliths previously recovered from Norfolk's beaches over the last 150 years (Wymer, 2005a:13).

4.3.7 The Anglian glaciation (c423,000 BP) brought ice cover and a periglacial climate to Britain. Although at the end of this period the study areas would have been exposed, harsh conditions are likely to have precluded occupation.

4.3.8 After the ice sheets had receded, the marine study area was likely to have been part of a low lying wetland landscape that characterised the southern North Sea. The rivers probably flowed at higher levels along their valleys than today and the coastline was considerably further away (Wymer, 2005a:13). This landscape of plains and possible marshland would have provided a wide range of resources and thus would have been an ideal habitat for hominin activity.

4.3.9 During the Hoxnian (423,000 BP – 380,000 BP), the climate was warmer, but it is probable that the sea level would have been higher than today, inundating the study areas and occasionally cutting off Britain from the European mainland. Archaeological evidence for this period from Norwich includes hand axe finds concentrated along the coast and in river valleys (Wymer, 2005a:13). For the whole of the UK, the only find of human remains from this period is from Swanscombe, Kent (May, 1976:18; Wymer, 1999:74-77). The remains were associated with Acheulian hand axes and mammalian faunal remains, providing evidence for intervals of hominin occupation during the interglacial (Wymer, 1999:77).

4.3.10 The Wolstonian (c380,000 BP – 130,000 BP) consisted of a number of cold and warm phases and as Palaeolithic groups appear to have favoured more open landscapes during the cool periods at the beginning and end of interglacial periods, there is the possibility of occupation at times throughout this period, such as at Pontnewydd Cave, in Wales (Wymer, 2005a:13; Wymer, 1999). Hominin occupation at the cave is evidenced by hand axes, axes, flakes and Neanderthal teeth that have been dated to 250,000 BP – 225,000 BP (Wymer, 1999:190).

4.3.11 In Britain during the Ipswichian (c130,000 BP – 110,000 BP), although the climate was temperate and suitable for hominin occupation, there is no evidence for hominin presence, even at sites such as Bobbitshole near Ipswich or Trafalgar Square where abundant animal remains have been discovered (Wymer, 1999:33). The lack of palaeoliths from the later Ipswichian has led to suggestions that Britain may have been uninhabited at this time (Wymer, 1999:33). This lack of occupation could have resulted from sea level rise that cut Britain off from the Continent, possibly before migrating populations were able to take advantage of the additional territory.

4.3.12 During the early Devensian, there is evidence in Norfolk for late Middle Palaeolithic activity. During gravel extraction activities in an area that used to be part of a small spur or island on the edge of the River Wissey, a large quantity of tools were recovered along with mammoth remains and were dated to 65,000 BP – 32,000 BP (Wymer, 2005a:13). Although no hominin remains were recovered, the tools are thought to be of a Neanderthal type.

4.3.13 There is evidence for the arrival of anatomically modern humans at sites such as Kent's Cavern, at Torquay, Devon and Paviland Cave, Gower Peninsula, Wales. These finds have been dated to 49,000 BP – 35,000 BP.

Upper Palaeolithic (30,000 BP– 10,000 BC)

4.3.14 The Late Middle Palaeolithic occupation of the region by anatomically modern humans would have been relatively short lived, as during the Devensian glacial maximum (21,000 BP – 18,000 BP) ice sheets would have covered the north Norfolk coast (Wymer, 2005a:13-14).

4.3.15 By 13,000 BP, the Devensian ice sheets were in retreat and the climate was warming. The North Sea Basin became a vast plain crossed by numerous rivers and with extensive areas of bog and wetland. The immediate post glacial landscape was colonised by grass, sedge and herb and increasingly mild temperatures provided a suitable environment for initial birch, willow, poplar, hazel and pine vegetation (Fryer *et al*, 2005:10; Spikins, 2000). Oak and elm forests were beginning to be established. During this period, both the marine and coastal study areas would have been terrestrial and suitable for human occupation.

4.3.16 Although the extent of modern human occupation in Britain shortly after the Devensian glaciation is believed to have been very limited (Wymer and Robins, 1994:35-36), *in situ* worked flint from Titchwell is thought to belong to a late Upper Palaeolithic tradition of tool making and may date to 12,000 BP – 10,000BP (Wymer and Robins, 1994:13). The Titchwell evidence was recovered from peat deposits exposed by marine erosion and suggests the potential for similar sites occurring elsewhere on the Norfolk coast.

Mesolithic (8,500 BC – 4,000 BC)

4.3.17 There was considerable sea level rise during the Mesolithic. However, during the early Mesolithic, Norfolk would have continued to form the western extremity of a great plain extending over what is now the North Sea and both the marine and coastal study areas would have been dry land. This plain is likely to have consisted of low lying fresh and brackish water wetlands and lagoons supporting animals such as deer and aurochs (Murphy, 2005:6). This type of terrain is thought to have been favoured by Mesolithic hunters and fishers who would have hunted the game and used the waterways to navigate through the landscape (Wymer, 2005b:15).

4.3.18 Small Mesolithic flint tools, known as microliths and distinctive Mesolithic long blades have been found in Norfolk, particularly along waterways, suggesting occupation by small groups of hunter gatherers during this period *(ibid*). The site of Titchwell, located by a small stream some distance from the current coastline, presented a particularly rich site (*ibid*). Another important site includes Kelling Heath, where flint work was discovered scattered over a large area (*ibid*).

4.3.19 There is also evidence for environmental modification, such as the pine charcoal from Spong Hill and Bixley, about 50km south of the study area, that thought to be associated with burning to increase grazing area and encourage game (Fryer *et al,* 2005:10). Other environmental modification could have been implemented by the tool assemblage of the Mesolithic, such as the flint axes, which would have enabled local inhabitants to clear the coniferous forests which were spreading across the landscape as the climate ameliorated.

4.3.20 These tools could also have been used for making the timber into objects such as boats (Wymer 2005b:15) and although no boat remains have been found in Britain from this time period, there is indirect evidence of riverine transport. Axe heads dredged from the River Trent, some of which weigh as much as 2kg, are thought to have been transported by boat (May, 1976:54). In addition, theoretical studies have suggested that complex log rafts, bundle rafts and simple log boats could have been used inland, while multiple hide boats could have been used at sea (McGrail, 2004:172). As the sea level rose and Britain was separated from the Continent, seagoing craft would have been particularly important (Wymer, 2005b:15).

4.3.21 Due to the rising sea levels, by the end of the Mesolithic most of the marine study area would have been inundated, with the exception of the more elevated areas. These inundated sites still have the potential to produce important archaeological finds, for example, artefacts including flints, spear heads and mammal remains have been dredged from locations on Dogger Bank in the North Sea (Department of Trade and Industry, 2002:33). A detailed study of the submerged Mesolithic landscape of Doggerland has provided evidence for features such as fluvial systems, saltmarsh, lakes, estuaries and shorelines (Gaffney *et al,* 2007).

Neolithic (4,000 BC – 2,400 BC)

4.3.22 By the beginning of the Neolithic, sea level in this area had risen to approximately 6m below the present level (Shennan and Horton, 2002:521; Shennan *et al*,

2000:291). Activity in the offshore wind farm marine study area and much of the cable route marine study area would have been limited to those of a maritime nature, but terrestrial activities would have continued in the southern end of the cable route marine study area and the coastal study area.

4.3.23 Farming in Britain became established around 4,000 BC and in Norfolk and Lincolnshire it appears to have been localised and fairly limited in scale (Ashwin, 2005a:17; Fryer *et al,* 2005:10). The adoption of farming led to a steady increase in population and, as during the Mesolithic, activity appears to have been concentrated around coastal areas and in river valleys. There is widespread evidence of human activities, consisting of flint axes, scrapers, arrowheads and other tools, as well as pottery. Flint could have been obtained from disturbed ground and from the seashore, but there is also evidence for quarrying in the later Neolithic. Three types of Early Neolithic monuments are recorded in Norfolk: 'causewayed enclosures', long barrows and cursi and there is considerable evidence of round barrows from the Late Neolithic and Early Bronze Age (Ashwin, 2005a:17; Ashwin, 2005b:19). There is sparse evidence for Neolithic settlement in Norfolk and it has been suggested that communities were semi mobile (Ashwin, 2005a:17).

4.3.24 Evidence for trade consists of imported axe heads of hard, igneous stone that may be traced to a single quarry in Langdale Cumbria, or to Cornwall (Ashwin, 2005a:17). These finds suggest the possibility of complex trade relationships and the connections between Early Neolithic communities (*ibid*).

4.3.25 There is indirect evidence for maritime transportation during the Neolithic. Since sheep and goats are not native to Britain, they must have been introduced (May, 1976:41). Similarly, the introduction of cereals in Britain, such as barley and wheat, native to the Near East, also implies transport by sea.

4.3.26 It is also possible that the Neolithic inhabitants in the area made use of water transport to exploit the coastal resources, in vessels such as hide boats or complex log boats (McGrail, 2004:173). Although there is no archaeological evidence for hide boats, the earliest log boat in Britain is dated to the 4th millennium BC and came from Old Parkbury, Hertfordshire (Fenwick, 1997:438; McGrail, 2004:173).

Bronze Age (2,400 BC – 700 BC)

4.3.27 A steady rise in sea level continued throughout the Bronze Age and the coastal study area would have become increasingly coastal, and less of the south end of the cable route marine study area would have been dry land (Murphy, 2005:7).

4.3.28 The movement of barrier beaches due to sea level rise has inundated sites such as the Bronze Age timber circles at Holme next the Sea, known as 'Seahenge' (*ibid*). Seahenge is located approximately 35 – 40km west of the coastal study area. Evidence from Seahenge indicates the proximity of saltmarsh and the finds include dung beetle, bones of sheep, cattle and red deer, that suggest that the saltmarsh were being used for grazing from the Early Bronze Age. Other sites, such as Redgate Hill have produced remains of pig, cattle, goat, possibly sheep, roe and red deer, wildcat, dolphin and shellfish (Fryer *et al,* 2005:12). These finds are particularly important, as animal bones are rarely well preserved in Norfolk due to soil acidity.

4.3.29 Populations continued to increase and settlement patterns remained similar to those of the Neolithic. Settlement sites from the Bronze Age are notably hard to find in Norfolk, although environmental evidence indicates large scale land clearance

across the county during this period (Ashwin, 2005c:21; Fryer *et al,* 2005:12). Finds from this period include bronze metal work and hoards (Ashwin, 2005c:21).

4.3.30 Coastal and marine transport also continued to be important. Numerous log boats have been discovered in Lincolnshire; May (1976) records 28 known examples. While the majority of these finds have not been dated and could thus date from the Mesolithic to the medieval period, two boats have been securely dated to the Bronze Age, the Brigg log boat (1,034 BC – 634 BC) and the Short Ferry boat (1,046 BC – 646 BC) (May, 1976:120).

4.3.31 Evidence of sewn plank boats from the Bronze Age has been discovered to the north of the study area at Brigg, North Ferriby and Kilnsea and to the south at Dover (Van de Noort, 2003:405). Unlike the log boats that have predominantly been found in rivers, sewn plank boats have been discovered near the coast or in intertidal environments suggesting that they could have been used along the coast (Van de Noort, 2003:406), while it is likely that they would have been capable of cross channel journeys in favourable weather (*ibid*). Being more robust than earlier vessels, sewn plank boats would have extended the windows of opportunity available to seafarers to conduct the sea based trade that became more common during the Bronze Age (*ibid*:407). Sewn plank boats such as 'Ferriby 1' had a maximum load of 11 tons and could have been used for the regular transport of goods such as animals, passengers and other commodities (*ibid*). Similar vessels could have been used in north Norfolk during the Bronze Age and the possibility of coastal traffic, possibly engaged in voyages across the southern North Sea, cannot be excluded.

Iron Age (700 BC – AD 43)

4.3.32 Evidence from the Iron Age in Norfolk suggests extensive farmed landscapes, with large-scale storage of cereals in pits, such as at Fison Wy, Thetford (Fryer *et al,* 2005:12). The settlements suggest that the majority of people lived in small unenclosed hamlets or villages (Hutcheson and Ashwin, 2005:23).

4.3.33 Finds dating to the end of the Iron Age include gold and silver neck rings or torcs. These are only found in the north and west of the country and it has been proposed that the people living in this area obtained large quantities of gold by controlling the flow of North Sea trade in and out of the Wash (Hutcheson, 2005:26).

4.3.34 During the later Iron Age, much of the south east coast of Lincolnshire consisted of marshland penetrated by creeks or open sea, allowing ships to reach places that are now far inland, such as Sleaford, which may have been a key site for coastal and overseas trade (May, 2001:12). At this time, salt would have been an important commodity for trade and evidence for salt workings has been discovered at Whaplode (*ibid*). Imports included fine pottery, metalwork and wine or other luxuries from Spain. The ships carrying these items would have crossed the marine study area, so there is the potential for shipwrecks of this period.

4.3.35 There is no direct evidence for Iron Age sea craft in Britain (Fenwick, 1997:440). However, examples from elsewhere in Europe suggest that log boats continued to be use on lakes, rivers and inner estuaries and although large log boats became rare, there is increasing evidence for plank boats (McGrail, 2001:176).

Romano-British period (AD 43 – AD 410)

4.3.36 Sea level rise since the Romano-British period has caused cliff erosion and the landward movement of barrier beach and dune coasts along the north coast of Norfolk (Murphy, 2005:7). The present mean rate of barrier beach movement along

the north coast is approximately one metre per year and if this is extrapolated back, it is possible to suggest that the coast could have been as much as 2km further seawards in Roman times, indicating that many Romano-British coastal sites may have been lost (*ibid*). Evidence of these coastal sites could be discovered in the southern end of the cable route marine study area.

4.3.37 Along the present northern coastline of Norfolk, there is evidence for buildings, pottery kilns, metal working sites and coin hoards, representing widespread industrial activities (Gurney, 2005:28). The landscape was cleared and farmed, with numerous settlements.

4.3.38 During the Romano-British period, the fens were extensively occupied and the economy may have been based on seasonal industries (Simmons, 2001:20). The extraction of salt from seawater would have been a major industry and salted meat and fish would have been traded along waterways, such as the Witham and the Slea (Whitwell, 2001:14). However, by about 375 AD, the fens would have been uninhabitable due to the prevailing weather conditions and sea level rise (Simmons, 2001:20).

4.3.39 There would have been increased maritime activity in the study area during the Romano-British period. Ships travelled the east coast of the UK between South Shields fort on Hadrian's Wall and London (Allen and Fulford, 1999). Many of these vessels would have passed the north coast of Norfolk while en-route to these destinations or other destinations in Europe.

4.3.40 Roman forts along the north coast of Norfolk, such as Brancaster, Burgh and Caister-on-Sea, can provide information about the maritime activities, as can the distribution of pottery and other materials (Allen and Fullford, 1999). Tacitus has described activities of the British fleet in the north of Britain in the 1st century AD and there appears to have been a significant increase in maritime traffic from the Hadrianic period onwards. Forts such as Brancaster, approximately 30km east of the coastal study area and Caister-on-Sea, by Great Yarmouth, are thought to have been part of a complex network, where building materials, iron and pottery were being imported to the north coast of Norfolk, with a possible return trade in perishable items such as foodstuffs exported from the fort's hinterlands (Allen and Fulford, 1999:179). The fort at Brancaster was constructed with imported stone, possibly indicating the extent of the diverse and busy trade of the coast, as local materials were available and without such trade, would likely have been used (*ibid*: 180). The role of the forts to safeguard trade with a variety of destinations along the coast and across the English Channel may have been just as important as that of defending against seaborne raiders (*ibid*:179).

4.3.41 The construction of a string of forts in the late 3rd or early 4th century along the south and east coasts of England, stretching from Porchester in Hampshire to Brancaster in north Norfolk and including Burgh Castle near Great Yarmouth, reflect a different trade pattern and all of these forts are constructed of local building materials. Allen and Fulford (1999) suggest that this change may reflect the demise of the *Classis Britannica*, the Roman Imperial Navy of Britain and the breakdown of wider ranging systems during this period.

4.3.42 The types of vessels that could have been in use for trade along the coast include the Romano-Celtic boats that developed during this period. These are characterised by close spaced framing, large nails and sewn planking that was laid flush, edge to edge, but not joined together (McGrail, 2004). Although some of these boats were thought to be restricted to use in estuaries or inland, others, such

as 'Blackfriars I' from London, 'St Peter Port I' from Guernsey and 'Barland's Farm' from the Severn Estuary are thought to have been seagoing (*ibid*). The find at Barland's Farm was associated with a jetty / landing stage or bridge feature and the vessel is thought to have been used to transport pottery for trade, agricultural produce and fuel and iron ores for smelting (Bell and Neumann, 1997; Nayling and McGrail, 1995).

Anglo-Saxon period (AD 410 – AD 1066)

4.3.43 The Anglo-Saxon period began after the end of Roman rule. In the 6th century, the East Angles occupied the region now known as Norfolk and Suffolk (Wade, 1997: 51). From 650, the East Angles had been subsumed into Mercia along with the Middle Angles (Cambridgeshire) and the East Saxons (Essex), although there was likely some continuation of independent rule.

4.3.44 A few Anglo-Saxon settlements and cemeteries are known along the north coast of Norfolk (Penn, 2005:30). The settlement pattern appears similar to the Romano-British one, with sparse settlement towards the north east coast, possibly reflecting the presence of woodland or boulder clay, as Early Anglo Saxon settlement was largely restricted to the lighter soils and river valleys (*ibid*; Wade, 1997:47). Settlements required a supply of water, so it is not surprising that so many are located along streams and rivers. The agricultural economy also indicates continuity, both in terms of cereal production and animal husbandry (Wade, 1997:50).

4.3.45 The archaeological evidence from the Middle Saxon period is significantly different from the earlier period. There is evidence for specialised agricultural production and the adaptation of farming systems to local conditions. In addition, settlements of this period are usually located in different places than in the earlier period and most of the major place names were introduced by the middle of the 9th century. These settlements continued to be occupied after the Danish invasion of the late 9th century (*ibid*).

4.3.46 The Anglo-Saxon period is associated with an influx of material goods from north west Europe and Scandinavia, but whether there was a mass migration of people from the Continent is still debated (Penn, 2005:30). Place name evidence from east Norfolk suggests a concentration of Scandinavian settlement and the evidence of Scandinavian material culture, such as Thor's hammers / pendants, trefoil brooches, Scandinavian type weights and ingots, is widespread (Pestell, 2005:36).

4.3.47 The Scandinavian influences highlight the importance of maritime activities during the later Anglo-Saxon period and underline the potential for unknown shipwrecks in the marine study area during this period, as a significant amount of ship traffic could have been crossing the east and north coasts of Norfolk.

4.3.48 There is evidence of clinker built ships from around Britain, including the ship burial at Sutton Hoo and Snape in Suffolk, dating to the 6th and 7th centuries and from London at New Fresh Wharf, Billingsgate and the Thames Exchange sites, dating to the 9th and 10th centuries (McGrail, 2004:201, 218).

Medieval period (AD 1066 – AD 1499)

4.3.49 During the early part of the medieval period, the population was increasing, with a marked expansion in the 12th and 13th centuries followed by a sharp decline in the 14th century, party as a result of the Black Death (Wade, 1997:52). The population again began to increase in the 15th century.

4.3.50 Unlike other areas of England, the majority of rural settlement in north Norfolk was not deserted during the medieval period. The evidence for earlier settlement now lies under present day villages (Wade, 1997:52).

4.3.51 Weybourne, which is located less than 1km from the export cable route landfalls, is the nearest town to the Dudgeon development. Weybourne is mentioned in the Domesday books and is recorded as 'Wabrume'. A Priory of Augustinian Canons was established in the 13th century at the site of a pre-conquest church. Details about the development of the priory and aspects of the local historic environment are discussed in the 'coastal study area: known archaeological evidence' section.

4.3.52 In addition to the activities of the priory, there would have been local fishing and coastal trade along the coast. Ships carrying cargoes for further afield would also have passed the north coast of Norfolk, as trade in medieval Norfolk was dominated by the ports of Great Yarmouth and King's Lynn, formerly Bishop's Lynn. Both towns became important after the conquest, slowly replacing riverine ports such as Norwich (Rutledge, 2005:78).

4.3.53 Norwich developed an urban economy during the 8th and 9th centuries (Ayers, 2005:46) and despite being sacked in 1004 it was one of the largest urban centres in England at the time of the Norman Conquest, having undergone spectacular growth during the 11th century. The wool trade was critical to this growth and by the late 13th and early 14th centuries, Norwich was an important market, industrial town and administrative centre (*ibid*). However, in the 14th century, when the customs system was reorganised, no customs officials were stationed there, indicating the decline of its importance as a port (Rutledge, 2005:78).

4.3.54 From the 12th century, Great Yarmouth's principal export was herring. Although little wool left from the port by the 14th century, the port handled the majority of English worsted exports. The merchant fleet based in Great Yarmouth c1300 - 1350 could have numbered between 60 – 100 vessels of 100 tons, in addition to many smaller ships. The port gained national importance as a supplier of shipping to royal campaigns (Rutledge, 2005:78). The majority of shipping from this port was to the east to France and Spain. Long before there was a harbour built at Great Yarmouth, boats worked from the beach (Larn and Larn, 1997).

4.3.55 King's Lynn supported an extensive foreign trade at various times, exporting corn, wool, cloth and herring. In the 13th century, the port of King's Lynn collected the fourth highest duties of any south or east coast port, including London (Rutledge, 2005: 78). Ships left King's Lynn for Iceland, Norway, the Baltic, the Rhineland and France and returned with fish, coal, timber, furs, baysalt, woad and wine (*ibid*). King's Lynn was in decline by the 15th century, but it became active again during the 16th century with coastal traffic from Newcastle, exporting corn and importing coal. The majority of vessels leaving King's Lynn passed along the north coast of Norfolk.

4.3.56 In Lincolnshire, the port of Boston was the focus for all shipments of wool en route for Calais. Until the 13th century, Boston exported more wool than any other port in England (Pawley, 2001a:56). By the 14th century, international trade flourished, with Scandinavian, Flemish and Hanseatic merchants trading at the port. (*ibid*). Fisheries were also important, in the 14th century, the herring fishery flourished and in the 15th century, vessels left to fish for cod off of Iceland (*ibid*).

4.3.57 Little is known about the smaller ports although it is thought that few could muster more than three ships over 16 tons in the late 16th century (Rutledge, 2005:78). The

smaller ports on the Norfolk coast suffered from the continued coastal accretion in the area, although many remained engaged in the fishery trade and these vessels could also have engaged in coastal trade or longer voyages across the North Sea (Rutledge, 2005:78).

4.3.58 Medieval ships were small and adaptable. Boats during the early medieval period generally consisted of clinker built boats and cogs, although log boats continued to be used and there was probably a wide variation in local vernacular coastal vessels, which evolved to meet local conditions and tastes.

4.3.59 Examples of these local vessels include the Norfolk Keel (Greenhill and Mannering, 1997). The Norfolk Keel, from the Anglo-Saxon word *ceolae*, meaning seagoing, was an early medieval double ended open boat that had a shallow draft and was clinker built. Boats like this worked regularly between the east Norfolk rivers and northern Suffolk.

Post-medieval period (AD 1500 – AD 1799)

4.3.60 During the post medieval period, Weybourne continued to be an active port and fishing village and the major contributors to the economies of Norfolk's coast were merchant trade and fishing.

4.3.61 However, the area would also have been greatly influenced by the 'agricultural revolution' from 1750 – 1820. This was a period of enormous change for rural life, as large landowners changed the landscape through enclosure and implemented new farming practices.

4.3.62 The merchant trade in Norfolk centred on the export of agricultural products, particularly grain, across the North Sea and the import of timber products from Scandinavia and the Baltic (Lewis and Warren, 2005:174). Much of the trade in the post medieval period continued to be based around beaches and creeks and did not require large, built up harbours (Lewis and Warren, 2005:174).

4.3.63 There was a wide variety of local, vernacular vessel types, including the wherry, beach punt, beach yawls and others (Greenhill and Mannering, 1997). Vessels such as the keel that had developed during the medieval period continued in use. Each of these vessel types was particularly suited to the local conditions. For example, the north Norfolk crab boat, was clinker built and double ended, an open boat with very shallow draft and a wide beam for stability (Greenhill and Mannering, 1997:65). This vessel type was particularly well suited to the conditions encountered on the open beaches between Bacton and Weybourne (*ibid*).

4.3.64 Vessels would also have crossed the Norfolk coast while en-route to destinations further afield. At Great Yarmouth, the autumn herring fishery was of international importance (Lewis and Warren, 2005:174). Vessels from King's Lynn and Great Yarmouth were engaged in the Icelandic cod fishery during the 17th century and in arctic whaling in the mid 17th and 18th centuries.

4.3.65 In the 18th century, the coastline of Norfolk developed a number of seaside resorts. Great Yarmouth was the first to develop, but numerous small resorts sprung up along the coast, at Cromer, Sheringham and Hunstanton (Lewis and Warren, 2005:174). Since the resorts could only be reached by road or sea before the railways, this opened up new opportunities for coastal vessels.

Modern period (AD 1800 – present)

4.3.66 Historic maps illustrate modern alterations to the coastal landscape (**Figure 5**). In the late 18th century, the area around Weybourne was largely agricultural, with local mills to the west and north of the town. Gravel, chalk and marl were extracted from pits to the south of Muckleburgh Hill. A boat hard, a place where boats can be pulled up onto the shore, is located on the coast north of Kelling, and it provides access for local boats. The coastguard station north of Weybourne implies the dangers faced by boats along the coast. By the time the OS map of 1907 was produced, the gravel and chalk pits had closed and by 1929 the mills are also marked as 'disused'.

4.3.67 Weybourne was the centre of considerable activity during World War II, including the construction of coastal defences, pillboxes, barbed wire entanglements, an anti-tank ditch and Weybourne Camp, a highly secret site that was used as an anti-aircraft artillery range. The camp was in use until 1959, but by the time the 1971 OS map was produced, many of the buildings had been removed (*en.wikipedia.org*).

4.3.68 The activities along the coast were changing too and by 1959, the coastguard station was no longer in use and by 1975, had been redeveloped as cottages. The 1975 OS map also indicates that a sewage works had been constructed, however, this sewage works is no longer in operation, and no obvious traces remain.

4.3.69 In the early modern period, sea traffic continued to be important along the coast of Norfolk and Great Yarmouth is credited as being one of the first ports in the country to have two lifeboats at the same time (Larn and Larn, 1997), which underlines the frequency of shipwrecks in this area. The first lifeboat at Great Yarmouth was installed in 1825 (*ibid*).

4.3.70 In the 19th century, the coastal fisheries were important, catching cockles, mussels, whelks, oysters, shrimps, crabs and lobsters. However, the fishing industry peaked in the early 1900's and a steady decline followed. The end of the industry in the late 1960's resulted from market problems and overfishing (Lewis and Warren, 2005:174). Although many of the small inshore fleets have vanished, some vessels still land shrimps and cockles at King's Lynn, and the area continues to be important for crab and lobster. There are also still boats operating out of Brancaster, Cromer, Sheringham, Blakeny and Wells-next-the-Sea.

4.3.71 For the shipping industry, the largest bulk import was coal from the north east, a trade that was eventually eradicated by the railways (Lewis and Warren, 2005:174).

4.3.72 Smuggling also took place, with the coast between Sheringham and Weybourne being ideal for landing smuggled goods, as ships could anchor closer to the shore than elsewhere in the area.

4.3.73 During the First and Second World Wars, large numbers of steam trawlers and drifters were bought or hired by the Admiralty to supplement the Royal Navy. Dozens of these small vessels were lost because of enemy action, some sunk by torpedoes or gunfire from submarines. In World War II, as in World War I, U-boats wreaked havoc along the coast. However, now there was the additional threat of German motor torpedo boats, known as E-Boats and fighter / bomber aircraft (Larn and Larn, 1997). The distance between the coast of Norfolk and the coasts of German occupied France and Holland was relatively short and ships were lost off Norfolk almost daily between 1939 – 1941 (*ibid*).

4.3.74 More recent activity on the north coast includes the search for North Sea gas. From the early 1960's, this industry instigated Great Yarmouth's development as an important supply and service port (Lewis and Warren, 2005:174).

4.4 MARINE STUDY AREAS: KNOWN WRECKS AND ANOMALIES

4.4.1 A full list of all known ship wrecks and anomalies within the marine study area can be found in **Appendix II,** however the known archaeology in the offshore wind farm marine study area and the cable route marine study area will be discussed separately below.

Offshore Wind Farm Marine Study Area

4.4.2 A full list of all known ship wrecks and anomalies within the marine study area can be found in **Appendix II**; they are displayed in **Figure 6.**

4.4.3 Two wrecks are recorded by the UKHO as known wrecks within the offshore wind farm marine study area (**Figure 13**).

4.4.4 Overall, 113 sites were identified from the sidescan and magnetometer data within the Dudgeon site. This includes two live wrecks known from UKHO records within the Dudgeon area.

4.4.5 Of the 113 sites found within the Dudgeon site, 110 have geophysical traces that are not clear enough to give a definite indication of their origin. These anomalies would require further archaeological investigation to confirm or deny their anthropogenic origin. Of these, nine are magnetic anomalies with amplitudes of up to 290nT, for which there are no corresponding sidescan anomalies, probably because the site / object causing the anomaly is buried beneath surface sediments.

4.4.6 There are a further 101 sites identified from the sidescan sonar data, without any corresponding magnetic anomalies, which are insufficiently clear to identify their form. These sites have been classified as debris, debris fields, linear or seabed disturbance. In all cases the identification of these anomalies is not certain, individual items classified as debris may represent boulders on the seabed or for instance the only visible element of an otherwise buried wooden wreck. Similarly seabed disturbance may be the result of natural processes or evidence of more ephemeral wooden wreck sites; however, sites identified as linear are likely to represent cables or discarded fishing gear.

4.4.7 Of the 113 anomalies, three have been identified as wrecks due to a combination of attributes such as obvious height, structure and high magnetic amplitude. These sites are as follows:

4.4.8 Site **7034** (**Figure 8, Plate 1**) represents a large area of broken debris measuring 32.6m by 25.1m and is 1.3m high; it is associated with a magnetic anomaly of 398nT. It has been reported by the UKHO as a live wreck with a length of 25.0m, width of 15.0m and height of 6.5m. This might indicate that the exposure of the wreck has changed since the collection of the UKHO data in 1992. It is situated in the north western region of the wind farm footprint, close to an area of sand waves, which indicate highly mobile sediments. Following the UKHO survey, the wreck swept clear at 12.6m (foul at 13.0m). The UKHO record the lowest echosounder depth as 16.3m with a general depth of 19.9m and scour with a depth of 0.5m.

4.4.9 Site **7035** (**Figure 8, Plate 2**) is identified as a wreck that measures 33.3m by 11.6m with a height of 1.9m; it is associated with a magnetic anomaly of 236nT.

The site is described by the UKHO as a live wreck, possibly the *Aquarius*, with dimensions of 28.0m length, 28.0m width and 1.9m height. The difference may indicate that the wreck has been partially buried since collection of the UKHO data set in 1992. It is situated in the westernmost region of the wind farm footprint (within the 1km buffer zone), within an area of sand waves which indicate highly mobile sediments.

4.4.10 The *Aquarius* was a British steam trawler of 187 gross tons that was mined when proceeding from Grimsby to fishing grounds with the loss of all ten crew. The site was surveyed in by the UKHO in 1992. Following this it was swept clear at 16.5m (foul at 17.4m). The lowest echosounder depth is 16.3m and the general depth is 19.2m. There is no scour around the wreck. The hull and superstructure are clearly evident on the sonar trace. At least seven items of debris lie around the main wreck site.

4.4.11 Site **7083** (**Figure 8, Plate 3**) is interpreted as a wreck that measures 25.9m by 7.5m with a height of 0.4m and an associated magnetic anomaly of 28nT. It is situated in the south east of the wind farm footprint within the 1km buffer zone; it lies within an area of highly mobile sand waves, close to an area with a strong sub-surface reflector, which has been interpreted as a peat layer (**7015**).

Cable Route Marine Study Area

4.4.12 A full list of all known ship wrecks and anomalies within the cable route study area can be found in **Appendix II**; they are displayed in **Figure 6** and **Figure 7.**

4.4.13 Overall, 121 geophysical anomalies were found within the cable route marine study area geophysical data (see **Figure 2** for extents; see **Figure 6** and **Figure 7** for results). As the wind farm and cable route study areas overlap, the anomalies that lie within both study areas are as follows:

WA ID	Name	Easting [m]	Northing [m]
7046	Debris	391258	5899468
7048	Debris	391470	5899175
7049	Debris	389428	5900810
7051	Debris	391585	5899174
7052	Debris	391776	5899143
7056	Seabed disturbance	393029	5898410
7057	Debris	391773	5899457
7058	Debris	391550	5899605
7059	Debris	388966	590179
7062	Debris	390440	5900425
7063	Debris	390059	5901035
7069	Linear	391797	5899663
7151	Debris	391290	5899301
7198	Debris	390814	5899375

WA ID	Name	Easting [m]	Northing [m]
7235	Magnetic anomaly	390833	5900498
7236	Magnetic anomaly	390961	5899815
7259	Magnetic anomaly	390558	5900083

Table 4.2: Anomalies found in both the offshore wind farm marine study area and cable route marine study area due to overlapping data sets

4.4.14 Of the 121 anomalies, two are live wrecks known from UKHO records that lie within the area of the cable route. Both have been identified on the geophysical data and are described below along with two anomalies that are possibly previously unknown wreck sites.

4.4.15 The remaining 119 anomalies found within the cable route study area have geophysical traces that are not clear enough to give a definite indication of their origin. Of these, 43 are magnetic anomalies with amplitudes of up to 595nT for which there is no corresponding anomaly identified from the sidescan data. This is probably because the site or material is buried within the seabed. There are a further 68 anomalies recorded by sidescan sonar or a combination of sidescan and magnetometer, which are insufficiently clear to identify their form.

4.4.16 Four anomalies have been identified as wrecks due to a combination of attributes such as obvious height, structure and high magnetic amplitude. These are as follows:

4.4.17 Site **7036** (**Figure 9, Plate 4**) is interpreted as a wreck with an associated debris field. It has dimensions of approximately 190m by 80m, a height of 1.6m and is associated with a large anomaly of 12,171nT. It has been reported by the UKHO as the wreck of the *Clan Morrison*, a British steam ship that was sunk 24 February 1940, lying in two parts and with a height of 2.6m, a length of 200m with a width of 60m. The data set assessed as part of this study places the site approximately 120m east of the UKHO charted position, approximately 16.5km south west of the centre of the Dudgeon site.

4.4.18 Site **7037** (**Figure 9, Plate 5**) is an anomaly measuring 4.1m by 2.1m with a height of 2.5m and with no associated magnetic anomaly. The UKHO lists a live wreck with a length of 100m and a width of 50m at this position. The difference may indicate that the wreck has been largely buried since collection of the UKHO data set in 1992. The site is situated approximately 16.5km south of the centre of the Dudgeon site.

4.4.19 Site **7173** (**Figure 9, Plate 6**) represents an area of large debris with dimensions of 47.4m length by 17.4m width and 0.2m height with no associated magnetic anomaly. The site is interpreted as a possible wreck, it is located close to an area of highly mobile sand waves and approximately 20.6km south west of the centre of the Dudgeon site.

4.4.20 Site **7193** represents a possible wreck with dimensions of 20.9m length by 9.5m width with a height of 0.4m without an associated magnetic anomaly. It is located within an area of highly mobile sand waves and is found approximately 19.6km south west of the centre of the Dudgeon site.

4.4.21 In addition to the wrecks identified during the geophysical assessment and discussed above, the following wrecks are recorded by the UKHO as known wrecks within the cable route marine study area (**Figure 14**).

4.4.22 The *Algarve* (**7038**) was a British steam ship built in 1921 by Frederikshavns Vaeft & Flydedok, Frederikshaven and at the time of loss it was owned by the Ministry of Shipping. The ship had a gross tonnage of 1,355 and was carrying a general cargo from London to Leith on its last voyage. The vessel was torpedoed and sunk by E-boats on 19 February 1941 and 27 men were lost. Liferafts were picked up near Scarborough and Bridlington and cargo identified as coming from the *Algarve* floated ashore at Wells-next-the-Sea and Brancaster (Larn and Larn, 1997). The wreck was examined in 1948 after dispersal and was swept clear at 52 feet (15.8m). A UKHO survey in 1992 indicated that the wreck lies at 21.5m. It is 60m in length, 25m in width, with a height of 2.2m. The wreck is now swept clear at 19.6m.

4.4.23 Built in 1906 by Werf V/H Rijkee & Co, Rotterdam, the *Westland* (**7039**) was a Dutch steamship that was carrying a cargo of coal from Methil to Rouen when it was torpedoed and sunk on 25 May 1917. Dives in 1972 indicated that both ends of the vessel were covered in silt, but the centre section rose to a confused mass of steel. A UKHO survey in 1992 indicated that the wreck has a length of 60m, a width of 25m and a height of 3.0m. The vessel was swept clear at 17.9m.

4.4.24 Site **7040** is a wreck of unknown provenance. In 1941, records indicate that its mast showed 9ft (2.7m) above Mean High Water (MHWS). The wreck was swept clear in 1943 at 44ft (13.4m), foul at 46ft (14m) Mean Low Water (MLWS). The wreck was last identified by a UKHO survey in 1992. From side scan sonar images, the wreck site is thought to be 60m in length and 30m in width, with a height of 2.8m. The wreck was swept clear at 18.1m, foul at 18.5m.

4.4.25 Site **7041** is an area of debris that was last surveyed by the UKHO in 1992. The area has a sonar shadow height of 2.2m, a length of 35m and a width of 20m. The area was swept clear at 19.8m, foul at 20.3m.

4.4.26 Site **7042** is a wreck that was located by the UKHO in 1983. In 1983, divers confirmed that the wreck was lying on its side, intact and partially buried. A sonar survey in 1992 indicated that the site had a height of 0.7m, a length of 80m and a width of 28m. The wreck could not be swept clear due to a nearby sandbank.

4.4.27 The MV *Francois Trixier* (**7043**) sunk in 1948. A UKHO survey in 1992 indicated a wreck with a length of 80m, a width of 30m and a sonar shadow height of 1.5m. The wreck was dispersed in 1949 and was considered clear at 45ft (13.7m). In 1992, the wreck was swept clear at 14.5m.

4.4.28 Wreck **7044** is possibly the *Rosalie*, a 4,248 gross ton British collier that was built in 1914 by W. Grey and Co. Ltd., West Hartlepool. At the time of loss the vessel was owned by the New Ruperra Steam Shipping Company and was in ballast. The ship was on passage from the Tyne for San Francisco when it was torpedoed by either UB-10 or UB-11 on 10 August 1915 (Larn and Larn, 1997; UKHO database accessed July 2008). Although nothing was seen of the German submarine that attacked the *Rosalie*, the master noted that he saw the track of a single torpedo shortly before it struck the vessel. About ten minutes later, the Chief Officer saw a second torpedo attack, although this missed and failed to explode (Larn and Larn, 1997). Six mine sweepers arrived at the scene and offered assistance and the vessel was towed inshore and beached at Weybourne. In 1978, a UKHO survey indicated that the superstructure and plates were spread over a large area with four

boilers in the centre, although the extent of the area was not provided. In 1982, the mast was still visible during most tides.

4.4.29 The sinking position of this unknown vessel (**7045**) was recorded in 1940; however a UKHO survey in 1992 found nothing other than peculiarly shaped sand ridges. This record was amended to 'dead', however the remains of this vessel could be discovered beneath the seabed, or in the wider area.

Offshore Wind Farm Marine Study Area: Sub-bottom Profiler Results

4.4.30 The sub-bottom profiler survey has produced evidence for a reflector with very high reflectivity in 15 areas (sites **7013 – 7017**, **7019 – 7023**, **7025**, **7029 – 7032**). This reflector has been interpreted as a possible peat layer (**Figure 6** and **Figure 10** for a data example of the SBP data). It is visible above the underlying Bolders Bank or Botney Cut Formations (where present), and lies below the cover of Holocene sands / sand waves. It is found mainly in the south east corner of the survey area, but is also visible in the north east and west of the site where it is found above a large Botney Cut Channel (**7026**).

4.4.31 Several cuts and fills have been identified in the area (**Figure 6**). The largest one of these (**7026**) is found in the west of the survey area with maximum extents of approximately 3km by 800m. This cut and fill has been interpreted as being part of the Botney Cut Formation, which cuts into the underlying Bolder Bank Formation with a maximum depth of approximately 4m; it is found below a cover of Holocene sand waves (see **Figure 11** for a data example of the SBP data). Four other cuts and fills have been mapped (**7024**, **7027**, **7028**, and **7033**) with depths varying between 2m and 8m. Two of these are found in the vicinity of site **7026,** and they are mostly found on single lines only. The Botney Cut Formation cuts and fills are thought to contain red-brown laminated clays and fine sands and show similar acoustic properties as the surrounding sediment.

Cable Route Marine Study Area: Sub-bottom Profiler Results

4.4.32 A total of 14 cuts and fills have been identified in the cable route marine study area geophysical survey data (for extents, see **Figure 2;** for results, see **Figure 6** and **Figure 7**); one of them (**7033**) lies within both the wind farm site as well as the cable route area and has already been described above. The cuts and fills within the cable route area are found either cutting into the underlying Bolders Bank Formation or the underlying bedrock (chalk) where the Bolders Bank Formation is not present, as discussed below.

4.4.33 In the northern part of the cable route, six cuts and fills (**7007 – 7012**) are found cutting into the underlying Bolders Bank Formation. These are again interpreted as Botney Cut cuts and fills and occur at or near the surface with maximum depths of up to 16m and exhibit slightly higher transparency than the surrounding sediments.

4.4.34 Further south, the Bolders Bank Formation is no longer present and the cuts and fills (**7000 – 7006**) cut into the underlying bedrock (chalk); see **Figure 12** for a data example of the sub-bottom profiler data. They show the same acoustic properties as the surrounding sediment and are generally less than 10m deep. These cuts and fills are also thought to be Botney Cut cuts and fills, but could equally belong to the Swarte Bank Formation (poorly sorted, gravelly, coarse-grained sands and diamictons).

4.5 MARINE STUDY AREA: POTENTIAL FOR FURTHER SITES AND FINDS

Documented Losses

4.5.1 In addition to the known wreck sites recorded by the UKHO, there are also records of vessels lost in the area for which the exact position and extent of survival (if any) is not known. These documented losses are listed by the NMR, which has assigned them to points known as Named Locations. Named Locations represent losses within a broad area and therefore any losses recorded at the Named Locations do not necessarily lie within the marine study area.

4.5.2 Norfolk has the third highest number of recorded shipwrecks of any county in the British Isles, with roughly 25.6 recorded shipping losses per mile of coastline (Larn and Larn, 1997). This is thought to be due to the lack of natural harbours between the River Humber and Harwich and the many dangerous offshore banks, sands and shoals. One of the particularly dangerous offshore sandbanks is Dudgeon Shoal, 22km to the west of the Dudgeon site (*ibid*).

4.5.3 There are no documented losses recorded in the NMR within the Dudgeon site, although as this area is some distance from shore, it is possible that vessels were lost without record.

4.5.4 The NMR lists three Named Locations in the cable route marine study area (**Figure 14**) and a total of 31 recorded losses. At Named Location 1 (NLO 1) there is one recorded loss, a German aircraft. At NLO 2 there are 14 recorded losses and at NLO 3 there are 16 recorded losses.

4.5.5 The table below illustrates the recorded date of loss for the vessels.

Period	Number of Losses
Pre 1700	1
1701 – 1800	5
1801 – 1850	5
1851 – 1900	6
1901 – 1913	0
1914 – 1918	3
1919 – 1938	0
1939 – 1945	0
1945 – present	0
WWII Airplanes	11
Total	**31**

Table 4.3: Recorded date of loss of vessels at Named Locations

4.5.6 The temporal distribution of these losses is not indicative of an absence of maritime losses during earlier periods, nor is it a comprehensive catalogue of all losses during the periods shown. The number of documented losses is generally limited in that they are dependent on the reporting and recording of a loss and on the survival of the record of that loss. Records of maritime casualties were not systematically kept until the 18th century and even then the records cannot be considered to be comprehensive.

4.5.7 The oldest recorded loss dates to 1671 and there are ten other recorded losses that pre-date the 1860's.

4.5.8 The majority of these vessels were lost due to bad weather, with February 1894 being a particularly bad month when three vessels were lost in as many days. Collision with other vessels and stranding were other reported causes for loss.

4.5.9 Of the 11 recorded World War II airplane losses, nine were 'Queen Bees' used as British Practice Targets and were shot down from the Anti-Aircraft Artillery Range at Weybourne. The other two airplanes were lost while in active military service. One is a Tiger Moth MK II that was in use as a British Trainer when it was lost and the other is a German Heinkel He III that was shot down in 1941.

Unrecorded Losses

4.5.10 The known sites and recorded losses in the marine study area may not be representative of the number of sites that survive and there is potential for as yet unrecorded and unknown archaeological material representing the past maritime use of the study area.

4.5.11 As discussed in the Historic Environment baseline section above, water transport could have been used on inland waterways from the Palaeolithic period onwards and along the coast from at least the Mesolithic (McGrail, 2004:172). Therefore there is the potential to discover previously unrecorded wrecks from the Palaeolithic to modern period.

4.5.12 Not only was there considerable local coastal traffic along the north coast of Norfolk from the Saxon period to modern times, but there was also considerable shipping that passed the coast while en route from places like King's Lynn and Great Yarmouth en route to other destinations in the UK and abroad. Further details about this trade can be found in the Historic Environment Baseline section above. The high number of casualties along the coast during the two World Wars also indicates increased potential for discovery of previously undiscovered shipwrecks.

4.5.13 The presence of navigational hazards in the area, such as Sheringham Shoal, also indicates the potential for unrecorded shipwrecks.

4.5.14 In addition to the potential for shipwrecks within the marine study area, there is potential for stray finds of items lost or thrown overboard from vessels crossing the area that may indicate past sea routes.

4.5.15 There is also considerable potential for aircraft remains from World War II. In addition to the potential for additional discoveries around the Anti-Aircraft Artillery Range at Weybourne Camp, the wider area was used as a strategic bomber flight gathering area and there is the possibility of finding aircraft lost during the stacking process, as accidents were possible, particularly in times of low visibility. There is also potential for aircraft lost while returning to base. In East Anglia, there are numerous Royal Air Force bases and many of the aircraft leaving from and returning to these bases would have crossed the north coast of Norfolk. In addition to the German and British aircraft recorded in the NMR's recorded losses, there is potential for American losses after the Americans joined the conflict in 1942. The US Eighth Air Force was stationed in East Anglia and participated in over 90,000 sorties between 1942 – 1945 (www.2ndair.org.uk).

4.5.16 The number of East Anglian air / sea rescues during World War II and the recorded losses in the NMR compared with the known aircraft sites on the seabed indicates

that the number of known sites falls far short of the total number of air losses over the sea and coast (Wessex Archaeology, 2008b:20)

Submerged Land Surfaces

4.5.17 At many times from the Palaeolithic to the Mesolithic, the marine study area would have been dry land. Therefore, there is potential to find palaeo-land surfaces, prehistoric landscapes, sites and artefacts. The recent analysis of geophysical data for Doggerland has identified Mesolithic landscape features to the north of the marine study area (Gaffney *et al,* 2007) and illustrates the potential to discover similar features in the study area.

4.5.18 Charted depths around the Outer Dowsing Channel indicate the potential for a palaeo-river course passing through the maritime study areas (**Figure 4**). Palaeo-river valleys and palaeo-channels were areas favoured by early human and hominin populations, as discussed in the Historic Environment Section above. At this time, the exact location of the palaeo-river valleys and palaeo-channels cannot be determined without further geophysical and geotechnical assessment.

4.5.19 In the Greater Wash SEA area, geotechnical work has been undertaken at other built, consented and proposed offshore wind farm sites that are at a more advanced stage of the development process than Dudgeon (a list of these projects can be found in Section 3.3: Previous Archaeological Work). The data from these studies can be used to predict the type of material that could be encountered at a later stage of the Dudgeon project, and to interpret the data that may be produced. All of the sites have undergone some level of geotechnical analysis, although not all of the results are available at this time.

4.5.20 Of particular interest, due to its proximity, is the evidence from the Sheringham Shoal offshore wind farm. Archaeological analysis of vibrocores for this site has identified alluvial sediments and peat deposits that may relate to Holocene palaeo-channels and terrestrial environments, indicating that these deposits have archaeological potential (Wessex Archaeology, 2006f).

4.5.21 Analysis of vibrocores from Lynn and Inner Dowsing offshore wind farms (LID) has also indicated archaeological potential (Wessex Archaeology, 2006g). Palaeo-environmental analysis identified pollen that was indicative of a generally open and herbaceous environment that included pine, birch, sedge and grass. The material surrounded a freshwater depositional environment indicative of a cold stage within the Pleistocene and the presence of spruce suggests earlier Devensian age at the latest (Wessex Archaeology, 2007e).

4.5.22 The coastline around the north coast of Norfolk has changed considerably since the Palaeolithic due to sea level change and coastal erosion. After the rapid sea level rise during the Mesolithic, sea level rise became much more gradual, slowly submerging Bronze Age sites such as Seahenge at Holme-next-the-Sea. Analysis of coastal erosion indicates that the Romano-British coast could have been up to 2km further seaward (Murphy, 2005:7) and therefore there is potential to discover terrestrial remains from the Neolithic to the Romano-British Period in the marine environment. These remains are unlikely to be *in situ*, rather the erosion will have jumbled the material, but even in secondary contexts, finds could still contribute important information towards understanding this area in the past.

4.6 COASTAL STUDY AREA: KNOWN ARCHAEOLOGICAL EVIDENCE

4.6.1 The coastal study area contains a number of known archaeological sites and finds that are recorded in the NMR and the Norfolk HER (**Figure 15)**. These are outlined below. Inferences regarding the potential for further archaeological discoveries, developed from reviewing the known archaeological evidence in relation to the landscape, will be discussed in the following section: 'Coastal Study Area: Potential for Further Sites and Finds'.

Prehistoric Period

4.6.2 The landscape at various times during the Palaeolithic and Mesolithic would have consisted of vast inhabitable plains (Gaffney *et al,* 2007) and the archaeological evidence below indicates the exploitation of this area by hunters and gatherers. Five prehistoric, but not securely dated finds include a flint piercer and several flint flakes, some of which (**1001 – 1005**) eroded from the cliff face and were recovered in 2004. A hand axe dated to the Palaeolithic was found in the cliff face in 1977 (**1006**).

4.6.3 Mesolithic finds have been recovered from Weybourne Hope, including a flint flake discovered in an old watercourse at a junction of sand and peat beneath shingle (**1007**). In the vicinity, a cut antler, the head of a shorthorn ox and horse bones were also discovered.

4.6.4 During the Neolithic, as farming was gradually adopted, the landscape would have been settled. Neolithic finds include a polished axe head found in a field in 1977 (**1008**) and a Neolithic or Bronze Age flint axe discovered in 1951 (**1009**). These were discovered in fields near the present coastline; however, analysis of coastal erosion over the last 2000 years indicates that the fields would have been some distance from the sea during the Neolithic.

4.6.5 There is a Bronze Age Scheduled Ancient Monument in the coastal study area, consisting of a round barrow located on the north side of Muckleburgh Hill (**1012**). On the southeast side of Muckleburgh Hill, pieces of Late Bronze Age or Iron Age pottery were recovered when they eroded out of the side of the hill (**1010**). In addition, a Bronze Age mound of burnt flints was discovered during an excavation at Beach Lane Pumping Station (**1011**).

Iron Age and Romano-British

4.6.6 The Iron Age finds include gold coins: two gold coins were found on the beach (**1013**) and a number of gold coins were found as part of a coin hoard (**1014**). Sheet metal fragments that were found in the cliff face have been dated as Iron Age or Roman (**1015**). Iron Age and Roman pottery was discovered along with some Roman brick and tile during an excavation and watching brief at The Mill, Sheringham Road (**1016**).

4.6.7 Roman material is generally from isolated find spots (**1017 – 1023**) and includes pottery, coins and a decorative strip or bracelet. There have been other finds of Roman pottery to the north east of Kelling and a Roman pottery kiln to the east of Weybourne also attests to Roman presence in the area. In addition, a possible Roman enclosure and field system has been identified by the Norfolk Historic Environment Record (NHER) from aerial photographs (**1024**).

Anglo-Saxon to Medieval

4.6.8 Weybourne is recorded in the Domesday Book, but its origins may date to at least the Anglo-Saxon period, as All Saints' Church (**1026**), a Grade II Listed Building, incorporates the remains of an Anglo Saxon tower. A find of Saxon pottery found about 1851 near the coast to the east of Kelling Hard and recorded on early OS maps, also indicates local activity during this period.

4.6.9 Archaeological evidence from the medieval period includes Weybourne Priory (**1032**), a Scheduled Ancient Monument. It was founded as a house of Augustinian canons towards the end of the 12th or at the beginning of the 13th century. The monument includes the remains of the priory church dating from the early 13th to the 15th century. There are associated buildings and water management features to the north and east within the known area of the monastic precinct.

4.6.10 Another medieval feature is the site of the moated enclosures and a fishpond South of Rosedale Farm (**1027**). Isolated finds in the area include a reused medieval stone, possibly from the ruins of the priory (**1028**), a German gold coin (**1029**), a pottery find (**1030**) and a ring brooch or buckle (**1031**).

Post-medieval

4.6.11 The majority of the post-medieval archaeological evidence consists of built heritage, such as Weybourne Mill (**1033**), a Grade II Listed Building; Spray Cottage (**1034**); and The Cottage/East Cottage (**1035**). There are three Listed Buildings in the coastal study area: Abbey Farmhouse, The Street (**1036**); Old Farm Cottage, Station Road (**1037**); and the Barn at Abbey Farm (**1038**).

4.6.12 Millstream House is the site of a post medieval windmill (**1039**) and the NHER notes that it was first recorded as working in 1723 and it is still marked on 19th century maps.

4.6.13 The north coast of Norfolk has often been the focus of military strategy and activity. The post medieval fortification and defences include possible earthworks that may have been part of the Armada defences (**1040**). Weybourne Hope was regarded as particularly vulnerable to invasion from the sea and a comprehensive plan for its defence was drawn up by Edmund Yorke during the invasion scare of 1587 (**1041**). Weybourne Fort (**1042**) was also part of the 1587 plans.

Modern

4.6.14 In the early modern period, the landfall area was used for agricultural purposes and this is supported by the old OS maps. Archaeological evidence from the coastal study area includes modern period includes an Old Watermill House and Mill that were probably built in the 19th century (**1042**).

4.6.15 The vast majority of evidence is from the two World Wars (**1043 – 1111**).

4.6.16 From World War I, there is a rare circular pillbox (**1043**) and several slit and practice trenches (**1044 – 1048**).

4.6.17 Weybourne Anti-Aircraft Training Camp (**1051**) is located alongside the cliffs at Weybourne and to the north west of the village. It was set up in 1935 as a temporary summer camp for the Anti-Aircraft Division of the Territorial Army. The camp initially consisted of wooden and tented structures, however in 1937, it was decided to make the camp permanent and more fixed structures and defences were constructed. During World War II, the camp was surrounded by a perimeter and anti-tank ditch and defended by a system of gun emplacements and barbed wire. A

considerable number of the NMR and NHER World War II monuments are associated within, or just on the perimeter of, this camp (**1052 – 1065**). These include gun batteries, gun emplacements, barbed wire obstructions, zigzag slit trenches and a pillbox. The camp closed in 1959.

4.6.18 Another heavily fortified area during World War II was Muckleburgh Hill. Sites here included gun emplacements, slit trenches, earthworks, weapons pits, a pill box and barbed wire defences (**1066 – 1078**).

4.6.19 There is further evidence of World War II at Weybourne Hope, including pill boxes, the foundations of a beach defence light and gun emplacements (**1079 – 1084, 1103**).

4.6.20 There are numerous other World War II defences in the coastal study area, including pillboxes, searchlights, beach defences, military structures, coastal defences, slit trenches, mortar bases, gun emplacements, an observation post and a concrete wall (**1085 – 1102**, **1104 – 1111**). Some of these represent quite rare types, including a type 20 pill box (**1085**), a type 28 pill box (**1089**) and a rare searchlight emplacement that has been destroyed by coast falls (**1088**).

4.6.21 More recently, modern human skeletal remains have been found on the beach (**1112**). The NHER notes that on a 1957 Admiralty chart, a shipwreck is marked at the same location and suggests there may be a connection. According to the UKHO, the closest wreck is thought to be the *Rosalie* (**7044**). This vessel was torpedoed by UB-11 in 1915 and was then anchored and later beached at Weybourne.

Multi-period

4.6.22 There are several multi-period sites in the coastal study area, some of which were encountered during field surveys, excavations, watching briefs and other archaeological activities. These sites include prehistoric and Roman finds from Muckleburgh Hill (**1113, 1114**), medieval and post-medieval finds and features at Abbey Farm barn (**1115**), prehistoric flint and medieval roof tiles (**1116**), an Iron Age settlement and medieval corn-drying oven and field boundaries (**1117**), metal finds from metal detector users (**1118**), other metal finds dated between the Roman and medieval periods (**1025**) and finds scatters with flint and post medieval pottery (**1119, 1120**).

Unknown

4.6.23 There are also several sites of unknown date. These include human skeletal remains (**1121**) found in a clay deposit on the beach and thought to be very old, possible iron working pits (**1122**), a hearth with flint and potsherds (**1123**), pottery (**1125**), ditches (**1124 – 1126**), a churchyard cross (**1128**), a possible barrow (**1129**) and an alleged former moat (**1130**).

4.6.24 A watching brief (**1131**) that took place during monitoring of groundworks for the extension of a land drain, located about 150m west along Weybourne beach from the modern parking lot, identified no archaeological finds or features (**1131**) (Westall, 2008). The work was undertaken in January 2008.

4.6.25 When NHER data was requested for this report, the NHER was still awaiting details of a field survey undertaken in March / April 2008 along the route of a pipeline (**1132, 1133**).

4.7 COASTAL STUDY AREA: POTENTIAL FOR FURTHER SITES AND FINDS

4.7.1 There is potential for further sites and finds from the Palaeolithic to the modern period. This potential can be examined through relating the known archaeology to the landscape and by understanding changes to the environment through time.

4.7.2 The landscape is relatively low lying and marshy and a small stream, Spring Beck runs through the coastal study area, through what is now Weybourne. Spring Beck is a minor watercourse that would likely have originally flowed down Beach Lane, until it was modified, possibly as part of the construction of a watermill. The topography would have influenced human activity in the area. The focus for occupation and formation of settlements was likely around the stream, where there was access to fresh water and fertile lands. The marshy areas nearby were more likely exploited for particular resources.

4.7.3 During the Palaeolithic, human occupation in the study area was limited by the Anglian, Wolstonian and Devensian glaciations, but human activity is likely during the interglacials when the climate was suitable. Although the landscape was reworked by the glaciations, there is still potential to find evidence for human occupation, as evidenced by the worked flints recovered from river deposits at Pakefield, Suffolk and dated to 700,000 BP. In addition, the north Norfolk coast has been identified in the *Research and Archaeology Framework for the Eastern Counties* as an area of high potential for the discovery of archaeological and environmental evidence in Pleistocene deposits (Austin, 2000:6).

4.7.4 From the Upper Palaeolithic to the Mesolithic, the coastal study area would have been part of the vast plain of the North Sea basin and would have supported hunter gatherer populations. Palaeolithic and Mesolithic finds have previously been recovered in the coastal study area from the eroding cliff faces and from fields, indicating the potential for new finds.

4.7.5 In Norfolk during the Neolithic, farming was adopted on a limited scale and appears to have been concentrated around coastal areas and river valleys, although some areas would still have been the focus of hunting and gathering activities and semi-mobile communities. Sea level continued to rise through the Mesolithic and by the Neolithic the coastal study area would have been increasingly coastal, although the sea could still have been over 2km distant. There was access to fresh water from Spring Beck and fertile lands surrounding the watercourse. The Neolithic finds to the east of Spring Beck indicate human activity in the coastal study area during this period and it would be reasonable to expect that Neolithic activity took place on both sides of the watercourse.

4.7.6 Although there is little evidence of Bronze Age settlement in Norfolk, there is a concentration of Bronze Age evidence from around Muckleburgh Hill, 700m south west of the landfall, including a round barrow, burnt flints and pottery. With burial sites concentrated on the high ground, there is potential for additional activity and possibly even settlement, nearby in the lower lying areas. The fertile area around Spring Beck is a likely location, possibly near the present location of Weybourne.

4.7.7 Many of the Iron Age finds around the cable landfall are from the beach and as they likely eroded out of the cliff face, their original position is not known. However, there was also Iron Age activity further inland around Weybourne, as represented by finds from an excavation at The Mill, Sheringham Road (**1016**). Just outside of the coastal study area to the south east, evidence for an Iron Age settlement (**1117**) was discovered during pipe laying works in 1999, on the edge of Weybourne on

Sheringham Road. Settlement during this period could have focussed on the fertile land around Weybourne and Spring Beck. During the Iron Age and Romano-British periods, farming intensified and there may be evidence of possible Roman field systems in the area. Other activities in the area are represented by the find of a Roman kiln to the east of Weybourne and finds of Roman coins. These discoveries indicate that there was considerable activity in the coastal study area during the Iron Age and Romano-British Period and that there is potential to discover further evidence of these activities in the area.

4.7.8 Unlike other areas of the UK, there was little desertion of medieval settlements in north Norfolk and evidence for early settlements is likely to be underneath modern urban areas. Other Anglo-Saxon evidence in the area will probably be restricted to farming activities.

4.7.9 The analysis of historic maps for the area indicates that the coastal study area was largely agricultural until the modern period and the most significant changes in the area would likely have resulted from enclosure during the post-medieval period. There is little change to the field systems from the late 19th century until World War II, when Weybourne Camp was developed. There is a considerable amount of known World War II evidence and potential for additional finds.

4.7.10 Previous survey work, such as the Norfolk Rapid Coastal Zone Archaeological Survey (Norfolk Archaeological Unit, 2005), identified material from the Prehistoric to the modern period. Along the coast, numerous pieces of flint were recovered from the cliff face between Kelling and Sheringham and considerable evidence was identified of World War II defences. Field surveys around the Cley next the Sea, Salthouse and Kelling fresh-marshes and between Weybourne and Sheringham encountered ridge and furrow, ditches, evidence of World War II structures, flint, post-medieval pottery, slag and building material.

4.7.11 Other archaeological activities in the area, such as field surveys, excavations and walking briefs, have regularly encountered new finds, indicating the potential for finds from the Palaeolithic to modern period.

4.8 IMPORTANCE OF THE KNOWN SITES

Marine Study Areas

4.8.1 There are no designated wrecks in the marine study areas.

4.8.2 The UKHO lists 12 wrecks within the wind farm and cable route study areas. However, one has been amended to ‘dead’ indicating that it has not been recorded on further surveys. Of the 11 ‘live’ wrecks, only six have additional information associated with them, such as an indication of the date of loss, the identity of the vessel and / or a brief history.

4.8.3 None of the known wrecks with a recorded date of loss was lost before 1860 and therefore these vessels would not necessarily be of particular interest based on their age. However, two of the wrecks date to World War I and three date to World War II. Those vessels lost during the two World Wars could be of increased interest, as they symbolise the magnitude of global events, particularly those in military service at the time of wrecking. For example, the *Clan Morrison* (**7036**), which was on charter to the Admiralty, could be considered for protection under the Protection of Military Remains Act (1986). The MV *Francois Trixier* (**7043**) sunk after World War II and would likely only be of special interest if determined to be historically or locally important.

4.8.4 The archaeological importance of sites without additional information cannot be assessed with any degree of certainty, as too little is currently known about them.

4.8.5 In addition, little is known about the anomalies discovered during the geophysical survey, apart from their location and extent. One possible new wreck was identified (**7083**), but other anomalies also have the potential to be of anthropogenic origin and could represent wreckage. However, due to the limited information available at this time, it is not possible to comment on their archaeological importance. In order to assess importance, more information would be needed, and if the anomalies are determined to be wrecks, further information would be required, for example, the wreck's age, type, rarity, survival and / or condition, fragility and / or vulnerability, group value, documentation, associations, scientific potential and outreach potential.

4.8.6 The geophysical surveys also identified features of potential archaeological importance beneath the sea bed. In the offshore wind farm marine study area, these include a possible peat layer which could represent a palaeo-land surface and several cuts and fills (interpreted as Botney Cut Formation cutting into the underlying Bolders Bank Formation) which could also be of archaeological importance (**Figure 6**). However, it is not possible to estimate the archaeological potential of these features from the supplied datasets and it is therefore recommended that if these features will be impacted, to target the features during the borehole programme that will take place as part of the detailed design work that will be done pre-consent. This would allow an estimate of the age of the possible peat layer and provide palaeo-environmental evidence for the cuts and fills thus providing sufficient data for archaeological classification.

4.8.7 In the cable route marine study area, two seismic features of possible archaeological importance were found: cuts and fills cutting into the Bolders Bank Formation in the north of the area and cuts and fills cutting into the underlying bedrock (chalk) further south (**Figure 7).** As for the offshore wind farm study area, it is not possible to estimate the archaeological importance of these features from the supplied datasets. If these features will be impacted by development, it is recommended that any vibrocores acquired as part of the cable burial assessment process are archaeologically assessed during the detailed design work that will be undertaken pre-consent. This would be done as a staged process and involve a review of the core logs initially. This would provide palaeo-environmental evidence for the cuts and fills and provide sufficient data for archaeological classification.

Coastal Study Area

4.8.8 Within the coastal study area, there are two Scheduled Ancient Monuments (**1012, 1032**), two Grade II Listed Buildings (**1026, 1032**) and three other Listed Buildings (**1035 – 1037**) (**Figure 16**), however all of these are located over 500m away from the landfall locations. These are protected under the Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas) Act 1990.

4.8.9 Many of the locations on **Figure 16** indicate find spots, from which the artefacts have been removed. Finds along the coast generally represent individual, unrelated finds that have eroded out of the cliffs. While the specific finds are important and can indicate the future potential for the area, they will not be impacted by development as they have already been removed. Although finds from terrestrial locations could also represent individual, unrelated finds, there is also the potential that they have been derived from sites and therefore could indicate the location of additional related archaeological material.

4.8.10 The landfall corridor for the export cable route (western landfall) crosses possible medieval coastal defences (**1039**) and enters the site of Weybourne Camp, an important World War II site (**1049**). The extents of Weybourne site have been recorded by the NHER and are illustrated in (**Figure 15**). Of the World War II remains within 100m of the Export Cable Route (eastern landfall), a number are rare examples of their type, for example **1085**.

4.8.11 English Heritage has provided guidance for evaluating, conserving and managing 20th century military sites (English Heritage, 1998b, 2003). The importance of a site can be based on its national importance or the presence of structures of special interest. This can be determined based on a standard set of non-statutory criteria, such as the site's survival or completeness, group value rarity of building types and historic importance (English Heritage 2003:11).

4.9 IMPORTANCE OF THE UNKNOWN SITES

Marine Study Area

4.9.1 Any further sites that come to light during the course of development will have to be assessed for importance on a site by site basis. A level of importance from negligible to internationally important is possible for each site.

4.9.2 Although no submerged prehistoric remains are known at the present time, were any to come to light during the course of the development, they are likely to be of national or international importance, as indicated by the guidance note Identifying and Protecting Palaeolithic Remains; archaeological guidance for planning authorities and developers (English Heritage, 1998). This assessment is based on the relative paucity of such sites within the British and European record.

4.9.3 The importance of any isolated chance finds of submerged prehistoric material is more problematic. Although the finds themselves will be associated with a high level of importance, if the finds are derived from a secondary context, the physical area from which they come may not necessarily be important.

4.9.4 There is the potential for the presence of unknown and undocumented wrecks and / or isolated artefacts from various periods dating back to at least the Mesolithic. Given the long history of maritime activity in the region, it is possible that the remains of vessels of regional, national and even international importance might be discovered. Any shipwrecks from the Mesolithic to the medieval period would be of special interest, as so little is known and remains are so rare from these periods. Remains of boats and ships from the post-medieval period are also relatively rare, so they would also be expected to be of special interest. As there are more examples of boats and ships in the modern period, greater discrimination would be required to determine which vessels are of special interest; vessels of interest might include those exhibiting characteristics indicating changes in vessel construction or use. Ships lost after 1945 are less likely to be of special interest, although they would still need to be examined on a case by case basis.

4.9.5 There could be numerous aircraft crash sites in the marine study area, due to the area's use as an anti-aircraft artillery range and strategic bomber gathering area. Aircraft could have been lost while en-route from various Royal Air Force bases in East Anglia for German raids and on the return route to base. Aircraft lost while in military service are automatically protected by the Protection of Military Remains Act (1986). Ships that were in military service when they wrecked can also be recommended for protection under this legislation.

Coastal Study Area

4.9.6 *England's Coastal Heritage* (Fulford *et al,* 1997) indicates that much of the archaeological material along the Norfolk coast has been derived from the erosion of originally terrestrial sites on top of the low cliffs. While many of these finds are not *in situ*, they can still be of considerable importance.

4.9.7 The importance of remains discovered at the cable route landfall will depend upon the nature and the extent of the material. Any finds of Palaeolithic, Mesolithic or Neolithic date are likely to be of high local or regional importance and discoveries of *in-situ* Palaeolithic remains would be of high national importance.

4.9.8 Finds from the Bronze Age, Iron Age, Romano-British, Saxon, medieval, post-medieval and modern periods would be considered important if they could be proven to add to the present knowledge and understanding of these periods in Norfolk.

4.9.9 There have been finds of Roman and medieval coins and any further finds that qualify as 'treasure' would have to be reported under the Treasure Act (1996). For further information about what constitutes 'treasure' see Section 2.8: The Treasure Act (1996).

4.9.10 Human remains have been discovered along the coast, suggesting the possibility for further finds and these would have to be reported under the Burial Act (1857).

4.9.11 There is also potential for the presence of intertidal sites, including Palaeolithic land surfaces, intertidal structures from the medieval to modern period and wrecks. Sites in the intertidal zone are generally under researched and as such may be of medium or high importance.

5 ASSESSMENT OF IMPACT

5.1 PREVIOUS IMPACT

Marine Study Area

5.1.1 The main processes constraining the survival of prehistoric land surfaces and any associated sites are the reworking of those deposits during the course of fluvial action, including several marine transgressions. Wave and tidal action are likely to have repeatedly eroded and deposited former terrestrial material, washing out fine sediments, abrading otherwise robust artefacts and exposing organic materials to chemical and biological decay.

5.1.2 Shipwrecks and aircraft remains on the seabed will have been impacted by site formation processes. These include the impact of hitting the seabed and breaking up, the degeneration of organic remains and the slow decay and collapse of metal remains. Additional impacts to shipwrecks and aircraft remains include clearance and sweeping activities.

5.1.3 Archaeological material may also have been impacted by modern developments such as gas well drilling and cable route construction.

5.1.4 There are three plugged and abandoned wells in the wind farm study area (48/22–1, 48/22-2 and 48/22-4) and others outside of the study area. The nearest operational one is at Waveney to the north. Impacts of both the active and inactive wells include impact to the seabed from the jack-up legs of the barge during construction and impact to buried deposits during the drilling of the well. The impacts of gas well drilling outside the main study area are mentioned here, as they can contribute to the cumulative impacts of development.

5.1.5 There are two out of service telecoms cables that intersect the southern end of the cable route marine study area, which indicate that there was likely previous impact in the area as a result of the laying of these cables. The cable routes both reach the shore in the vicinity of the Dudgeon cable landfall and therefore there may have already been minor, localised impact on the historic environment in this area from these activities.

Coastal Study Area

5.1.6 Archaeological material in the coastal study area could have been impacted by previous development. Modern developments include roads, a car park, a disused sewage works, drains, a wireless station, a telegraph station and previous pipelines and cable routes.

5.1.7 World War II defence construction would also have had a significant impact on the historic environment in the coastal study area, although many of these structures are now historic in their own right.

5.2 OVERVIEW OF DEVELOPMENT

5.2.1 Although the size, number and configuration of the WTGs have not yet been confirmed, it is possible to comment generally on the possible effects of the development. WTGs with a range of sizes are under consideration, from 3.0 – 10MW_e, and the number of WTGs deployed will depend on which model is chosen.

5.2.2 The foundation types are also still being considered and evaluated and include monopiles, steel jackets of different designs and gravity base structures (GBS).

These will be reviewed below, as the final choice of foundation for the Dudgeon project will only be determined following the selection of WTG, a full geotechnical investigation and subsequent detailed foundation engineering.

Monopile Foundation Option

5.2.3 The monopile option would be best suited for WTGs at the lower end of the size range, but if heavier WTGs are chosen, a different foundation is likely to be required. The monopile is the most common WTG foundation option used in the UK to date and it consists of a single steel pipe driven into the seabed. The monopile diameter and depth of penetration into the ground (embedded length) will depend on the size of the WTG finally selected, but is likely to be in the range of 5.0 – 6.5m in diameter for WTGs rated up to 5.0MW_e.

5.2.4 The installation of the monopiles is typically achieved either by driving them directly into the seabed, where minimum preparation of the seabed is required, or by drilling a socket in the seabed which is slightly larger than the diameter of the pile, into which the pile is inserted and grouted in place. A combination of drilling and driving is also a possibility if a pile hits refusal prior to its desired penetration depth being achieved. Where drilling is required, spoil will be left on the seabed. It is also possible to drill a hole and then grout the monopile into position.

5.2.5 Installation of the monopile foundation will require appropriate transport and handling vessels. The installation vessel ('jack-up') would have up to eight legs which would be lowered onto the seabed when in position, raising the vessel out of the water to create a stable working platform. These 'jack-up' legs will make an impact on the sea floor, as will any anchors from associated vessels.

5.2.6 Upon decommissioning, it may be necessary to remove the piles at 2m below seabed level. This may involve a degree of excavation around the pile to a specified depth below the seabed in order to allow pile removal.

Jacket Foundation Option

5.2.7 The Jacket Foundation Option consists of the use of standard tubulars with either welded or cast nodes. This method requires a larger footprint but smaller piles, for example up to four piles would be used, but each of the piles would have a diameter of up to 3.0m. This method would be considered for WTGs of 5MW_e and above.

5.2.8 The installation method will be similar to the monopile foundations. Once the jacket foundations have been transported to site, they will be installed by jack-up barge. There is potential for impact to the sea floor not only in the footprint of the foundations but also from the jack-up legs of the installation vessel.

Gravity Base Structure Foundation Option

5.2.9 The Gravity Base Structure (GBS) foundation relies on spread weight to stabilise the WTG and typically consists of a cellular steel or concrete structure loaded with a ballast of rock. Depending on the size of the WTG, the diameter of the base will vary, but is likely to be up to 45m in diameter for the largest WTG being considered. Of the considered foundations, the GBS will cover the largest area of the seabed. The GBS is by far the heaviest of the foundation options and will exert a large amount of pressure on the seabed, although the exact ground pressure is unknown.

5.2.10 An even, level seabed is required for installation of the GBS. This is likely to require seabed preparation of the foundation area potentially up to a depth of 2 – 3m and to a diameter slightly larger than the base itself.

5.2.11 When the GBS is taken to site, it would be lifted by a crane onto a Heavy Lift Vessel (HLV). The HLV is likely to be either a specialist floating lift vessel, or a large multi-leg jack-up barge. There will be direct impact from the legs and / or vessel anchorages.

5.2.12 Once the GBS has been lowered to the seabed and is confirmed to be stable, ballast will be placed in the base compartments to give the foundation the required stability.

Scour Protection

5.2.13 Scour protection may be required for all of the foundation options considered due to scour occurring around the base of the foundation structure. Bathymetric surveys immediately following the installation of the structures and again awhile after would will determine the requirements of scour protection. If required, rock or slate would be deposited at the base of the foundation structures in order to fill any scour pit and to build a rock berm above the seabed. The rock or slate would be placed by a vessel using a side tipping system or placed using a grab device. There is potential for impact from the weight of the rock or the slate.

Submarine Cables

5.2.14 Burial of both export and interarray submarine cables associated with the wind farm will likely be necessary to protect them from damage from anchors, fishing gear and other seabed disturbances. It will be necessary to clear the seabed of any debris before laying cables. This would consist of detecting and removing obstructions by towing a snagging device. Where required, grappling or grabbing may also be employed to remove obstructions.

5.2.15 Three techniques are generally employed to bury the cables; ploughing, jetting and cutting. For all of these techniques it is necessary to cut an incision in the seabed within which the cables are buried. If required, scour protection methods will be investigated after construction.

5.2.16 The cables will generally be buried between 1 – 3m, depending on local seabed conditions.

5.2.17 The interarray cable routes will be assessed in the Written Scheme of Investigation, which will be discussed in more detail in Section 5.8.

5.3 IMPACTS ASSOCIATED WITH THE DUDGEON PROJECT

5.3.1 The construction of the wind farm and cable route could have a number of direct, indirect, secondary, cumulative and synergistic impacts on the cultural heritage in the area (Wessex Archaeology, 2007a). This section will define the different types of impact and provide examples, but each impact will be discussed in more detail in relation to the Dudgeon project in later sections.

5.3.2 Direct impacts are related to the construction, operation and decommissioning of the offshore wind farm and cable route. These could include:

- Pre-construction dredging;

- Foundations for WTGs and offshore substation and accommodation platforms;
- Burial of interarray and export submarine cables;
- Jack-up vessel legs and other vessel moorings (including anchors);
- Scour protection;
- Cable landfall and trenching; and
- Removal of foundations during decommissioning.

5.3.3 Direct impacts not only include direct damage to structures, features, deposits and artefacts, but also the disturbance or destruction of relationships between structures, features, deposits and artefacts and their wider surroundings.

5.3.4 Indirect impacts are those beyond the actual construction project, which could potentially implicate archaeological sites or deposits located some distance away. In the marine and coastal environment, indirect impacts can include changes to water quality, currents, sediment transport and erosion patterns.

5.3.5 Secondary impacts arise from activities that occur as part of the development process, but are not necessarily part of the development as such. For example, on land, secondary impacts might include access roads and compounds for the installation of onshore cables.

5.3.6 Cumulative impacts are those that result from incremental changes to the historic environment caused by multiple impacts within a development project and / or in combination with past, present and future developments (Oxford Archaeology, 2008). Cumulative impacts include recurrent physical or direct impacts diminishing the historic environment due to the development of a number of offshore energy installations over time and over a wide area. Cumulative impacts also include changes to the perception of the historic environment due to impact on the setting of historic monuments from offshore wind farm developments.

5.3.7 The combined results of different types of impact, or interaction of impacts, either within a development or in combination with others, are described as synergistic impacts (Oxford Archaeology, 2008). Synergistic impacts affect different aspects of the environment, for example one impact affecting both the historic environment and habitats and species.

5.4 EVALUATION OF IMPACT ON THE KNOWN ARCHAEOLOGY

Dudgeon Offshore Wind Farm Study Area

5.4.1 There are three wrecks within the Dudgeon Offshore Wind Farm study area, however, only one of the wrecks is located within the development area of the Dudgeon site (**7034**). Two wrecks, (**7035** and **7083**) are outside the Dudgeon site, and are therefore unlikely to be impacted.

5.4.2 For the 168 x 3.0MW_e layout, one of the WTGs (F03) would be located approximately 100m away from **7034 (Figure 17**). Side scan sonar data analysed by the UKHO indicated that the wreck measures 25m by 15m and therefore, unless the wreck has a significant, but unrecorded debris field, it is likely to be outside of the impact area. For the other WTG layouts, the nearest WTG would be over 150m away from this wreck (**Figure 18** to **Figure 21**).

5.4.3 A number of geophysical anomalies (sidescan, magnetic and seismic) within the assessed footprint of the Dudgeon site have the potential to be impacted. Anomalies on the seabed could be impacted by development activities on the seabed, while anomalies beneath the seabed could be impacted by development activities that penetrate the seabed.

5.4.4 Due to the number of WTG options and the associated layout of the interarray cables still under consideration, it is not known specifically which anomalies may be impacted by the development. However, within each option, there are anomalies that lie close to the area of impact, see **Figure 17** to **Figure 21**. Once final project details are confirmed, including the location of interarray cables, any anomalies that are likely be impacted should be investigated further in line with an approved Written Scheme of Investigation (WSI); some possible investigation methods are outlined in Section 5.8 Mitigation and Monitoring.

Export Cable Route – Marine Study Area

5.4.5 The wrecks and obstructions most likely to be directly impacted are those closest to the cable route. In order to examine impact along the cable route marine study area, the route has been divided into four parts: the northern export cable route corridor; the main cable route; the southern part of export cable route (eastern landfall) (after export cable route (eastern landfall) and the export cable route (western landfall) diverge); and the export cable route (western landfall) and corridor (**Figure 6** and **Figure 7**).

Cable Route – Northern Export Cable Route Corridor

5.4.6 This consists of an area approximately 2.5km^2 at the north end of the cable route where it joins the Dudgeon offshore wind farm site.

5.4.7 There are no known wrecks within this area. However, there are 18 geophysical anomalies, including 13 sites described as 'debris', one linear feature and four magnetic anomalies. Impact will be localised, and therefore, can only be determined once the cable route has been confirmed.

5.4.8 The geophysical coverage is not complete for this area, and there is no geophysical data for two triangular areas on the east and west of the corridor (see **Figure 2**). As there is no information for these areas, it is not possible to comment on the potential development impact.

Export Cable Route – Main Cable Route

5.4.9 This consists of approximately 24km of cable route, south of the northern export cable route corridor and north of where the cable routes diverge.

5.4.10 The debris field of the *Clan Morrison* (**7036**) covers an area of 190m by 80m. The cable route will pass within close proximity to the debris field (**Figure 9**), and therefore there is potential for impact.

5.4.11 An unknown wreck (**7037**) lies just over 150m from the cable route, and although the recent geophysical survey indicated a small site, a previous UKHO survey recorded a wreck 100m in length. Changes in sedimentation could have buried parts of this wreck, and may indicate that even the original UKHO survey dimensions provide a conservative estimate of the site size. Therefore, there is potential for this wreck to be impacted.

5.4.12 Wreck **7193** is located 135m from the cable route and as this is a relatively small site, the distance away from the cable route indicates that it is unlikely to be directly impacted.

5.4.13 There are 21 sidescan anomalies located within 100m of the cable route. Of these, three are within 25m: **7155** (within 15m), **7154** (within 20m) and **7230** (within 25m). Six are within 50m: **7258** (30m), **7249** (36m), **7254** (40m), **7222** (40m), **7223** (40m), and **7248** (43m). Of these anomalies, the ones closest to the cable route are the most likely to be impacted.

5.4.14 There is also the potential for sub-bottom anomalies to be impacted by development activities that penetrate the seabed, and the cable route crosses **7006, 7007, 7009, 7010, 7011** and **7012** (**Figure 6** and **Figure 7**). Of these the ones closest to the surface are most likely to be impacted, as cable laying activities are expected to reach a depth of 1 – 3m. Anomalies **7007** and **7009** are recorded as being cut and fill at or near the surface, whereas the cut and fill of the other anomalies begin at least 4m below the seabed, and therefore are less likely to be impacted.

Export Cable Route –Export Cable Route (eastern landfall)

5.4.15 Export cable route (eastern landfall) diverges from the export cable route (western landfall) approximately 10km from shore and runs nearly straight south west to the landfall.

5.4.16 The nearest known wrecks to export cable route (eastern landfall) are the *Francis Trixier* (**7043**) and the *Rosalie* (**7044**), both of which are located over 300m from the cable route, and therefore are unlikely to be impacted.

5.4.17 The geophysical survey data only covers 2km of export cable route (eastern landfall) after the cable routes divide. Therefore, it is not possible to comment on the geophysical anomalies for the 8km closer to shore.

5.4.18 Within the 2km of geophysical data coverage, there are three sidescan anomalies within 100m of the cable route: **7243** (within 25m), **7168** (within 50m), and **7170** (within 65m). The anomalies closest to the cable route are those most likely to be impacted. The cable route also crosses two sub-bottom anomalies: **7002** and **7003**.

5.4.19 Geophysical data with relevance to the cable route, in the areas not covered by geophysical analysis in this report, has been collected by Scira for the Sheringham Shoal project. Where necessary, DOW will liaise with Scira in order to ensure any archaeological features are identified.

Export Cable Route - Export Cable Route (western landfall) and Corridor

5.4.20 The export cable route (western landfall) leaves the export cable route (eastern landfall) approximately 10km from shore (at geophysical anomaly **7170**), runs south west for 2km, then turns and runs 5km west before heading due south for 7km to the landfall.

5.4.21 There is one potential wreck within the export cable route (western landfall) corridor. Site **1092** is thought to be either an undated wreck or World War II beach defences.

5.4.22 Near shore, just over 100m to the east of the cable route corridor is the *Rosalie* (**7044**). The UKHO records indicate that this wreck covers ‘a large area’ and therefore, if the cable route runs along the eastern edge of the corridor, there could be potential to impact this wreck.

5.4.23 The geophysical data for the export cable route (western landfall) is limited to 2km at the north end and a small section that runs parallel to the cable route corridor at the southern end of the geophysical coverage (for details on coverage, see **Figure 2**). With the limited coverage of a 13.5km route, it is not possible to identify all of the potential geophysical anomalies within the area. However, the known anomalies can be addressed.

5.4.24 Where the export cable route (western landfall) diverges from export cable route (eastern landfall), there is one sidescan anomaly (**7170**) within 70m of the cable, and the cable route crosses a sub-bottom anomaly (**7003**)

5.4.25 About 2.5km from shore, outside of the cable route corridor, but less than 100m to the east, there are two sidescan anomalies (**7163** and **7253**), and one sub-bottom anomaly (**7000**). If the cable route falls within the cable route corridor, these anomalies are unlikely to be directly impacted.

5.4.26 For the areas not covered by geophysical analysis in this report, DOW will liaise with Scira in order to ensure that any archaeological features identified in the study area are considered.

Coastal Study Area

5.4.27 The impact of the cable landfall will be localised, and therefore, the historic environment most likely to be impacted is that closest to the cable route and the onshore transition pit. The specific impacts of export cable route (eastern landfall) and the export cable route (western landfall) corridor will be discussed below.

Export Cable Route (eastern landfall) Landfall

5.4.28 Export cable route (eastern landfall) makes a landfall approximately 100m to the north of the north eastern corner of Beach Lane car park. It crosses about 70m of shingle beach, and then runs inland for another 70m before reaching the onshore transition pit location (**Figure 15**).

5.4.29 According to information from the National Monuments Record (NMR), the cable route will cross the site of World War I and World War II defences (**1065, 1098**) including the site of a World War II Vicker's machine gun emplacement (**1082**).

5.4.30 Near to the landfall along the intertidal zone, there is further evidence for the two World Wars. The foundations of a World War II beach defence light (**1080**) or rare CDL searchlight emplacement (**1088**) are recorded 10m to the east of the cable route, and although the records indicate the site has been destroyed by cliff falls, there could be fragmentary evidence in the area. About 30m east of the cable route, there is evidence of three World War II pillboxes: **1089** is the remains of a rare World War II type 28 pillbox; **1079** is the remains of a large World War II type 22 pillbox situated on the beach; and **1086** is a pillbox that was recorded on the cliff edge and eroded onto the beach. Site **1097**, 50m east of the cable route, represents an area of considerable World War II activity, and in addition to some of the evidence listed above, includes an underground structure, underground military headquarters weapons pit and tank block.

5.4.31 Within 100m of the onshore transition pit where export cable route (eastern landfall) terminates, there are a number of find spots that date from the Neolithic and Iron Age periods (**1008** and **1013**). The artefacts have been removed from their find locations, and although nothing remains *in situ*, they represent the potential for further discoveries in the area.

Export Cable Route (western landfall) Landfall

5.4.32 The exact location for the landfall of the export cable route (western landfall) has not yet been determined, and therefore the archaeology within an export cable route corridor will be examined. The eastern edge of the export cable route corridor lies 350m to the west of Beach Lane car park, and the corridor reaches 590m to the west (**Figure 15**).

5.4.33 The corridor covers an area of Weybourne Camp (**1049**), and there is a concentration of World War II evidence on the western side of the corridor including three World War II Vickers machine gun emplacements (**1056**, **1057** and **1058**), and a Type 22 pillbox (**1050**). Further remains of World War II structures and beach defences (**1095**) were noted during the 2004 coastal survey, on the cliff face and buried in the beach shingle (NHER MNF46183).

5.4.34 There is evidence of possible earthworks (**1039**). Documentary evidence from 1588 refers to plans to enlarge the Sconce at Weybourne Hope as part of the Armada defences, indicating that there were already fortifications at this site at the time (NHER MNF44237).

5.4.35 There are a number of find spots in the corridor, indicating the potential for further discoveries. Finds include a prehistoric flint (**1002**, **1003**, **1004** and **1116**), and skeletal remains that are possibly very old (**1121**) and relatively modern (**1112**). A medieval German coin (**1028**) was recovered less than 10m east of the cable route corridor.

5.5 IDENTIFICATION OF EFFECTS

5.5.1 Applying a 'worst case scenario', or Rochdale Envelope, approach with regards to the known and potential historic environment in the marine and coastal study areas, the effects of construction, operation and decommissioning that need to be considered are:

Construction Effects

5.5.2 The construction effects can be summarised as follows:

- Potential damage to or destruction of submerged prehistory, prehistoric land surfaces, shipwrecks and aircraft by:
  - Seabed preparation;
  - WTG foundations;
  - Construction vessel legs and/or anchorages;
  - Cable laying activities; and
  - Landfall impacts such as cable pit excavation.

Operational Effects

5.5.3 The operational effects can be summarised as follows:

- Potential damage to or destruction of shipwrecks, aircraft, submerged prehistory and prehistoric land surfaces from scouring.

Decommissioning Effects

5.5.4 The decommissioning effects can be summarised as follows:

- Potential damage to, or destruction of, shipwrecks, aircraft, submerged prehistory and prehistoric land surfaces from:
  - Removal of foundation structures;
  - Vessel legs; and
  - Vessel anchors.

5.6 SIGNIFICANCE OF EFFECT

5.6.1 All of the impacts upon the known and unknown archaeology will be permanent. The level of significance will depend on the scale of the impact and the importance of the archaeology being impacted.

5.6.2 The significance of effects can be assessed by correlating the likely direct, indirect, secondary, cumulative and synergistic impacts (identified above) with the importance of the receptor. If both magnitude of impact and importance of receptor have been classified, then a matrix may be used to determine the significance of effects. However, many matrices have been designed for dealing with other environmental topics and their application to the historic environment may be inappropriate. Descriptions of effects that are more qualitative or textual may be more sympathetic to the characteristics of the historic environment and may result in a more adequate assessment.

5.6.3 The historic environment is an irreplaceable and non-renewable resource, and it is highly sensitive to change. Therefore, alterations to it, and its environment, must be carefully considered. Any impact on the historic environment will likely be permanent and negative.

5.6.4 Within the Dudgeon offshore wind farm study area, there is potential for the wreck (**7036**) to be impacted. It is an unknown wreck, and as there is little information available, its importance cannot be assessed. In this case, best practice would be to treat the wreck as important until proven otherwise. If impacted by wind farm construction any damage to the wreck would be permanent and negative, and therefore the potential effects on this wreck should be considered to be significant.

5.6.5 Along the cable route, the wreck most likely to be impacted is the *Clan Morrison* (**7036**). The impacts of the cable route laying include ploughing, jetting, or cutting and possibly the addition of scour protection. The impacts of the cable installation process would be permanent, and the addition of scour protection has the potential to compress or crush fragile archaeological remains. This wreck has importance based on its history and usage. It was mined while on passage from Southampton to Blyth during World War II whilst on charter to the Admiralty, and therefore could be considered for protection under the Protection of Military Remains Act (1986). The potential effects on this wreck are considered to be significant.

5.6.6 There is little information available about the geophysical anomalies at this time, and therefore it is not possible to assess their importance or the significance of effect. However, as a considerable proportion of these anomalies are likely to material that is not of archaeological interest, only anomalies that will be impacted by the development should be examined further to determine significance.

5.6.7 The significance of effect on the historic environment onshore will be determined once the cable route landfall and onshore transition pit locations have been confirmed. The significance of effect will be based on the importance of the archaeology being impacted.

5.7 CUMULATIVE IMPACTS

5.7.1 As defined above, cumulative impacts are those that result from incremental changes to the historic environment and can include recurrent impacts and also the perception of setting. This section will examine the cumulative impacts from direct, indirect and secondary impacts resulting from the development of a number of other wind farms in the area, but will not examine the impacts on the visual setting, as this aspect is being dealt with in a separate report.

5.7.2 There are numerous offshore wind farm development proposals in the area surrounding the Dudgeon project. Of these, the developments in close proximity that are likely to occur within the timeframe of the Dudgeon project and are considered for this cumulative impact assessment are:

- Lynn offshore wind farm (Round One) – built;
- Inner Dowsing offshore wind farm (Round One) – built;
- Sheringham Shoal offshore wind farm (Round Two) – approved;
- Docking Shoal offshore wind farm and associated Wash cable route corridor (Round Two) – submitted;
- Lincs offshore wind farm (Round Two) – approved;
- Race Bank offshore wind farm (Round Two) – submitted; and
- Triton Knoll offshore wind farm (Round Two) – Scoping phase.

5.7.3 All of the above developments have been subject to archaeological assessments that have identified known wrecks and assessed geophysical data as part of an attempt to identify previously unknown losses. These assessments have also assessed the potential for the presence of submerged prehistoric archaeology, through geophysical and geotechnical surveys.

5.7.4 With regard to wrecks, in all cases, the means of mitigating against damage to the known sites will be through the implementation of Archaeological Exclusion Zones (AEZs), which will be discussed in more detail below. This approach will have the effect of minimising the direct impacts from construction. It will also be used to protect geophysical anomalies that may represent currently unknown shipwrecks, aircraft or other features of anthropogenic origin. As a result, the cumulative direct impact on the known sites from wind farm construction, cable laying, anchoring and dredging resulting from the schemes is negligible.

5.7.5 The effect of indirect impact on known sites, for example changes to sedimentation and erosion patterns, are more difficult to quantify. Localised, project specific studies have, for the most part, indicated little change in sedimentation from wind farm construction. Although changes to sedimentation could cover up and therefore protect sites, erosion could uncover and destabilise sites, therefore leading to potential impact.

5.7.6 This has been addressed by the generally adopted principle that further geophysical studies, undertaken during the working life of the projects, will be archaeologically assessed. Thus any currently known or unknown sites exposed by scour or changes to sedimentation could be identified and the general archaeological principals of evaluation can be applied to identify the importance and significance of the effects and remedial mitigation can be applied.

5.7.7 WTG installation could impact on as yet unconfirmed prehistoric archaeology, palaeo-land surfaces and palaeo-environmental remains, although other activities such as cable laying and anchoring are less likely to penetrate the seabed to a depth sufficient to cause concern. This issue can be addressed through geophysical and geotechnical surveys that can identify these features prior to impact.

5.7.8 One of the positive cumulative effects of studies relating to wind farm developments is the accumulation of archaeologically interpreted geophysical and geotechnical data regarding submerged and sub-bottom, prehistoric land surfaces and palaeo-environmental evidence. For example, evidence from Sheringham Shoal and Lynn and Inner Dowsing offshore wind farms was discussed in relation to the potential for submerged land surfaces in the marine study areas. This developing resource is indicating the broad spread of palaeo-landscape and palaeo-environmental data off the east coast. It is anticipated that any evidence derived from the Dudgeon studies be included in this lexicon of evidence.

5.7.9 In view of the potential for cumulative impact from WTG installation, it is appropriate to look at the worst case scenario for the scale of this effect. In order to do this, the total surface area of the WTG foundations has been compared with the overall footprint of the schemes listed above as follows:

Name	Project area (m^2)	No. of WTGs	WTG foundation area (m^2)	Total WTG area (m^2)	% wind farm area subject to WTG impact
Lynn	9,996,905	27	19.6	530	0.005
Inner Dowsing	9,994,894	27	19.6	530	0.005
Docking Shoal	74,969,130	166	380.1	63,102	0.08
Humber Gateway	35,043,023	43	1,256.6	54,034	0.15
Lincs	34,933,773	83	380.1	31,551	0.09
Sheringham	34,971,171	108	706.9	76,341	0.22
Race Bank	39,964,836	83 –166	unknown	unknown	unknown
Dudgeon	34,929,740	56 – 168	20 – 2,826	3,000 – 160,000	0.0085 – 0.46

Table 5.1 Project footprints (from Wessex Archaeology, 2007c with additions)

5.7.10 This assessment illustrates that the percentage of the seabed that is subject to permanent negative direct impacts from the WTG foundations is small relative to the overall wind farm footprint. Therefore, it would appear that the cumulative impact of the construction of offshore wind farms upon any submerged prehistoric deposits that may survive off the Lincolnshire and Norfolk coastline is likely to be small. However, although the actual impact area of each foundation structure is small, the large number of foundation structures planned indicates that there is still some potential for impact.

5.8 MITIGATION AND MONITORING

5.8.1 The following measures are designed to mitigate the impact of the wind farm upon known sites and palaeo-landscapes and to establish the presence of unknown sites within the marine and coastal study areas. It is acknowledged that should the project change significantly, full archaeological assessment will be necessary for any areas not already covered by this assessment.

5.8.2 The Historic Environment Guidance to the Offshore Renewable Energy Sector (COWRIE) (Wessex Archaeology, 2007a), sets out mitigation measures to avoid, minimise or offset the adverse effects of development. Mitigation measures for archaeological sites and features generally take three forms:

- Prevention or avoidance;
- Reduction; and
- Remedying or offsetting.

5.8.3 Government policy and international best practice favours the preservation *in situ* of archaeological remains. As archaeological remains and material are finite and non-renewable, prevention and avoidance is the preferred form of mitigation and the preferred method is to redesign project layouts to avoid sites. This can be accomplished by developing Archaeological Exclusion Zones (AEZs) around either discrete sites or more extensive areas identified as being of archaeological importance. An AEZ is defined as an area where construction activity that would impact upon or disturb the archaeology in or on seabed is prohibited. The proposed AEZs in relation to Dudgeon are illustrated in **Figure 17** to **Figure 23**.

5.8.4 Even with precautions in place to avoid archaeological material, it is still possible that previously unknown archaeological material or sites could be encountered in the course of the construction, operation or decommissioning of a project. However, these effects can be reduced, for example through watching briefs where new finds are recorded and recovered as they are encountered. Watching briefs can also be used to initiate more intensive archaeological investigations if required.

5.8.5 If it is not possible to avoid known sites, the effects of the project can be remedied by carrying out excavation and recording prior to the impact occurring. Although the site will be destroyed, the information embedded within it will be 'preserved by record'. Other forms of remedying may include restabilising sites that have been destabilised by development, or offsetting damage to a site by safeguarding otherwise comparable sites elsewhere.

5.8.6 A Written Scheme of Investigation (WSI) should be prepared to set out procedures for managing any features that appear to be of archaeological importance that are discovered in the course of construction. The WSI should ensure compliance with the relevant legislation and be finalised once the final project details are available and prior to the construction works commencing. The WSI should also examine the project in more detail, for example the chosen WTG arrangement, interarray and export cable routes, and predicted environmental changes, and identify the specific impacts on the historic environment.

5.8.7 A Protocol for Unexpected Discoveries of Archaeological Importance should also be developed in order to reduce adverse effects of the development by enabling people working on the project to report their discoveries or recovered material rapidly in a manner that is convenient and effective.

Mitigation and Monitoring within the Marine Study Area

Wreck Sites and Geophysical Anomalies

5.8.8 Geophysical survey data has been archaeologically assessed to provide information on the known wreck sites and obstructions and to identify any previously unknown wrecks or other anomalies within the development area.

5.8.9 In order to prevent damage to known and possible wreck sites AEZs have been placed around these sites (**Figure 22** and **Figure 23**). The AEZs consist of a 50m radius around the cardinal extents of the following sites:

WA ID
7034
7035
7083

Table 5.2: Sites in the offshore wind farm marine study area proposed to have Archaeological Exclusion Zones.

WA ID
7036
7037
7193
7173 & 7175

Table 5.3: Sites in the cable route marine study area proposed to have Archaeological Exclusion Zones.

5.8.10 Although two of the proposed AEZs in the offshore wind farm marine study area are located outside of the footprint of the wind farm (**7035** and **7083**), and thus the wrecks are unlikely to be impacted, as they are within the development's buffer zone, they have been proposed for an AEZ for precautionary reasons.

5.8.11 The four AEZs in the cable route marine study area represent known wrecks and areas of archaeological potential, which are all within 200m of the assessed cable route.

5.8.12 In addition to the confirmed and possible wrecks there are a further 209 sidescan or magnetometer anomalies within the wind farm and cable route geophysical survey areas that may represent archaeology, modern debris or natural features. As such it is likely that a significant proportion of these anomalies will transpire not to be of archaeological interest. It is also likely that once the preferred configuration of the development, WTGs, export and interarray cables are confirmed the majority of these anomalies are unlikely to be impacted.

5.8.13 Where the project plans indicate that no impact is likely, because for instance the anomaly is a sufficient distance from an interarray cable, then it may be appropriate that no further action need be taken.

5.8.14 However, for the relatively small number of anomalies that may still be impacted by the development there may need to be further appropriate investigation in order to

determine whether or not they consist of archaeological material. The effected anomalies can be re-evaluated, following confirmation of project details and further assessment of the particular impact from the development, and this would normally take place at WSI stage. At such time they can be removed if no impact is apparent or further appropriate investigation and or mitigation can be put in place.

5.8.15 Investigation methods might include the archaeological analysis of any geophysical survey data obtained during the next phases of the development, and if appropriate, the requisition and analysis of new geophysical data, and / or diver or Remotely Operated Vehicle (ROV) surveys. This is envisaged as appropriate at only the relatively small number of anomalies where development impact is thought to be unavoidable and will be in line with the WSI.

5.8.16 If the anomalies do not consist of archaeological material, the archaeological requirement for avoiding development impacts will be removed. If the effected anomaly does consist of archaeological material, then appropriate mitigation in line with the WSI can be put in place. This may include the creation of an appropriate AEZ commensurate with the size and nature of the anomaly and the nature of the potential impact to ensure that the material is protected.

5.8.17 All AEZs will be marked on the project master plans and the installation contractors briefed accordingly.

5.8.18 If project plans cannot be altered to avoid an archaeological site, then the site should be subject to a process of evaluation to establish its importance and extent, followed (if necessary) by a level of recording appropriate to the importance of the site as per the agreed WSI. This work would be required prior to the construction works that will affect the site.

Palaeo-landscapes

5.8.19 The archaeological assessment of the geophysical data identified features of potential archaeological interest beneath the seabed, including possible areas of peat, cuts and fills. However, as it is not possible to estimate the archaeological potential of these features from the supplied datasets, it is therefore proposed to target the features using vibrocores during the pre-construction engineering survey programme. This will allow an estimate of the age of the possible peat layer and provide palaeo-environmental evidence for the cuts and fills thus providing sufficient data for archaeological classification.

5.8.20 Any vibrocore and borehole surveys undertaken for the project should be subject to a phased archaeological analysis. Phase 1 would involve the archaeological assessment of the core logs generated by the survey contractor. Phase 2 would involve the archaeological recording of selected cores, and Phase 3 would involve the archaeological assessment of any palaeo-environmental samples taken from these cores. Phase 4 would involve full analysis of the Phase 3 samples and publication of the results. This phased approach requires that at the end of Phases 1 to 3 a report is produced to outline any requirements for progression to the next stage of work.

5.8.21 Any additional geophysical data that is produced will also be archaeologically analysed to assess the potential for the discovery of further evidence below the seabed.

Monitoring and New Site Identification

5.8.22 In order to monitor the effectiveness of AEZs and to identify new sites that may come to light as a result of sediment movement, it would be appropriate to archaeologically assess any further geophysical survey data. Additionally, archaeological advice should be obtained at the time the work is commissioned in order to ensure that the work undertaken is suitable for archaeological analysis.

5.8.23 Without a confirmed construction methodology for the works on the wind farm and cable route, it is not possible to establish a firm programme of archaeological monitoring at this time. However, in view of the potential for the presence of drowned land surfaces and associated prehistoric sites and as yet unknown wrecks, it is suggested that there be archaeological involvement during the pre-construction cable route clearance and any similar activity undertaken within the vicinity of the wind farm.

Mitigation and Monitoring within the Coastal Study Area

5.8.24 There is only a small intertidal area that will be impacted by the Dudgeon project. However, mitigation and monitoring is still possible, and the following mitigation is sugegsted where the cable will be ploughed and / or trenched into the foreshore.

5.8.25 A walkover survey of the cable route within the intertidal zone would enable the identification, classification and position fixing of all visible sites. The identification of new sites and finds is particularly important, as the Rapid Coastal Zone Assessment (Robertson *et al,* 2005) identified numerous flint flakes and other finds eroding from the cliff face, thus indicating the potential for further new discoveries in this area. However, as the intertidal area is small, it may not require a separate walkover survey. Instead, the area could be included in the onshore cable route archaeological assessment.

5.8.26 In the event that any significant features are identified from the walkover, then these would be marked as AEZs on project master plans. Where the AEZ impinges on construction, future archaeological investigation, for example geophysical survey and/or evaluation trenching would be undertaken if required.

5.8.27 As the palaeo-landscapes discussed above could continue into the intertidal zone, core samples taken along the cable route should be analysed to determine the potential for impact in the coastal area, and thus indicate whether further work is required.

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APPENDIX I: TERRESTRIAL SITES IN THE COASTAL STUDY AREA

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1001		MNF46139	Prehistoric	Prehistoric flint flake.	375366	5868176	611383	343663
1002		MNF46577	Prehistoric	Prehistoric flint piercer.	374245	5868397	610249	343805
1003		MNF46578	Prehistoric	Prehistoric flint flake.	374238	5868415	610240	343823
1004		MNF46136	Prehistoric	Prehistoric flint flakes, found in the cliff face in 2004.	374256	5868405	610259	343814
1005		MNF46140	Prehistoric	Prehistoric flint flakes and a retouched flake were found eroding out of the cliff in 2004.	375774	5868118	611794	343633
1006		MNF12755	Palaeolithic	Palaeolithic hand axe found in the cliff face in 1977.	375911	5868176	611927	343701
1007	132115	MNF6256	Mesolithic	Mesolithic finds, Weybourne Beach. Flint flake found by a A.Q. Watson, 1939, in old watercourse at junction of sand and peat beneath shingle. Calcined flint in mud above peat. In the vicinity Hewlett also found a cut antler, head of a shorthorn ox in clay and horse bones.	374989	5868298	610998	343758
1008		MNF33103	Neolithic	Neolithic polished axe head - found in a field in 1997.	375152	5868125	611550	343390
1009	132121	MNF6260	Neolithic	A Neolithic or Bronze Age flint axe, found in June 1951 by GC Chenevix-Trench.	375514	5867892	611173	343597
1010		MNF17390	Bronze Age	Late Bronze Age to Early Iron Age pieces of pot were eroded out of the southeast side of Muckleburgh Hill.	374056	5867545	610119	342942
1011		MNF38812	Bronze Age	Bronze Age mound of burnt flints and undated but pre-medieval ditches, discovered during an evaluation and excavation at Beach Lane Pumping Station	374889	5867798	610933	343252
1012	21372, 132150	MNF6249	Bronze Age	A round barrow located on the north side of Muckleburgh Hill. It is visible as an earthen mound standing to a height of circa 1.5m and covering a circular area of circa 22m in diameter. **Scheduled Ancient Monument.**	374071	5867736	610121	343134
1013	132157	MNF6269	Iron Age	Two Iron Age gold coins found on the beach in 1956.	375140	5868279	611150	343750
1014	132119	MNF6264	Iron Age	Iron Age gold coin hoard including at least 12 late Iron Age uninscribed gold staters.	375697	5868191	611712	343701

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1015		MNF6271	Iron Age to Romano-British	Iron Age or Roman sheet metal fragments - found in the cliff face in 1950.	375761	5868136	611780	343650
1016		MNF33260	Iron Age to Romano-British	Iron Age and Roman pottery finds and some Roman brick and tile, recovered during an excavation and watching brief at The Mill, Sheringham Road.	375511	5867677	611562	343175
1017		MNF15030	Romano-British	Roman pottery finds	375018	5867676	611070	343140
1018		MNF17649	Romano-British	Roman coin finds, Old Woman's Field, discovered in the 19th century.	374858	5868259	610870	343710
1019		MNF46135	Romano-British	Roman decorative strip or bracelet.	374255	5868408	610258	343817
1020	132114	MNF6274	Romano-British	Roman pottery and coins, found when altering the channel of a drain.	374821	5868301	610830	343750
1021		MNF6275	Romano-British	Roman coin.	375353	5867593	611410	343080
1022	132140	MNF6277	Romano-British	Roman pottery finds, Beach Lane. Late 2nd/3rd century sherds found to the north west of the Church of All Saints.	374843	5867759	610890	343210
1023		MNF42532	Romano-British	Five Roman coins.	374292	5868001	610323	343413
1024		MNF47225	Romano-British	Possible Roman enclosure and field system, recorded by the NHER as visible as crop marks in aerial photographs from 1981 and 1994.	375689	5867604	611745	343115
1025		MNF30250	Romano-British to Medieval	Roman and medieval metal finds.	375605	5868046	611630	343550
1026	132153	MNF6278	Saxon	All Saints' Church. The parish church has the remains of an Anglo Saxon tower which was originally placed between the nave and chancel but now stands at the north east of the present chancel. The church was refashioned in the 13th and 14th century. **Listed Building II.**	375117	5867616	611173	343087

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1027		MNF6304	Medieval	A medieval moated site, south of Rosedale Farm, with associated moated enclosures and fishpond is recorded by the NHER as visible on 1946 and 1969 aerial photographs.	374879	5867054	610975	342509
1027		MNF21886	Medieval	Re-used medieval stone, Fareham cottage, The Street. A much weathered lump of re-used medieval limestone forming the corner of a garden wall. It probably came from the ruins of the priory.	374933	5867573	610993	343031
1028		MNF23247	Medieval	Medieval German gold coin.	374655	5868363	610660	343800
1029		MNF25908	Medieval	Medieval pottery find, Weybourne Hope.	375437	5868228	611450	343720
1030		MNF29809	Medieval	Medieval ring brooch or buckle.	375036	5867269	611117	342735
1031	132125, 21390	MNF6278	Medieval	Weybourne Priory. The priory was founded as a house of Augustinian canons towards the end of the 12th or at the beginning of the 13th century by Sir Ralph Mainwaring. The monument includes the remains of the priory church dating from the early 13th to the 15th century. **Scheduled Ancient Monument, Listed Building I.**			611170	343080
1032	498975	MNF15108	Post Medieval	Weybourne Mill: a tower mill built circa 1850. It was restored and extended in the 1920s by J. S. Brocklesby. A brick building of five storeys complete with cap, sails and fantail. It has since been converted to be a part of a dwelling. **Listed Building II.**	375506	5867627	611561	343125
1033		MNF21885	Post Medieval	Spray Cottage, The Street, a small two storey flint and brick house with a date of 1606 outlined in brick on the façade.	374848	5867543	610910	342995
1034		MNF57240	Post Medieval	The Cottage/East Cottage.	374822	5867534	610885	342984
1035		MNF52415	Post Medieval	Abbey Farmhouse, The Street. A 17th century two storey coursed flint farmhouse - partly built over the ruins of the Augustinian priory, with 19th century additions and alterations. **Listed Building.**	375094	5867580	611153	343049
1036		MNF52542	Post Medieval	Old Farm Cottage, Station Road, 17th century house of flint with brick dressings. **Listed Building.**	375170	5867377	611243	342852
1037		MNF52667	Post Medieval	Barn at Abbey Farm north of Abbey Farmhouse. **Listed Building.**	375101	5867661	611154	343130
1038		MNF50241	Post Medieval	Site of post medieval windmill, Millstream House. First recorded as working in 1723 and marked on 19th century maps.	374988	5867899	611025	343360
1039		MNF44237	Post Medieval	Possible earthworks and documentary references, to the Armada defences and fortifications at Weybourne Hope.	374298	5868426	610300	343838

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1040	1394968		Post Medieval	During the invasion scare of 1587, Edmund Yorke drew up a comprehensive plan for the defence of Weybourne Hope, a two-mile stretch of land between Weybourne and Cley, which was regarded as particularly vulnerable to invasion from the sea.	371825	5868584	610000	343000
1041	1394967		Post Medieval	Weybourne Fort: During the invasion scare of 1587, the 2 miles of beach west of Weybourne to Cley was identified as the weakest undefended beach in Norfolk and an elaborate plan of defences was drawn up by Edmund Yorke to defend the coast.	373804	5868522	609800	343900
1042		MNF15109	Modern	Old Watermill House and Mill: probably built in the 19th century.	374955	5867954	610988	343413
1043	1417172	MNF32502	World War I	A rare World War I circular pillbox is located within a hedge line to the immediate north of one of the main southern tracks within Weybourne Camp.	374236	5867909	610274	343318
1044		MNF32518	World War I / World War II	Site of World War II pillbox situated within the hedge line. The NHER notes that aerial photographs also show a line of World War II Huts and a slit trench, possibly dating to World War I.	375304	5867784	611348	343267
1045	1417150	MNF17818	World War I / World War II	Crop marks of a probably World War I slit and practice trenches are recorded in the NHER as visible on aerial photographs. The NMR notes that at the time of a field visit in March 1981 the trench was in very bad condition.	375486	5868083	611509	343578
1046		MNF43687	World War I / World War II	An area of World War II coastal defences at Weybourne, to the immediate east of Weybourne Camp. The site consists of a barbed wire enclosure, a possible pillbox and gun emplacement, plus several sections of slit trench possibly dating to World War I.	375382	5868160	611400	343648
1047		MNF43689	World War I / World War II	A line of three possible World War I slit trenches along the coast at Weybourne - visible on aerial photographs.	375315	5868223	611329	343706
1048		MNF43699	World War I / World War II	A group of World War I or World War II slit trenches and a possible gun emplacement. The NHER notes that they are visible on aerial photographs.	375979	5868119	611999	343649
1049		MNF11335	World War II	Weybourne Camp: a World War II barbed wire enclosure surrounding a defensive position, which is possibly a gun emplacement or pillbox. The NHER notes that it was visible on early wartime aerial photographs.	374158	5868190	610176	343593

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1050	1417167	MNF24264	World War II	The former site of a World War II Type 22 pillbox situated at Weybourne Beach, Weybourne Camp. The pillbox was built of concrete and red brick shuttering and was constructed during the period 1940 to 1941. Its walls were 600mm thick.	374149	5868458	610149	343860
1051		MNF32460	World War II	World War II gun battery located within the western extent of Weybourne Anti-Aircraft Training Camp.	373734	5868444	609735	343817
1052	1417165	MNF32469	World War II	World War II Vickers machine gun emplacement situated at Weybourne Army Camp to the north-west of Weybourne. The pillbox still survives.	373850	5868469	609850	343850
1053		MNF32471	World War II	World War II heavy machine gun emplacement (type 2) constructed in 1940 within Weybourne Anti-Aircraft Training Camp.	373839	5868450	609840	343830
1054	1417210	MNF32476	World War II	World War II gun emplacement - possibly for some medium to large anti tank gun, either a 2-pounder or a 75mm. The large open rear implies use with a wheeled artillery piece. Brick shuttered with concrete roof. Part of the Weybourne Anti-Aircraft Camp defences.	373848	5868008	609880	343390
1055		MNF32477	World War II	Two World War II gun emplacements located along the Kelling/Weybourne parish boundary. These are part of the Weybourne Anti-Aircraft Camp Defences.	373843	5868069	609870	343450
1056	1417162	MNF32500	World War II	World War II Vickers machine gun emplacement, a variant on the standard type, situated to the north-west of Weybourne at the Weybourne Army Camp.	374226	5868402	610229	343809
1057	1417161	MNF32501	World War II	World War II Vickers machine gun emplacement situated to the north-west of Weybourne at the Weybourne Army Camp.	374209	5868294	610220	343700
1058	1417166	MNF24265	World War II	World War II Vickers machine gun emplacement situated on the edge of a low cliff above the beach to the north-west of Weybourne at the Weybourne Army Camp.	374306	5868387	610310	343800
1059		MNF43690	World War II	Site of World War II barbed wire obstruction - part of the defences associated with Weybourne Camp.	375629	5868057	611654	343562
1060		MNF43694	World War II	Two World War II zigzag slit trenches along the coast (visible on aerial photographs). These are associated with the military training camp.	375553	5868029	611580	343529

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1061	1417164		World War II	World War II pillbox situated next to a Vickers machine gun emplacement. The pillbox is a variant on the standard type. It is situated at Weybourne Army Camp to the north-west of Weybourne.	373834	5868452	609835	343831
1062		MNF47244	World War II	Site of possible World War II gun emplacements, on the perimeter of Weybourne Camp.	374231	5867726	610281	343135
1063		MNF32528	World War II	World War II pillbox on the edge of woodland and in close proximity to the military camp at Weybourne.	374313	5867412	610385	342827
1064		MNF43697	World War II	A group of World War II defensive structures set into the cliff at Weybourne, near the anti-aircraft training camp. They may be gun emplacements or part of a similar coastal defence site.	375742	5868142	611760	343655
1065		MNF44058	World War II	Traces of possible World War II slit trenches are recorded in the NHER as visible on aerial photographs along the cliff top. These are located east of the main Weybourne Anti-Aircraft Training Camp.	375184	5868116	611205	343590
1066		MNF47245	World War II	World War II gun emplacement visible on aerial photographs of Muckleburgh Hill, on the perimeter of Weybourne Camp.	374334	5867710	610385	343126
1067		MNF47234	World War II	Site of World War II slit trenches on Muckleburgh Hill.	374076	5867705	610128	343103
1068		MNF47235	World War II	Site of possible World War II earthwork on Muckleburgh Hill.	373999	5867685	610053	343078
1069		MNF47236	World War II	World War II weapons pits on Muckleburgh Hill.	373988	5867670	610043	343062
1070		MNF47237	World War II	Site of World War II trench on Muckleburgh Hill.	373962	5867609	610021	342999
1071		MNF47238	World War II	Site of possible World War II hollow on Muckleburgh Hill.	373953	5867552	610016	342942
1072		MNF47240	World War II	Site of possible World War II ditch on Muckleburgh Hill.	373990	5867511	610056	342903
1073		MNF47242	World War II	Possible World War II pillbox on Muckleburgh Hill.	374032	5867533	610096	342928
1074		MNF47243	World War II	Site of possible World War II weapons pits on Muckleburgh Hill.	374060	5867649	610116	343046
1075		MNF49546	World War II	Site of World War II trenches and weapons pits on Muckleburgh Hill.	373768	5867735	609819	343112
1076		MNF49552	World War II	Site of World War II slit trenches on Muckleburgh Hill.	373839	5867623	609897	343005
1077		MNF47246	World War II	Site of World War II slit trenches and pits on Muckleburgh Hill.	374268	5867528	610332	342940

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1078		MNF44183	World War II	An area of World War II barbed wire defences and military structures, located around the base of Muckleburgh Hill and recorded as visible on aerial photographs by the NHER. They form part of the outer defences of the camp and are probably also related to the World War II training activities on Muckleburgh Hill to the immediate south.	374057	5867810	610102	343207
1079	1417177		World War II	Remains of a large World War II Type 22 pillbox situated on the beach at Weybourne Hope to the north of Weybourne. It is constructed of brick and concrete. The pillbox mounted a 2-pounder or a 6-pounder field gun.	375158	5868258	611170	343730
1080	1417185		World War II	World War II beach defence light situated at the beach of Weybourne Hope to the north of Weybourne. The structure housed a light to illuminate the beach in the event of enemy invasion. Only the foundations remain.	375138	5868249	611150	343720
1081	1417173		World War II	World War II Vickers machine gun emplacement situated on the beach at Weybourne Hope to the north of Weybourne. The gun emplacement is now destroyed but was seen on aerial photographs held by Norfolk Landscape Archaeology - Gressenhall.	375011	5868298	611020	343760
1082	1417182		World War II	A World War II Vickers machine gun emplacement situated at the beach of Weybourne Hope to the north of Weybourne Hope. It was constructed of brick and concrete. The gun emplacement was originally located twenty feet back from the cliff.	375126	5868220	611140	343690
1083	1417178	MNF19437	World War II	World War II Vickers machine gun emplacement situated near the beach at Weybourne Hope to the north of Weybourne. It is likely to have formed part of one of two groups of World War II coastal defences. The gun emplacement is now partly destroyed and is only to be seen in fragments in the sea.	375042	5868316	611050	343780
1084	1417171	MNF17820	World War II	A type 24 pillbox situated in middle of field on the coastal defensive line, overlooking the approach from the sea at Weybourne Hope.	375260	5868050	611286	343530
1085		MNF19438	World War II	The remains of a quite rare type 20 pillbox, constructed between 1940 and 1941.	375036	5868226	611050	343690

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1086		MNF19439	World War II	The remains of a World War II pillbox recorded on cliff edge and eroded onto the beach.	375158	5868248	611170	343720
1087		MNF32503	World War II	Site of World War II pillbox located on the beach at Weybourne.	375011	5868298	611020	343760
1088		MNF32504	World War II	The ruins of a very rare CDL searchlight emplacement, now destroyed by cliff falls.	375138	5868249	611150	343720
1089		MNF32516	World War II	Remains of a rare World War II type 28 pillbox.	375158	5868258	611170	343730
1090		MNF32517	World War II	Overgrown World War II type 26v pillbox.	375551	5867709	611600	343210
1091		MNF32519	World War II	World War II spigot mortar base.	375337	5868235	611350	343720
1092		MNF46141	World War II	World War II beach defences or undated wreck.	374512	5868481	610509	343908
1093		MNF46186	World War II	World War II scaffolding clamp found loose on the beach in 2004.	375698	5868159	611715	343669
1094	1417149	MNF17819	World War II	World War II Vickers machine gun emplacement located at Water Hill to the north of Weybourne. It is built of concrete and brick with brick shuttering. Overgrown.	375600	5867976	611630	343480
1095		MNF46183	World War II	Remains of World War II structure and beach defences - fragments of reinforced concrete noted in 2004 on the cliff face and top and buried in beach shingle are probably the remains of a World War II building.	374220	5868438	610221	343845
1096		MNF43695	World War II	A group of square and rectangular, possibly World War II military structures on top of Water Hill, Weybourne, are recorded in the NHER as visible on aerial photographs.	375548	5868042	611574	343542
1097		MNF44064	World War II	Group of World War II coastal defences, including searchlight and gun emplacements, recorded in the NHER as visible on aerial photographs.	375178	5868218	611192	343692
1098		MNF44066	World War II	Site of World War II coastal defences, located along the cliff top and recorded in the NHER as visible in aerial photographs.	375081	5868246	611094	343713
1099		MNF49547	World War II	Site of a World War II slit trench - recorded by the NHER as visible on aerial photographs.	373806	5867749	609856	343128
1100		MNF46130	World War II	Possible World War II coastal defences.	373749	5868582	609741	343955
1101		MNF46137	World War II	Concrete wall - possibly World War II	375211	5868253	611223	343729
1102	1420201		World War II	World War II Vickers machine gun emplacement situated to the west of Weybourne at the north-east corner of a housing estate grouped around Weynor Gardens.	374319	5867424	610390	342840

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1103	1417176		World War II	Unknown World War II pillbox of which only a few concrete fragments remain at the foot of the cliff at Weybourne Hope to the north of Weybourne	375041	5868296	611170	343700
1104	1417152		World War II	World War II Spigot mortar base located at Weybourne Beach to the north of Weybourne. Constructed of concrete and steel it was found lying on its side.	375337	5868235	611350	343720
1105	1417186		World War II	World War II Spigot mortar base originally situated opposite the entrance to the museum containing the Muckleburgh Collection. By 1999 the Spigot mortar base had been moved inside the museum containing the Muckleburgh Collection at Weybourne.	374321	5867760	610369	343175
1106	1452036		World War II	A World War II machine gun emplacement is situated at Kelling Hard. The gun emplacement was built of concrete and was constructed during the period of 1940 to 1941. It features a 3m diameter gun platform with a concrete platform to the rear	373729	5868448	609730	343820
1107	1417181		World War II	World War II Spigot Mortar base on north side of track in caravan park. Weybourne Heath, Weybourne.	375041	5868296	611050	343760
1108	1417154		World War II	World War II Type 26 pillbox situated in a hedge at the bottom of a garden at Weybourne Hall at the north-east corner of Weybourne. It is constructed of concrete and brick and has brick shuttering.	375315	5867760	611360	343244
1109	1417147		World War II	World War II Type 26 pillbox situated on the east side of the lane leading north towards the beach on the north-east corner of Weybourne. It is constructed of concrete and brick and has brick shuttering.	375541	5867706	611590	343205
1110	1417209		World War II	A World War II coastal observation post to a large gun emplacement to an anti tank gun. A single embrasure is set high in the front wall and makes it therefore not suitable as a firing position.	373822	5867984	609855	343363
1111	1417211		World War II	A World War II machine gun emplacement is situated at Kelling Hard. The gun emplacement was built of concrete and was constructed during the period of 1940 to 1941. It features a 3m diameter gun platform.	373735	5868447	609736	343820

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1112		MNF6286	Modern	Probably modern human skeletal remains - found on the beach in 1973. The NHER notes that a shipwreck is marked at the same location on a 1957 Admiralty chart and there may be a connection.	374544	5868400	610547	343829
1113		MNF43356	Multiperiod	Prehistoric and Roman finds from Muckleburgh Hill. Neolithic worked flint, two pieces of an Iron Age pot and pieces of a Roman pot were found.	374078	5867537	610142	342936
1114	132116	MNF6250	Multiperiod	Multi-period finds from Muckleburgh Hill. The alleged site of a group of bowl-shaped pits of supposed ancient origin on Muckleburgh Hill and the find spot of Romano-British sherds.	374017	5867556	610080	342950
1115		MNF45886	Multiperiod	Medieval and post medieval finds and features, Abbey Farm barn.	375101	5867661	611154	343130
1116		MNF46134	Multiperiod	Prehistoric flint flake and medieval to post medieval roof tile, recovered during a coastal survey in 2004.	374269	5868409	610272	343819
1117		MNF38804	Multiperiod	Iron Age settlement, medieval corn-drying oven and field boundaries. These were discovered during the watching brief for pipe-laying works in 1999.	375612	5867553	611672	343058
1118		MNF29098	Multiperiod	Multi-period metal finds recovered by metal detecting from 1992 to 2004. Objects include an Iron Age brooch, Roman, medieval and post medieval coins, a Middle Saxon pin head, a Late Saxon bridle side-link, medieval buckles and belt fittings and post medieval tokens and a strap fitting from a sword.	375603	5867653	611656	343157
1119		MNF55974	Multiperiod	Multi-period finds scatter, including worked flint and post medieval pottery.	375768	5867774	611812	343290
1120		MNF55975	Multiperiod	Multi-period finds scatter, including worked flint and post medieval pottery.	375940	5867947	611972	343474
1121		MNF39906	Unknown	Undated human skeletal remains - found in clay deposit on the beach. The bones were heavily stained and probably very old.	374264	5868501	610260	343910
1122	132116	MNF6251	Unknown	Possible iron working pits.	374187	5867557	610249	342963
1123	132128	MNF6279	Unknown	Undated hearth found under a hedge in 1925. Calcinated flints and 5 or 6 potsherds were also found.	375400	5867554	611460	343045
1124		MNF6340	Unknown	Undated pottery, found in 1970.	378003	5867435	614066	343107
1125		MNF46580	Unknown	Undated ditch.	375440	5868165	611457	343657
1126		MNF46579	Unknown	Undated ditches.	375284	5868185	611300	343666

WA ID	NMR ID	NHER ID	Period	Name	UTM Zone 31N Easting	UTM Zone 31N Northing	BNG Easting	BNG Northing
1127		MNF46581	Unknown	Undated ditches.	375804	5868118	611824	343635
1128	132165	MNF6278	Unknown	A churchyard cross stood 25 feet south west of south west buttress of the tower. Only a few inches of the rubble core remain. It is marked on W.J.J Bolding's detailed plan of the priory. No trace remains.	375138	5867528	611200	343000
1129	969057		Unknown	Possible barrow seen on air photograph and recorded in the NMR. Field investigation failed to confirm the site due to vegetation cover.	374041	5867604	610100	343000
1130	132122	MNF6278	Unknown	Alleged site of a former moat	375118	5867679	611170	343150
1131		MNF56192	Unknown	Site with no archaeological finds or features, Weybourne beach	375016	5868229	611030	343691
1132		MNF56791	Unknown	Details of a field survey undertaken in March/April 2008 along the route of a pipeline are awaited.	374561	5867315	610639	342748
1133		MNF56793	Unknown	Details of a field survey undertaken in March/April 2008 along the route of a pipeline are awaited.	374654	5867052	610751	342492

APPENDIX II: KNOWN WRECKS, OBSTRUCTIONS AND GEOPHYSICAL ANOMALIES

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7000	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 8.7m. Fill similar to surrounding sediment. Observed on one line.	6017SBP	
7001	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 4.8m. Fill similar to surrounding sediment. Observed on five lines.	6016SBP, 6018SBP, 6058SBP, 6059SBP, 6076SBP	
7002	Cut and fill			A1		Small cut and fill cut into the underlying bedrock (chalk). Maximum cut depth 3.97m. Fill similar to surrounding sediment. Observed on one line.	6034SBP	
7003	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 9.4m. Fill similar to surrounding sediment. Observed on eight lines.	6019SBP, 6032SBP, 6033SBP, 6057SBP, 6060SBP, 6072SBP, 6075SBP, 6082SBP	
7004	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 6.3m. Fill similar to surrounding sediment. Observed on one line.	6083SBP	
7005	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 4.5m. Fill similar to surrounding sediment. Observed on one line.	6062SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7006	Cut and fill			A1		Cut into the underlying bedrock (chalk). Maximum cut depth 4.5m. Fill similar to surrounding sediment. Observed on seven lines.	6003SBP, 6020SBP, 6074SBP, 6077SBP, 6062SBP, 6031SBP	
7007	Cut and fill			A1		BTC cut at or near surface into the underlying BDK. Maximum cut depth 16m. Fill more transparent than the surrounding sediment. Observed on seven lines.	6010SBP, 6026SBP, 6041SBP, 6042SBP, 6043SBP, 6051SBP, 6067SBP, 6084SBP, 6089SBP, 6090SBP	
7008	Cut and fill			A1		BTC cut at or near surface into the underlying BDK. Maximum cut depth 3.6m. Fill more transparent than the surrounding sediment. Observed on two lines.	6040SBP, 6068SBP	
7009	Cut and fill			A1		BTC cut at or near surface into the underlying BDK. Maximum cut depth 14m. Fill more transparent than the surrounding sediment. Observed on seven lines.	6012SBP, 6023SBP, 6024SBP, 6038SBP, 6039SBP, 6050SBP, 6069SBP, 6085SBP, 60691SBP, 6092SBP	
7010	Cut and fill			A1		Cut approximately 4m below surface. Maximum cut depth 7m. Fill more transparent than the surrounding sediment. Observed on three lines.	6013SBP, 6037SBP, 6049SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7011	Cut and fill			A1		Cut approximately 4m below surface. Maximum cut depth 7m. Fill more transparent than the surrounding sediment. Observed on four lines.	6014SBP, 6036SBP, 6048SBP, 6070SBP	
7012	Cut and fill			A1		Cut approximately 5m below surface. Maximum cut depth 5m. Fill more transparent than the surrounding sediment. Observed on two lines.	6047SBP, 6071SBP	
7013	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found less than 1m below trough of sand wave. Found on one line.	6174SBP	
7014	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found 2.5m below trough of sand wave. Found on one line.	6109SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7015	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found on 20 lines.	6103SBP, 6107SBP, 6113SBP, 6114SBP, 6123SBP, 6128SBP, 6178SBP, 6179SBP, 6182SBP, 6184SBP, 6186SBP, 6193SBP, 6198SBP, 6199SBP, 6200SBP, 6205SBP, 6206SBP, 6208SBP, 6212SBP, 6213SBP, 6214SBP, 6215SBP, 6216SBP, 6217SBP, 6218SBP, 6219SBP, 6220SBP, 6224SBP, 6229SBP, 6230SBP, 6231SBP, 6232SBP, 6240SBP, 6249SBP, 6316SBP, 6317SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7016	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found less than 1m below trough of sand wave. Found on one line.	6177SBP	
7017	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found approximately 1.5m below trough of sand wave. Found on one line.	6176SBP	
7018	Cut and fill			A1		BTC cut 3m below trough of overlying sand waves. Maximum cut depth 5m, cuts into underlying BDK. Fill more transparent than the surrounding sediment. Observed on three lines.	6106SBP, 6185SBP, 6194SBP	
7019	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found 3m below trough of sand wave. Found on one line.	6239SBP	
7020	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found approximately 4m below trough of sand wave. Found on two lines.	6129SBP, 6238SBP	
7021	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found 2m below trough of sand wave. Found on one line.	6197SBP	
7022	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found 1.5m below trough of sand wave. Found on one line.	6131SBP	
7023	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found less than 1m below trough of sand wave. Found on two lines.	6250SBP, 6257SBP	
7024	Cut and fill			A1		Shallow channel at surface. Maximum cut depth 8m. Fill similar to surrounding sediment. Found on two lines.	6247SBP, 6248SBP, 6252SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7025	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found 1-4m below trough of sand wave. Found on seven lines.	6132SBP, 6225SBP, 6226SBP, 6235SBP, 6236SBP, 6243SBP, 6253SBP, 5323SBP	
7026	Cut and fill			A1		BTC cut below trough of overlying sand waves. Maximum cut depth approximately 4m, cuts into underlying BDK. Fill more transparent than the surrounding sediment. Observed on 26 lines.	6133SBP, 6135SBP, 6136SBP, 6137SBP, 6138SBP, 6141SBP, 6242SBP, 6244SBP, 6254SBP, 6255SBP, 6258SBP, 6260-6263SBP, 6265-70SBP, 6273SBP, 6274SBP, 6276SBP, 6278SBP, 6281SBP, 6284SBP, 6286SBP, 6321SBP, 6324SBP	
7027	Cut and fill			A1		Shallow channel close to surface. BCT into BDK. Maximum cut depth 3m. Fill similar to surrounding sediment. Found on one line.	6272SBP	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7028	Cut and fill			A1		Shallow channel 3m below surface. BCT into BDK. Maximum cut depth 3m. Fill similar to surrounding sediment. Found on one line.	6283SBP	
7029	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found up to 2.5m below trough of sand wave. Found on three lines.	6146SBP, 6290SBP, 6293SBP	
7030	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found up to 4m below trough of sand wave. Found on five lines.	6147SBP, 6288SBP, 6289SBP, 6292SBP, 6295SBP	
7031	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found up to 3.5m below trough of sand wave. Found on three lines.	6148SBP, 6291SBP, 6296SBP	
7032	High reflectivity reflector			A1		Possibly peat. Found below top Holocene sands and above BDK. Found less than 2m below trough of sand wave. Found on three lines.	6259SBP, 6264SBP, 6325SBP	
7033	Cut and fill			A1		Shallow channel at surface. Maximum cut depth 2m. Fill similar to surrounding sediment. Found on one line.	6111SBP	
7034	Unknown	388916	5905990	A1	32.6m x 25.1m x 1.3m Mag 398nT	Area of large broken debris with sonar dimensions of: length of 25m, width of 15m and height 6.5m. The area was surveyed in 1992 using Syledis and was swept clear at 12.6m, foul at 13.0m. The least E/S depth is 16.3m with a general depth of 19.9m. The scour has a depth of 0.5m.	6001, 2001	UKHO 9505

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7035	*Aquarius* (possibly)	387699	5905833	A1	33.3m x 11.6m x 1.9m Mag 236nT	This British steam trawler of 187 gross tons that was mined when proceeding from Grimsby to fishing grounds. The crew of 10 was lost. The site was surveyed in 1992 using Syledis. It was swept clear at 16.5m, foul at 17.4m. The least E/S depth is 16.3m and the general depth is 19.2m. There is no scour around the wreck. The surveyed height of the wreck is 1.9m, length 28m and width 8m. The hull and superstructure are clearly evidence on the sonar trace.	6002, 2002	UKHO 9509
7036	Clan Morrison	386046	5887236	A1	190 m x 80 m x 1.6 m Mag 12171nT	This British steam ship was mined while on passage from Southampton to Blyth on 24th February 1940. The vessel had a length of 124.7m, a beam of 16.2m and a draught of 10.1m. The vessel's gross tonnage was 5936 and the ship was in ballast when it sunk. A UKHO survey in 1992 indicated that the wreck lies in two parts and has a height of 2.6m, a length of 200m with a width of 60m.	6003, 2003	UKHO 9252 NMR 907575
7037	Unknown	385965	5887063	A1	4.1m x 2.1m x 2.5m	This wreck was surveyed by the UKHO in 1992 and has a general depth of 21.4m with no scour. The length is 100m, width 50m and it lies at 300/120 degrees.	6004, 2004	UKHO 9514 NMR 892343
7038	Algarve	386289	5887009	O1		British steam ship of 1355 gross tons, built in 1921 by Frederikshavns Vaeft & Flydedok, Frederikshaven and owned at time of loss by the Ministry of Shipping. The vessel was 77.7m long, 11.3m wide with a draft of 4.9m. The ship was on passage from London for Leith carrying a general cargo when it was torpedoed and sunk by E-boats. 27 men were lost. A UKHO survey in 1992 indicated that the wreck has a general depth of 21.5m, with scour depth of 0.2m. The wreck is 60m in length, with a width of 25m and a height of 2.2m.	6005, 2005	UKHO 9249 NMR 907572

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7039	Westland	385714	5884753	O1		This Dutch steam ship was built in 1906 by Werf V/H Rijkee & Co, Rotterdam. At the time of loss, the vessel was owned by Scheepvaart-en Steenkolen. The vessel was carrying a cargo of coal and was torpedoed and sunk. The vessel was 1283 gross tons, with a length of 70.4m, a beam of 10.4m and a draught of 4.6m. A UKHO survey in 1992 indicated a wreck with a general depth of 21.4m and a scour depth of 0.2m. The sonar height was 3m, length 60m with a width of 25m.	6006, 2006	UKHO 9237 NMR 9237
7040	Unknown	383369	5883155	O1		A UKHO survey in 1992 indicated a vessel with a general depth of 26m, a height of 2.8m, length of 60m and a width of 30m.	6007, 2007	UKHO 9226 NMR 892343
7041	Unknown	384184	5881851	O1		Area of debris surveyed by UKHO in 1992. The area has a general depth of 21.3m and a scour depth of 0.2m. The shadow height is 2.2m and it has a length of 35m and a width of 20m.	6008, 2008	UKHO 9222 NMR 892333
7042	Unknown	381247	5877473	O1		This wreck was located in 1983 and is lying on its side, intact and partially buried. A UKHO survey in 1992 indicated a wreck with a general depth of 15.4m and a scour depth of 3.1m. The sonar shadow height was 0.7m, length 80m and a width of 28m.	6009, 2009	UKHO 9399
7043	Francois Trixier	378155	5873484	O1		The MV Francois Trixier sunk in 1948. A UKHO survey in 1992 indicated a wreck with a sonar shadow height of 1.5m, a length of 80m and a width of 30m.	6010, 2010	UKHO 10639 NMR 907511 / 927590

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7044	Rosalie (Possibly)	374750	5868441	O1		The 4248 gross ton British Collier was built in 1914 by W. Grey and Co. Ltd, West Hartlepool. The vessel was 114.6m with a beam of 15.8m and a draught of 7.3m. At the time of loss, the vessel was carrying ballast and was owned by the New Ruperra Steam Shipping Co. The ship was on passage from the Tyne for San Francisco when it was torpedoed by UB-11. It was anchored and later beached at Weybourne, Norfolk. A UKHO survey in 1978 indicated superstructure and plates spread over a large area with four boilers in the centre. The scour was 2ft deep on the SE side. It 1982 it was noted that the mast was visible during most states of tide.	6011, 2011	UKHO 10616
7045	Unknown	387285	5889399	O1		A sinking position was recorded in 1940, however a UKHO survey in 1992 found nothing other than peculiarly shaped sand ridges. The record was amended to dead.	6012, 2012	UKHO 9257
7046	Debris	391258	5899468	A2	3.2m x 0.4m x 0.2m		6013	
7048	Debris	391470	5899175	A2	8m x 0.6m x 0.3m		6015	
7049	Debris	389428	5900810	A2	5m x 1.2m x 0.1m	Debris or possibly disturbed sediment	6016	
7050	Debris	388578	5901760	A2	1.8m x 0.9m x 0.4m	Debris or possible boulder	6017	
7051	Debris	391585	5899174	A2	1.1m x 0.2m x 0.2m	Debris or possible boulder	6018	
7052	Debris	391776	5899143	A2	1.9m x 0.9m x 0.5m		6019	
7054	Debris	395257	5896556	A2	1.5m x 0.4m x 0.5m	Debris or possible geology	6021	
7055	Linear	395141	5896666	A2	4.5m x 0m x 0m	Linear object with associated debris lying 5m away	6022	
7056	Seabed disturbance	393029	5898410	A2	3.5m x 0.3m x 0.2m		6023	
7057	Debris	391773	5899457	A2	2.6m x 1.4m x 0.3m		6024	
7058	Debris	391550	5899605	A2	3.7m x 1.2m x 0.3m	Object in area of disturbed sediment	6025	
7059	Debris	388966	5901709	A2	1.9m x 0.4m x 0.2m	Debris or possible boulder	6026	
7060	Debris	387278	5903122	A2	1.6m x 0.6m x 0.5m	Debris or possible boulder	6027	
7061	Debris	387549	5902953	A2	3.1m x 1.7m x 0.6m	Possibly more than one object	6028	
7062	Debris	390440	5900425	A2	4m x 1.1m x 0.2m		6029	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7063	Debris	390059	5901035	A2	3m x 1.3m x 0.1m	Debris or possible boulder	6030	
7064	Debris	388341	5902244	A2	2.1m x 0.5m x 0.4m	Debris or possible boulder; adjacent to several other boulders	6031	
7065	Debris	388309	5902435	A2	2.4m x 0.9m x 0.2m	Debris or possible boulder/sediment	6032	
7066	Debris	389929	5901262	A2	2.5m x 0.8m x 0.2m		6033	
7067	Debris	387074	5903430	A2	1.1m x 0.3m x 0.1m		6034	
7068	Debris	389015	5902146	A2	4.6m x 1.5m x 0.3m	Debris or possible sediment disturbance	6035	
7069	Linear	391797	5899663	A2	19.4m x 0.9m x 0.2m	Possible wire / rope	6036	
7070	Linear	389195	5902045	A2	17.8m x 0.9m x 0.1m	Possible wire / rope	6037	
7071	Debris	389091	5902239	A2	3.9m x 1.2m x 0.5m		6038	
7072	Linear	389514	5901860	A2	6.4m x 0.7m x 0m	Possible wire / rope	6039	
7073	Debris	392750	5899389	A2	3.8m x 0.7m x 0.1m		6040	
7074	Debris	389206	5902251	A2	1.5m x 0.5m x 0.3m		6041	
7075	Debris	393714	5898704	A2	3.6m x 0.6m x 0.2m		6042	
7076	Debris	392689	5899561	A2	2.6m x 0.6m x 0.5m		6043	
7077	Debris	389383	5902256	A2	4.8m x 0.8m x 0.5m		6044	
7078	Debris	387820	5903394	A2	3.4m x 0.4m x 0.3m		6045	
7079	Debris	389035	5902628	A2	1.5m x 0.7m x 0.4m	Debris or possible boulder; next to several other boulders	6046	
7080	Debris	393960	5898764	A2	3.1m x 0.4m x 0.3m		6047	
7081	Linear	389430	5902282	A2	4.1m x 0.7m x 0.2m		6048	
7082	Debris	392866	5899530	A2	6.6m x 1.5m x 0.5m	Debris or possible seabed disturbance; close to several boulders	6049	
7083	Wreck	395481	5897503	A1	25.9m x 7.5m x 0.4m Mag 28nT		6050	
7084	Debris	395361	5897600	A2	7.1m x 4.4m x 0m		6051	
7085	Debris	395421	5897742	A2	8.5m x 4.2m x 0.2m		6052	
7086	Debris	390867	5901459	A2	2.6m x 0.4m x 0.3m		6053	
7087	Debris	392971	5899620	A2	4.2m x 1.5m x 0.9m		6054	
7088	Debris	387543	5904417	A2	3.9m x 1.6m x 0m		6055	
7089	Debris	394248	5899119	A2	2.8m x 0.9m x 0.3m		6056	
7090	Debris	393544	5899765	A2	2.4m x 2.1m x 0.8m	Debris or possible large boulder	6057	

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7091	Debris	388362	5904056	A2	4.5m x 1.2m x 0.2m		6058	
7092	Debris	392457	5900772	A2	2.6m x 0.9m x 0.3m		6059	
7093	Debris	393061	5900210	A2	1.7m x 0.5m x 0.2m		6060	
7094	Debris	391386	5901570	A2	3.7m x 1.2m x 0.3m		6061	
7095	Debris	388669	5903766	A2	4m x 1m x 0.3m	Possibly longer	6062	
7096	Debris	387955	5904510	A2	6m x 1.1m x 0.3m		6063	
7097	Debris	394030	5899746	A2	2.4m x 0.5m x 0.5m	Debris or possible boulder	6064	
7098	Debris	389128	5903593	A2	5.3m x 0.8m x 0.2m		6065	
7099	Linear	390661	5902414	A2	7.8m x 0.3m x 0.3m	Possible	6066	
7100	Debris	391218	5902112	A2	3.3m x 1.6m x 1m		6067	
7101	Debris	392907	5900593	A2	2.3m x 0.7m x 0.4m	Debris or possible boulder	6068	
7103	Debris	393335	5900311	A2	2.6m x 1.2m x 0.4m		6070	
7104	Debris	392323	5901408	A2	15m x 12m x 0.2m	Debris or area of disturbed sediment	6071	
7105	Debris	393454	5900516	A2	7.1m x 1.2m x 0.4m	Debris or area of disturbed sediment	6072	
7106	Linear	394940	5899325	A2	4.5m x 0.3m x 0.1m		6073	
7107	Debris	387348	5905734	A2	11m x 0.5m x 0m		6074	
7108	Debris	392813	5901393	A2	3.5m x 0.9m x 0.4m		6075	
7109	Debris	394294	5900610	A2	3.9m x 1.3m x 0.4m		6078	
7110	Debris	390894	5903471	A2	3.1m x 0.8m x 0.4m		6079	
7111	Debris	394118	5901115	A2	3.7m x 0.4m x 0.4m		6080	
7112	Debris	389740	5904805	A2	4.1m x 0.9m x 0.4m		6081	
7113	Debris	390420	5904400	A2	5.9m x 0.5m x 0.3m		6082	
7114	Debris	393573	5901712	A2	1.5m x 0.6m x 0.3m		6083	
7115	Debris	387981	5906479	A2	2.3m x 0.6m x 0.2m		6084	
7116	Debris	388667	5906028	A2	2.6m x 0.6m x 0.3m		6085	
7117	Debris	390599	5904261	A2	4.3m x 1.2m x 0.4m	Debris or area of disturbed sediment	6086	
7118	Debris	390170	5904696	A2	2.5m x 0.8m x 0.2m		6087	
7119	Debris	388960	5906109	A2	1.5m x 0.3m x 0.4m		6088	
7120	Debris	396050	5900465	A2	1.4m x 0.3m x 0.3m		6089	
7121	Debris	390729	5904807	A2	10.9m x 5.3m x 0.2m	Circular feature; debris or sediment	6090	
7122	Debris	390058	5905343	A2	4.4m x 0.6m x 0.3m		6091	
7123	Debris	389996	5905288	A2	9.7m x 0.4m x 0.2m	linear object	6092	

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7124	Debris	388337	5906834	A2	4.1m x 0.7m x 0.4m		6093	
7125	Debris	390276	5905259	A2	3.8m x 1.5m x 0.2m	Debris or area of disturbed sediment	6094	
7126	Debris	395971	5900582	A2	1.9m x 0.6m x 0.2m		6095	
7127	Linear	392713	5903363	A2	12.9m x 0.4m x 0.1m		6096	
7128	Debris	390129	5905575	A2	4.7m x 1.8m x 0.3m	Debris or area of disturbed sediment	6097	
7129	Debris	390376	5905176	A2	7m x 1.2m x 0.1m	Debris or area of disturbed sediment	6098	
7130	Debris	395117	5901451	A2	2.7m x 0.5m x 0.6m		6099	
7131	Debris	396057	5900683	A2	3.7m x 0.5m x 0.2m		6100	
7132	Debris	395124	5901450	A2	5.4m x 2.3m x 0.5m		6101	
7133	Debris field	393302	5903097	A2	23.4m x 15.3m x 0m	Several pieces of debris, some linear	6102	
7134	Debris	389317	5906101	A2	1.7m x 0.4m x 0.4m		6103	
7135	Debris	388295	5907099	A2	3.4m x 0.3m x 0.5m	Debris or area of disturbed sediment	6104	
7136	Debris	387869	5907425	A2	4.4m x 1.6m x 0.3m		6105	
7137	Debris	396148	5900963	A2	7.2m x 0.5m x 0.3m	Debris or area of disturbed sediment	6106	
7138	Debris	392026	5904232	A2	16.4m x 14.1m x 0.3m	Patch of low reflectivity, possible mound	6107	
7139	Debris	388763	5906792	A2	3.1m x 0.5m x 0.5m	Area of disturbed sediment	6108	
7140	Debris	395504	5901418	A2	7.1m x 0.8m x 0.5m		6109	
7141	Debris	389020	5907006	A2	2.9m x 3.2m x 0.6m		6110	
7142	Debris	389433	5907124	A2	22.6m x 14m x 2.8m	Debris or sediment mound	6111	
7143	Debris	395993	5901937	A2	29m x 19m x 5.1m	Debris or sediment mound	6112	
7144	Debris	394984	5903230	A2	22m x 15.4m x 5.4m	Debris or sediment mound	6113	
7145	Debris	393542	5904494	A2	2.1m x 0.5m x 0.3m		6114	
7146	Debris	392178	5904526	A2	2.5m x 1.7m x 0.3m		6115	
7147	Debris	391554	5903959	A2	1.9m x 0.9m x 0.4m		6116	
7148	Debris	391452	5903609	A2	1.5m x 1.2m x 0.3m		6117	
7149	Debris	388446	5906215	A2	2.2m x 0.8m x 0.7m	Debris or possible boulder	6118	
7150	Debris	389002	5906984	A2	2m x 0.6m x 0.6m		6120	
7151	Debris	391290	5899301	A2	2.2m x 1m x 0.4m		6121	
7152	Debris	383892	5882332	A2	2.5m x 0.3m x 1.2m	Linear contacts / reflectors	6122	
7153	Debris	388870	5894033	A2	2.3m x 1.4m x 0.6m	Strange shape; adjacent to several more contacts	6123	
7154	Debris	388932	5894006	A2	2m x 0.7m x 0.2m		6124	

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7155	Debris	388961	5894081	A2	3.8m x 1m x 0.2m Mag 25nT		6125	
7156	Debris	388377	5893259	A2	6.9m x 1.8m x 0.3m Mag 9nT	Distorted by tugging; possibly manmade	6126	
7157	Debris	388108	5892500	A2	1.1m x 0.4m x 0.2m	Debris or possible boulder	6127	
7158	Debris	387995	5892307	A2	2m x 0.6m x 0.3m	Debris or possible boulder, close to some more smaller boulders	6128	
7159	Debris	387969	5892084	A2	1.7m x 0.7m x 0.6m	Debris or possible boulder	6129	
7160	Debris	385967	5887669	A2	4m x 0.3m x 0.2m	Two linear objects -possible pole	6130	
7161	Debris	385460	5886580	A2	11.8m x 1.5m x 0.5m	Linear anomaly	6131	
7162	Debris	374812	5871937	A2	3.6m x 3.4m x 0.1m	Possible anchor	6132	
7163	Debris field	374507	5870729	A2	37m x 15.6m x 0m		6133	
7164	Debris	381749	5877686	A2	9.2m x 8.3m x 3.2m	Circular mound with height; debris or sediment	6134	
7165	Debris	377008	5873899	A2	5.6m x 0.2m x 0.1m	Linear debris	6135	
7166	Debris	374707	5872363	A2	8.4m x 6.9m x 0.1m	Debris or disturbed seabed/different sediment type	6136	
7167	Seabed disturbance	376423	5873644	A2	7.1m x 10.5m x 0.3m	Area of low reflectivity	6137	
7168	Linear	380087	5875317	A2	6m x 0m x 0m		6138	
7169	Debris	381775	5876884	A2	1.4m x 0.7m x 0.4m	Debris or possible boulder	6139	
7170	Debris	381153	5876133	A2	1.3m x 0.5m x 0.4m	Close to smaller contact	6140	
7171	Seabed disturbance	377486	5873694	A2	16.8m x 14m x 0m Mag 36nT		6141	
7172	Debris	374942	5871697	A2	2.6m x 1.7m x 0.6m	Debris or possible boulder	6142	
7173	Debris	383970	5883160	A1	47.6m x 17.4m x 0.2m	Possible large debris or wreck with associated debris field	6143	
7174	Debris	383756	5882558	A2	1m x 0.6m x 0.3m		6144	
7175	Debris field	383970	5883170	A2	107.8m x 0m x 0	Possible debris field associated with possible large debris	6145	
7176	Debris	384639	5884469	A2	6.7m x 0.7m x 0.2m	Possible	6146	
7177	Linear	385320	5886433	A2	6.1m x 0.4m x 0.1m		6147	
7178	Debris	385481	5886605	A2	1.4m x 1.1m x 0.4m		6148	
7179	Debris	385671	5887303	A2	1.9m x 0.9m x 0.3m	Debris or area of disturbed sediment	6149	

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7180	Linear	385805	5887555	A2	5.8m x 0.4m x 0.1m		6150	
7181	Debris	386585	5889110	A2	12.1m x 4.7m x 0.5m	Patch of debris	6151	
7182	Debris	387488	5891379	A2	2.6m x 0.5m x 0.3m		6152	
7183	Debris	388065	5892602	A2	2.9m x 1m x 0.4m	Debris or possibly large boulder within area of scattered boulders	6153	
7184	Linear	390295	5898994	A2	4.1m x 0.7m x 0.2m	Debris or area of disturbed sediment	6154	
7185	Debris	390365	5899485	A2	3.6m x 1.5m x 0.6m	Debris or area of disturbed sediment	6155	
7186	Debris	389003	5894748	A2	3.1m x 0.3m x 0.1m		6156	
7187	Debris	386307	5888851	A2	1.9m x 0.6m x 0.5m		6157	
7188	Debris field	385033	5885839	A2	57 m x 10.6m x 0m Mag 20nT	Debris over wide area with several linear contacts	6158	
7189	Debris	387799	5892187	A2	71m x 7m x 3.1m	Large area of disturbed sediment with numerous linear contacts which are not obviously connected	6159	
7190	Debris	388434	5892655	A2	7.1m x 4.1m x 0.4m	Debris or possible sediment mound	6160	
7191	Linear	387283	5890287	A2	3.6m x 0.3m x 0.2m		6161	
7192	Debris	387259	5890094	A2	3.6m x 0.5m x 0.2m		6162	
7193	Wreck	384686	5884093	A1	20.9m x 9.5m x 0.4m		6163	
7194	Debris	385564	5885940	A2	8.3m x 0.9m x 0.4m	Possibly linear	6164	
7195	Debris	387571	5890550	A2	12.6m x 0.5m x 0.3m	Debris or area of disturbed sediment	6165	
7196	Debris	388213	5892270	A2	5.5m x 1.9m x 0.6m		6166	
7197	Debris	389012	5893757	A2	3.9m x 0.6m x 0.1m		6167	
7198	Debris	390814	5899375	A2	2.7m x 2.8m x 0.2m	Debris or area of disturbed sediment	6168	
7199	Debris	390826	5899077	A2	6.4m x 2.5m x 0.1m	Debris or sediment mound	6169	
7200	Debris	390804	5899066	A2	6.5m x 2.1m x 0.3m	Debris or sediment mound	6170	
7201	linear	389131	5894188	A2	6.1m x 0.2m x 0.1m		6171	
7202	Debris	389086	5894044	A2	6.6m x 4.9m x 0.1m Mag 28nT	Debris or area of disturbed sediment	6172	
7203	Debris	388347	5892304	A2	2.9m x 0.9m x 0.3m	Debris or possible large boulder	6173	
7204	Debris	387153	5889668	A2	3.2m x 0.4m x 0.3m	Debris or possible boulder	6174	
7205	Debris	385008	5884727	A2	7m x 0.3m x 0.1m		6175	
7206	Debris	384115	5882504	A2	2.7m x 1.1m x 0.3m Mag 81nT		6176	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7207	Magnetic	388719	5902558	A2	8.57nT		6177	
7208	Magnetic	392382	5899660	A2	12.97nT		6178	
7209	Magnetic	389762	5902865	A2	58.89nT		6179	
7210	Magnetic	391634	5902305	A2	290.08nT		6180	
7211	Magnetic	392309	5901755	A2	129.39nT		6181	
7212	Magnetic	390997	5903050	A2	6.05nT		6182	
7213	Magnetic	392789	5901633	A2	8.7nT		6183	
7214	Magnetic	395722	5899535	A2	20.76nT		6184	
7217	Magnetic	377792	5873960	A2	25.59nT		6187	
7218	Magnetic	382530	5878510	A2	11.93nT		6188	
7219	Magnetic	381105	5875760	A2	12.44nT		6189	
7220	Magnetic	382655	5879785	A2	11.65nT		6190	
7221	Magnetic	382715	5879935	A2	12.47nT		6191	
7222	Magnetic	383280	5881135	A2	24.9nT		6192	
7223	Magnetic	383243	5881048	A2	20.2nT		6193	
7224	Magnetic	383978	5883023	A2	11.55nT		6194	
7225	Magnetic	384475	5884240	A2	11.34nT		6195	
7226	Magnetic	389936	5897575	A2	9.77nT		6196	
7227	Magnetic	389953	5897643	A2	6.52nT		6197	
7228	Magnetic	389871	5897613	A2	5.31nT		6198	
7229	Magnetic	390051	5898015	A2	14.67nT		6199	
7230	Magnetic	389548	5895658	A2	52.38nT		6200	
7231	Magnetic	389633	5895603	A2	11.35nT		6201	
7232	Magnetic	389738	5895705	A2	15.23nT		6202	
7233	Magnetic	388633	5894015	A2	19.24nT		6203	
7234	Magnetic	388288	5892120	A2	14.47nT		6204	
7235	Magnetic	390833	5900498	A2	11.69nT		6205	
7236	Magnetic	390961	5899815	A2	16.97nT		6206	
7237	Magnetic	385230	5886275	A2	10.4nT		6207	
7238	Magnetic	383573	5881385	A2	16.51nT		6208	
7239	Magnetic	383553	5881345	A2	17.18nT		6209	
7240	Magnetic	383625	5881338	A2	16.68nT		6210	

WAID	Name / Classification	UTM E	UTM N	Code	Dimensions	Notes / Description	Source	UKHO / NMR ID
7241	Magnetic	387558	5890815	A2	15.75nT		6211	
7242	Magnetic	387691	5891118	A2	17.53nT		6212	
7243	Magnetic	380260	5875465	A2	40.22nT		6213	
7244	Magnetic	379340	5874935	A2	10.97nT		6214	
7245	Magnetic	384048	5882378	A2	594.68nT		6215	
7246	Magnetic	384560	5883625	A2	17.12nT		6216	
7247	Magnetic	385058	5884838	A2	17.07nT		6217	
7248	Magnetic	382690	5879695	A2	8.83nT		6218	
7249	Magnetic	382758	5879850	A2	6.14nT		6219	
7250	Magnetic	390791	5899238	A2	7.53nT		6220	
7251	Magnetic	388333	5892960	A2	18.62nT		6221	
7252	Magnetic	390471	5899215	A2	7.93nT		6222	
7253	Magnetic	374514	5870478	A2	66.84nT		6223	
7254	Magnetic	388238	5892570	A2	24.6nT		6224	
7255	Magnetic	376092	5873335	A2	7.76nT		6225	
7256	Magnetic	390066	5897745	A2	8.23nT		6226	
7257	Magnetic	387373	5890988	A2	12.58nT		6227	
7258	Magnetic	384088	5883083	A2	6.16nT		6228	
7259	Magnetic	390558	5900083	A2	3.73nT		6229	

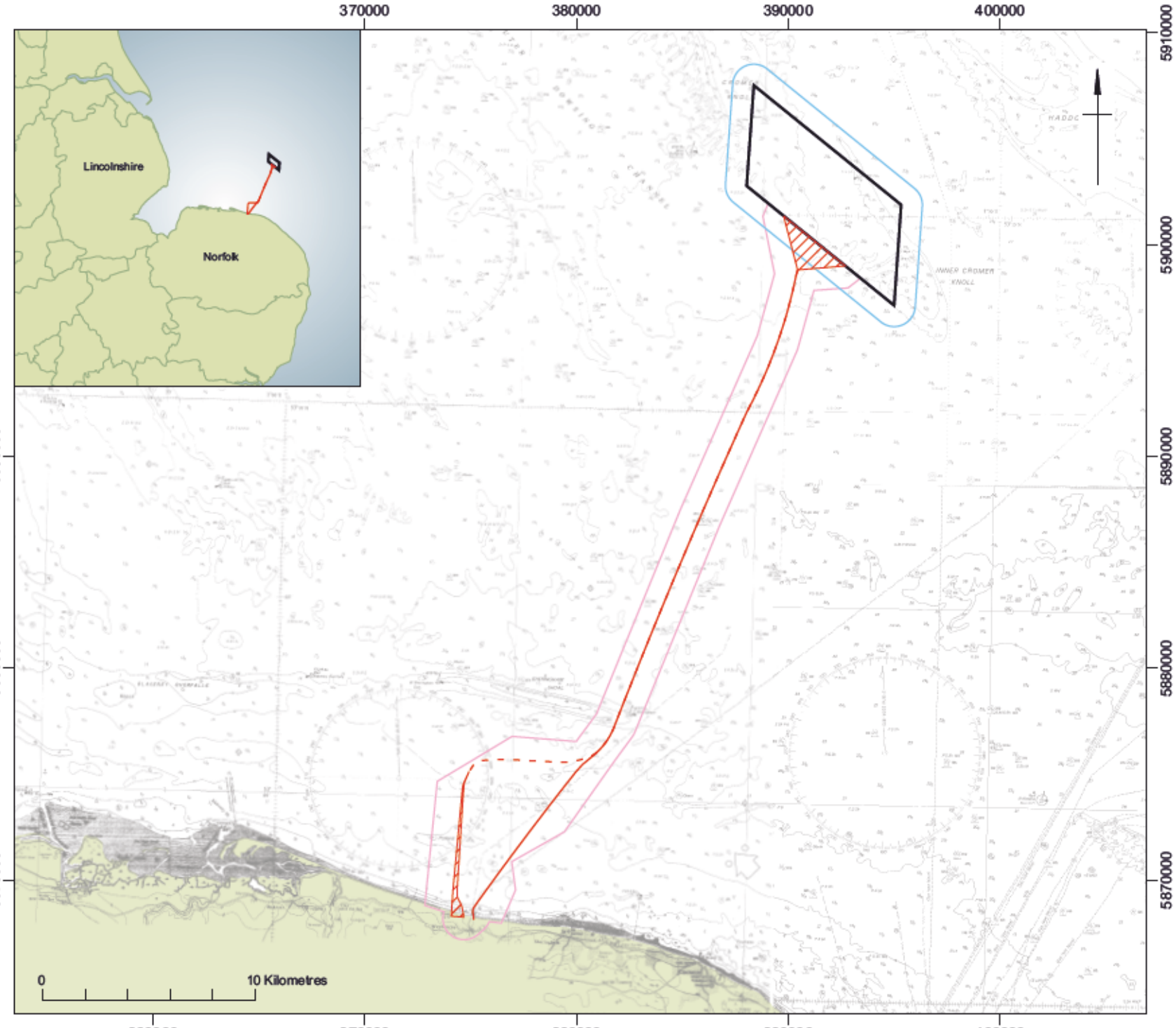
Note:
A1: Anthropogenic origin of archaeological interest
A2: Uncertain origin of possible archaeological interest
O1: Outside geophysical footprint

APPENDIX III: DOCUMENTED LOSSES IN THE MARINE STUDY AREA

				Named Location Coordinates	
NMR ID	**Name**	**Description**	**Period**	**UTM Zone 31N Easting**	**UTM Zone 31N Northing**
1383875		1671 wreck of craft which stranded on the Norfolk coast in the vicinity of Salthouse and Runton; a wooden sailing vessel.	pre 1700	374482	5868756
1385932	Ann	1762 wreck of English cargo vessel which stranded near Salthouse en route from London in ballast; a wooden sailing vessel.	1701-1800	374482	5868756
927484	Rye	British Sixth Rate Ship of the Line, 1744. The wrecking was blamed on the pilot, John Weller, who underestimated the tide. He was condemned to lose one year's pay and serve three months in Marshalsea prison, but the sentence was relented, because the pilot was elderly and blind in one eye. The ship's master was also criticised for not objecting to the pilot's actions and for failing to inform the captain when the course was changed (Larn and Larn, 1997).	1701-1800	374482	5868756
1355793	Fortune	1762 wreck of English cargo vessel which stranded at Weybourne after sinking offshore; a wooden sailing vessel.	1701-1800	374004	5872106
1217311	Good Intent	British craft, 1793. This wooden sailing vessel en-route from Ostend is recorded as having wrecked on Weybourne Beach.	1701-1800	374482	5868756
1320832		Passenger vessel, 1770	1701-1800	374482	5868756
1315933		1829 wreck of English billyboy which capsized and foundered off Weybourne. Constructed of wood, she was a sailing vessel.	1801-1850	374004	5872106
1344109	Neptune	This wooden sailing vessel was driven on shore during a violent gale while en route from Scheidam on 14 April 1815.	1801-1850	374482	5868756
1351034	Expedition	English cargo vessel, 1823	1801-1850	374482	5868756
1351091	Ann	Craft, 1823.	1801-1850	374482	5868756
1339622	James	On 9 October 1804, this English wooden sloop wrecked near Holt while en-route from Newcastle-upon-Tyne to Rochester. The vessel was carrying a cargo of coal.	1801-1850	374482	5868756

				Named Location Coordinates	
NMR ID	**Name**	**Description**	**Period**	**UTM Zone 31N Easting**	**UTM Zone 31N Northing**
927950	Bee	This English schooner was stranded and lost in wind conditions ENE Force 8 on 9 April 1868. The vessel was built in Hull in 1837 and was owned by Lowther & Co. The vessel was carrying a cargo of superphosphate.	1851-1900	374482	5868756
1348446	Ida	Norwegian barque built in 1875 in Thorstensen, Christiansand. The vessel was owned by Jorgensen, Christiansand, Norway, when it was stranded and lost in wind conditions ENE force 8 while en-route from Christiansand to Cardiff 22 February 1893. At the time of loss, the vessel was carrying a cargo of wood.	1851-1900	374482	5868756
928016	Arethusa	This wooden sloop was built in 1852 in Leeds and was owned by France, W. Goole. At the time of loss, the vessel was en-route from London to Goole carrying a cargo of manure (patent). The cause of sinking is unknown, although the vessel is believed to have foundered at anchor possibly as a result of stress of weather due to wind conditions ENE force 9. The vessel was lost 14 April 1876.	1851-1900	374004	5872106
1348665	Majestic	This English dandy was en-route from the fishing grounds returning to Great Yarmouth when it foundered and was lost in heavy weather on 12 February 1894. The vessel, built in 1878, was owned by Hewett & Co Ltd., London.	1851-1900	374004	
1348674	Wellesley	This English fishing vessel was en-route from the fishing grounds returning to Great Yarmouth when it foundered and was lost on 13 February 1894. The iron fishing trawler (ss) was built in 1865 and was owned by Hewett & Co Ltd., London.	1851-1900	374004	5872106
1348669	Precursor	This English iron fishing trawler (ss) was built in 1878. It was owned by Hewett & Co Ltd., London and was en-route from the fishing grounds returning to London when it foundered and was lost in wind conditions WNW Force 10 on 12 February 1894.	1851-1900	374004	5872106
929120	St Francois	French dandy, 1916. This vessel was en-route from Gravelines to Newcastle-upon-Tyne when it stranded on Weybourne beach on 28 March 1916 while carrying bone dust. This wooden sailing vessel was built in 1896 and had a gross tonnage of 59.	1914-1918	374482	5868756
927590	Rosalie	Welsh cargo vessel, 1915 (see Appendix II for additional detail).	1914-1918	374482	5868756

				Named Location Coordinates	
NMR ID	**Name**	**Description**	**Period**	**UTM Zone 31N Easting**	**UTM Zone 31N Northing**
929104	Vera	The *Vera* was a steel steamship that was carrying coal when it foundered and was lost after a collision with the mine-sweeper HMS *Parthian* on 15 November 1914. The vessel had been built in 1891 by Turnbull and Son, Whitby and was owned by W Coupland and Co. at the time of loss. The vessel measured 88.21m by 11.63m with a depth of 5.96m. The vessel had been en-route from South Shields to Leghorn at the time of sinking.	1914-1918	374004	5872106
1329573	Tiger Moth MK II N6719	British trainer, 1942	1939-1945	374004	5872106
1352765	Queen Bee V4797	British target, 1941	1939-1945	374482	5868756
1352748	Queen Bee V4757	British target, 1941	1939-1945	374482	5868756
1352754	Queen Bee V4755	British target, 1941	1939-1945	374482	5868756
1328084	Queen Bee L7760	British target aircraft, 1941	1939-1945	374004	5872106
1327800	Queen Bee L5894	British target aircraft, 1941	1939-1945	374004	5872106
1328682	Queen Bee N1847	British target aircraft, 1939	1939-1945	374004	5872106
1321723	Queen Bee P4780	British target aircraft, 1941	1939-1945	374004	5872106
1328672	Queen Bee N1846	British target aircraft, 1939	1939-1945	374004	5872106
1328669	Queen Bee N1844	British target aircraft, 1939	1939-1945	374004	5872106
1401901	Heinkel HE111H-E (5683) V4+HK	1941 wreck of a German Heinkel He111 which was shot down and crashed 1.5 miles off Ingoldmells Point. It was part of Squadron 2/KG1.	1939-1945	390195	5894892



Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105, 106 and 108 (dated 2008, 2006 and 2000)

Title:
Study area

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:		
22/05/09	1:250,000		
Figure:	Drawn:	Rev.:	
1	KJB	3	

Wessex Archaeology

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370000 380000 390000 400000 410000

5900000 5890000 5880000 5870000

DUDGEON SHOALS
DOWSING CHANNEL
CROMER KNOLL
HADDOCK BANK
INNER CROMER KNOLL
SHERINGHAM SHOAL
Pollard

0 5 Kilometres

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Geophysical interpretation limits

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105, 106 and 108
(dated 2008, 2006 and 2000)

Title:
Maximum extent of geophysical interpretation limits

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
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Figure:	Drawn:	Rev.:
2	KJB	4

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370000 380000 390000 400000 410000

5900000 5890000 5880000 5870000

DUDGEON SHOALS
DOWSING CHANNEL
CROMER KNOLL
HADDOCK BANK
INNER CROMER KNOLL
SHERINGHAM SHOAL
Pollard

0 5 Kilometres

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Sand wave Coverage

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105, 106 and 108
(dated 2008, 2006 and 2000)

Title:
Sand Wave Coverage

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:150,000

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3	KJB	2

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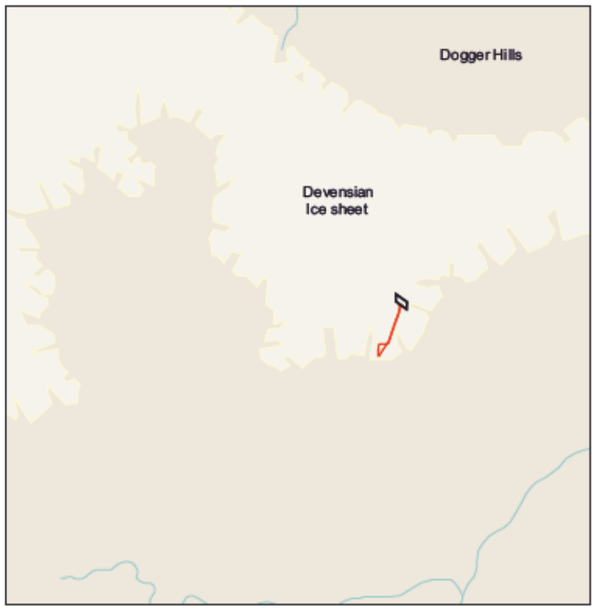
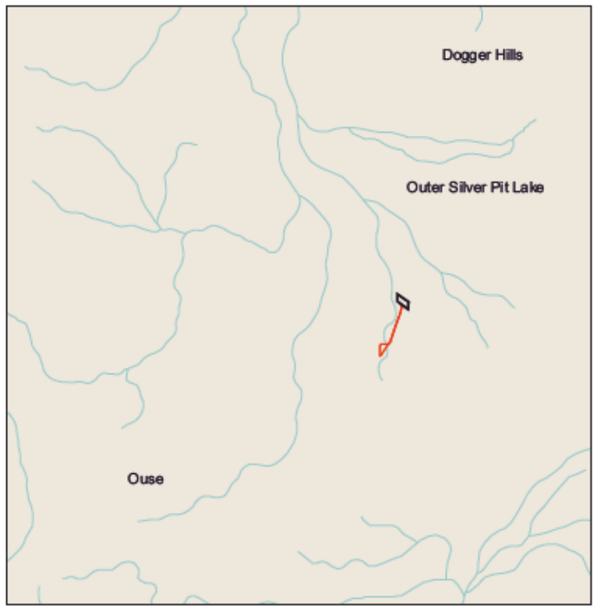
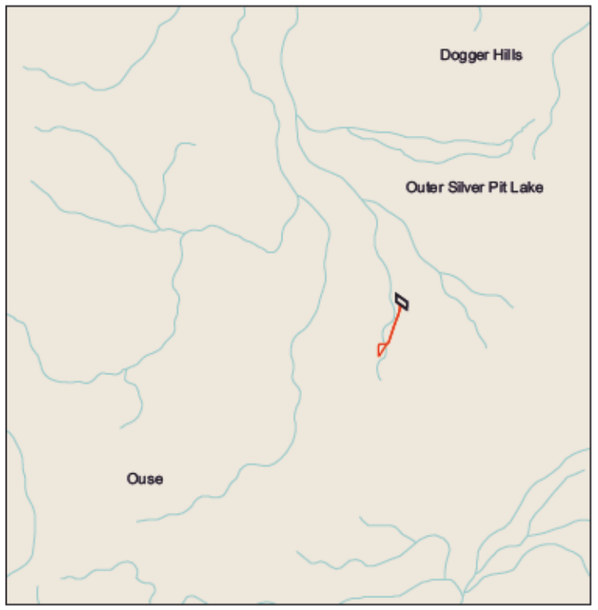


18,000BP



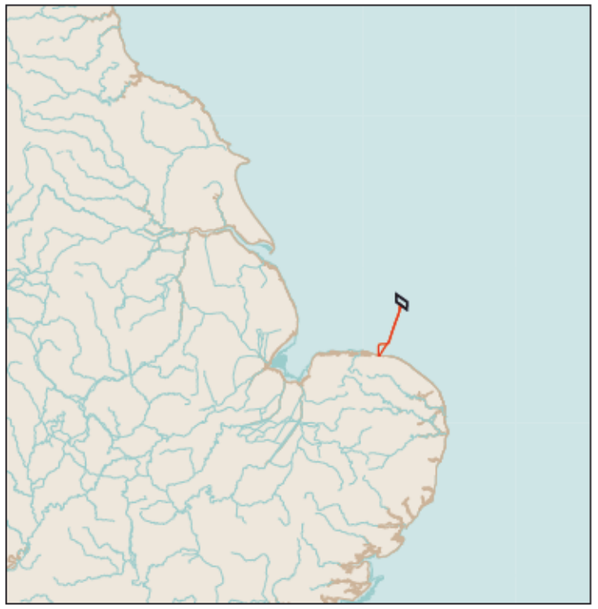
16,000BP



13,000BP

10,000BP

5,000BC



Current coastline

0 100 200 Kilometres

Key:

- Dudgeon Offshore Wind Farm
- Export Cable Route

Drawing projection: OSGB National Grid

Title:
Glaciation and sea level changes in the UK

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:4,000,000

Figure:	Drawn:	Rev.:
4	KJB	3

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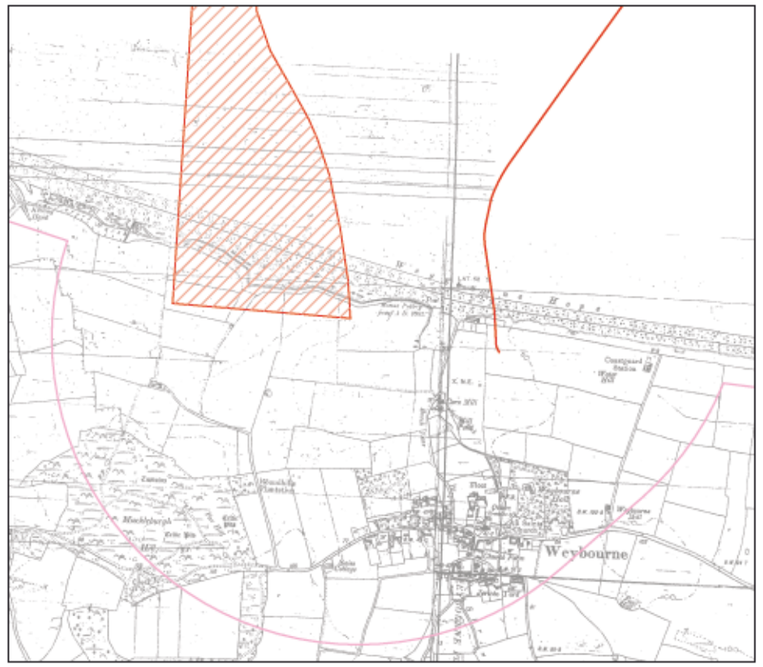
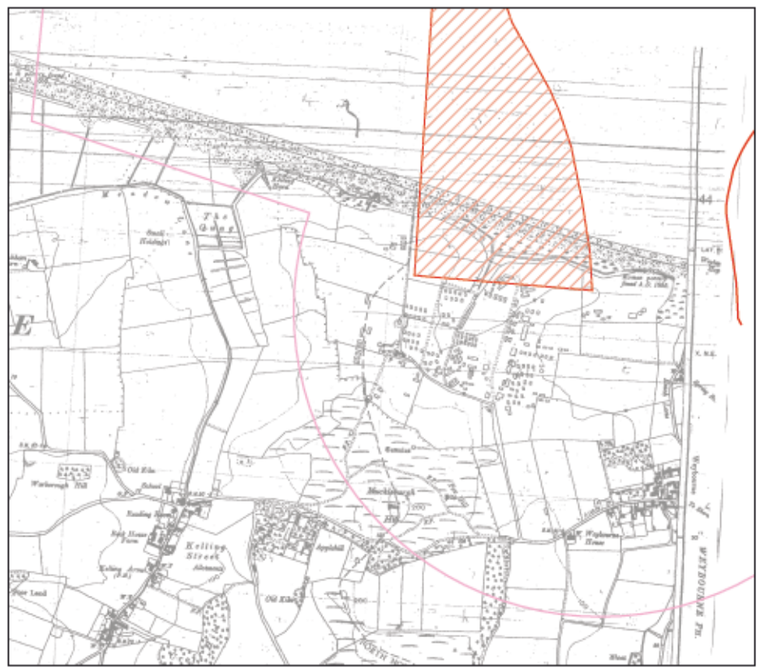
A. 1889-90 Ordnance Survey map



B. 1907 Ordnance Survey map

C. 1929 Ordnance Survey map

D. 1938 Ordnance Survey map



E. 1950 Ordnance Survey map

Key:
- Export Cable Route (eastern landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas

Drawing projection: UTM WGS84 z31N

Title:
Historic maps at the landfall

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:20,000

Figure:	Drawn:	Rev.:
5	KJB	3

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380000

390000

400000

5900000

5890000

DOWSING

CHANNEL

CROMER KNOLL

INNER CROMER KNOLL

1°30'E

53°15'N

0 5 Kilometres

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- SSS/Magnetic anomaly - wrecks/debris field
- SSS/Magnetic anomaly
- Outside geophysical footprint
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
SSS / Magnetic Anomalies and SBP Features - north

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:80,000

Figure:	Drawn:	Rev.:
6	KJB	3

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370000 380000 390000

5880000

5870000

Key:

- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- SSS/Magnetic anomaly - wrecks/debris field
- SSS/Magnetic anomaly
- Outside geophysical footprint
- SBP features: cuts and fills

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 106 and 108
(dated 2006 and 2000)

Title:
SSS / Magnetic Anomalies and SBP Features - south

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:80,000

Figure:	Drawn:	Rev.:
7	KJB	3

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0 5 Kilometres

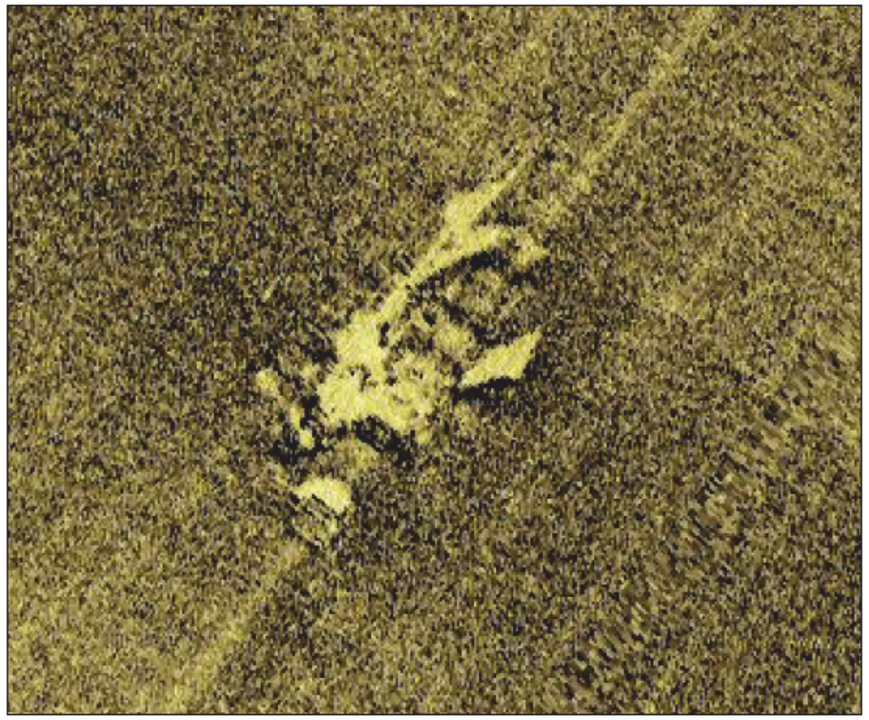


Plate 1: Site 7034: Area of large broken debris measuring 32.6m x 25.1m x 1.3m and 398nT magnetic anomaly

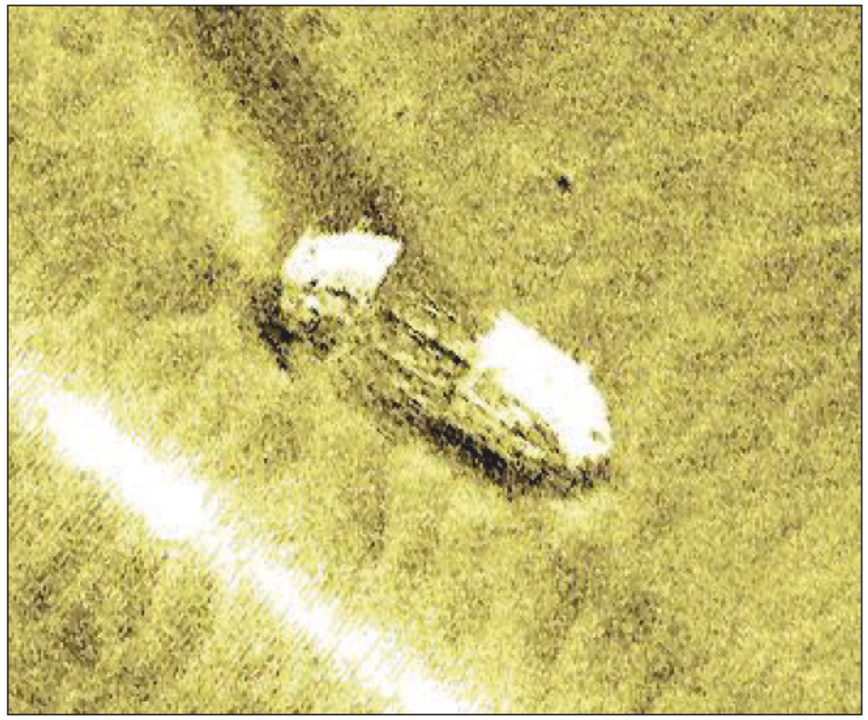


Plate 2: Site 7035: Wreck site of the Aquarius (possible) measuring 33.3m x 11.6m x 1.9m and 236nT magnetic anomaly

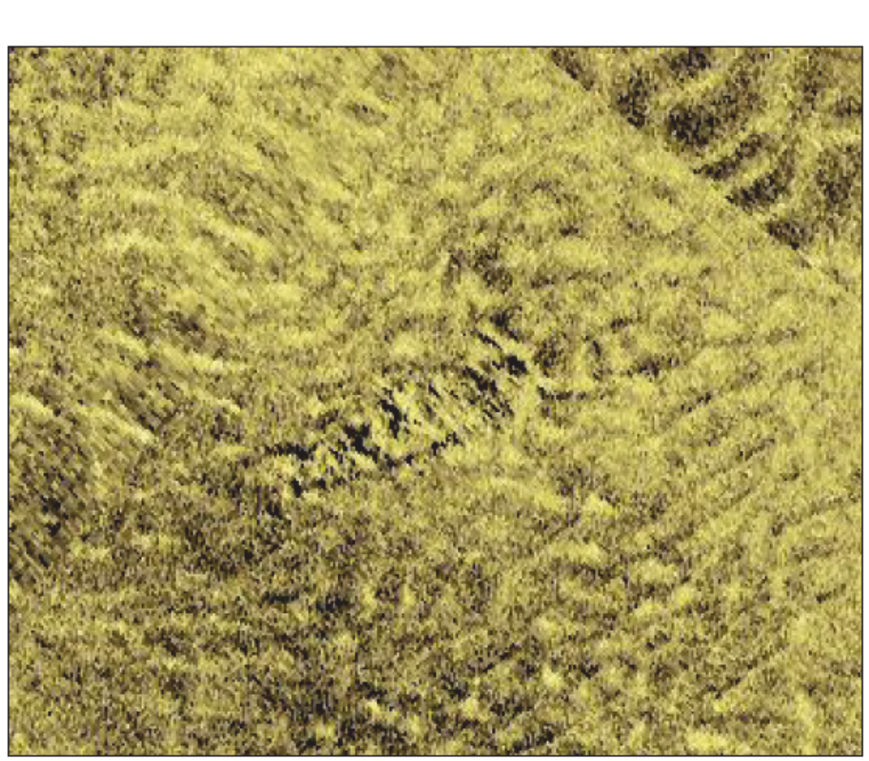
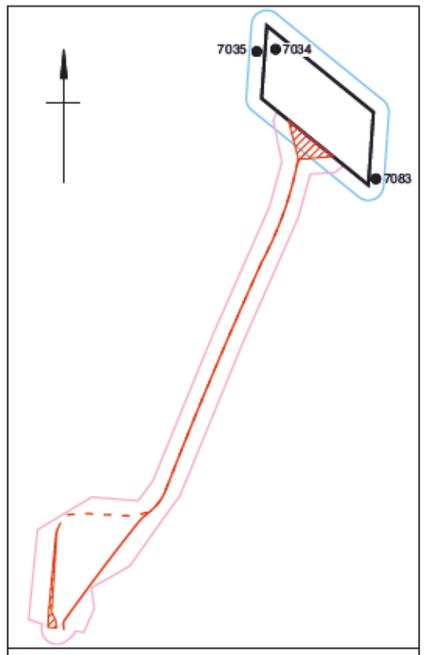


Plate 3: Site 7083: Unknown wreck measuring 25.9m x 7.5m x 0.4m and 28nT magnetic anomaly

0 10 20 metres



Key:
- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas

Drawing projection: UTM WGS84 z31N

Title:
Sidescan Sonar Data Examples of Sites that have Exclusion Zones, Plates 1-3

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:		
22/05/09	1:500 (Inset 1:400,000)		
Figure: 8	Drawn: KJB	Rev.: 3	

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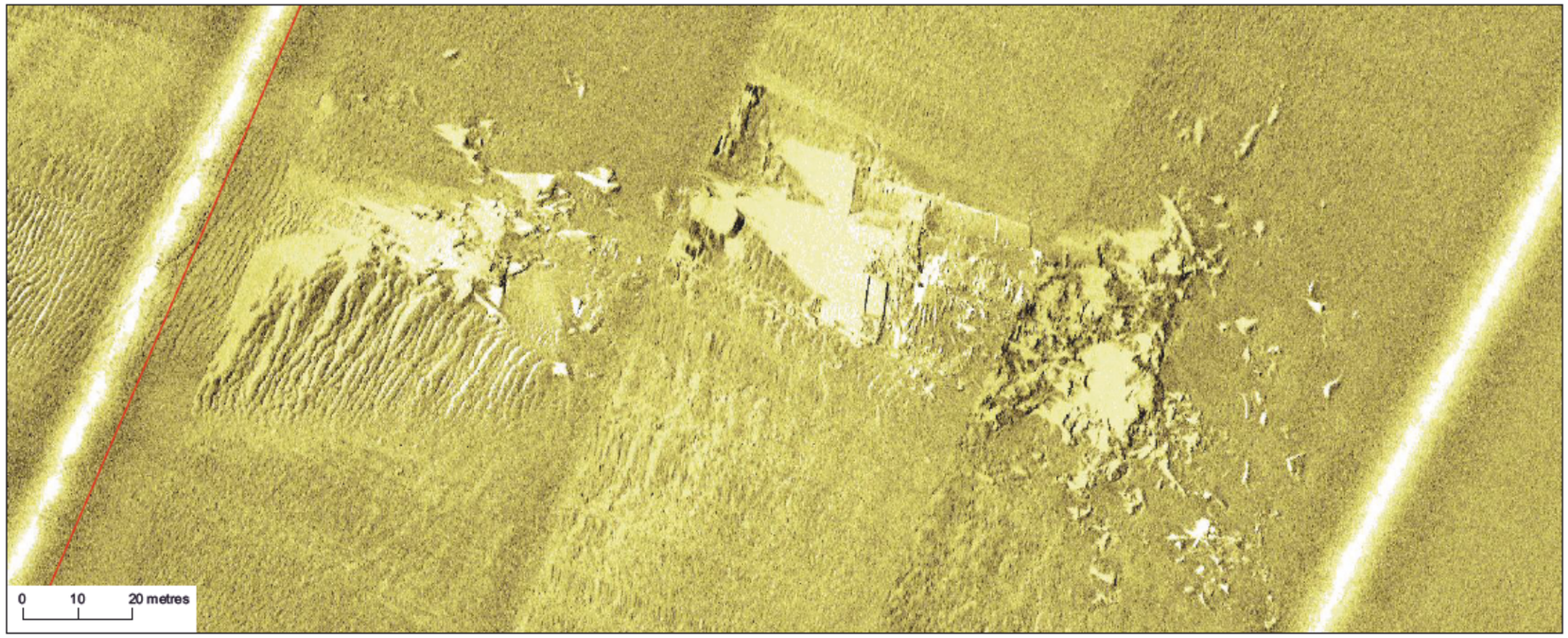


Plate 4: Site 7036: Clan Morrison ship wreck measuring 190m x 80m x 1.6m and 12171nT magnetic anomaly

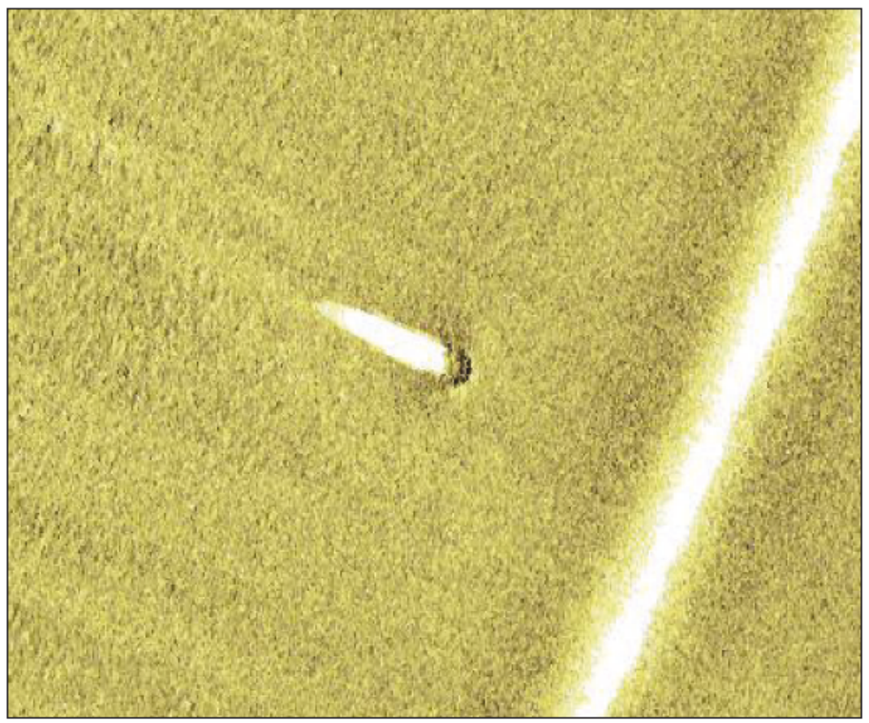


Plate 5: Site 7037: Unknown Wreck measuring 4.1m x 2.1m x 2.5m

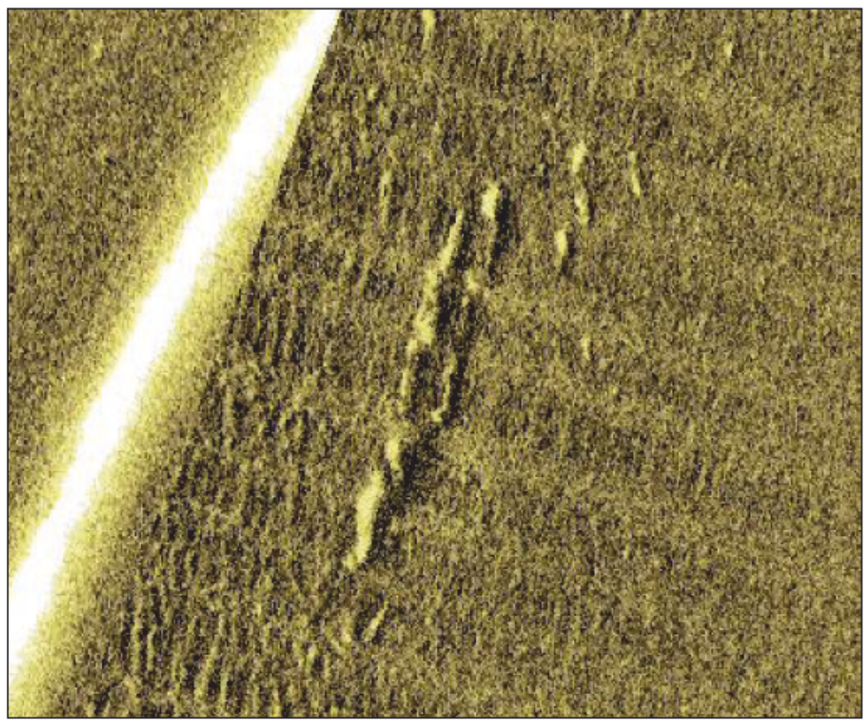
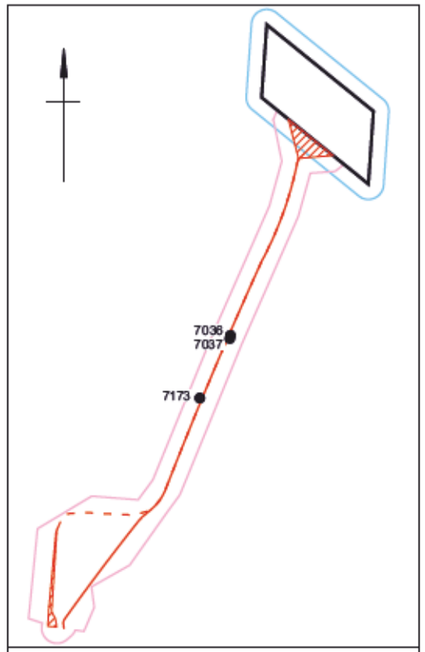


Plate 6: Site 7173: Debris measuring 47.4m x 17.4m x 0.2m



Key:
- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas

Drawing projection: UTM WGS84 z31N

Title:
Sidescan Sonar Data Examples of Sites that have Exclusion Zones, Plates 4-6

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:		
22/05/09	1:1000 & 1:500 (Inset 1:400,000)		
Figure: 9	Drawn: KJB	Rev.: 3	

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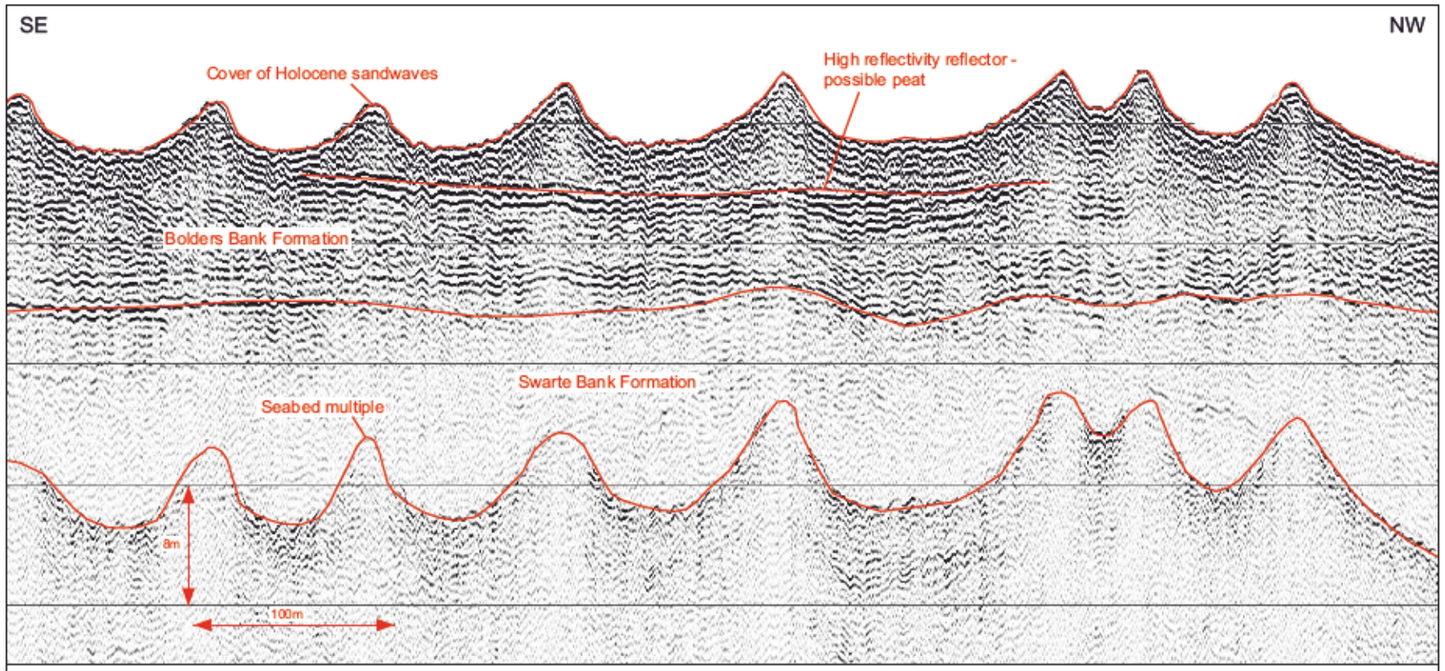

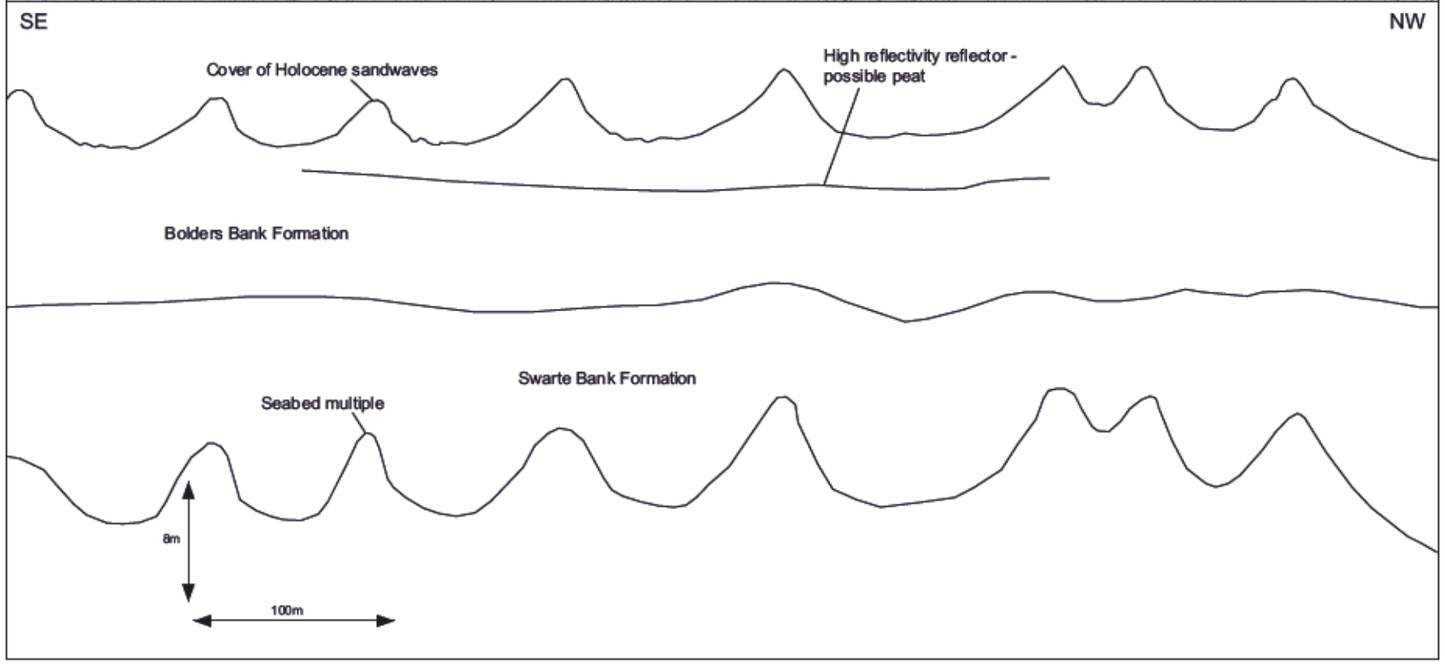

Key:
- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Location of data example

Drawing projection: UTM WGS84 z31N

Title:
Sub-bottom Profiler Data Example (WA 7015)

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:		
22/05/09	1:3000 horizontal (inset 1:400,000)		
Figure: 10	Drawn: KJB	Rev.: 3	

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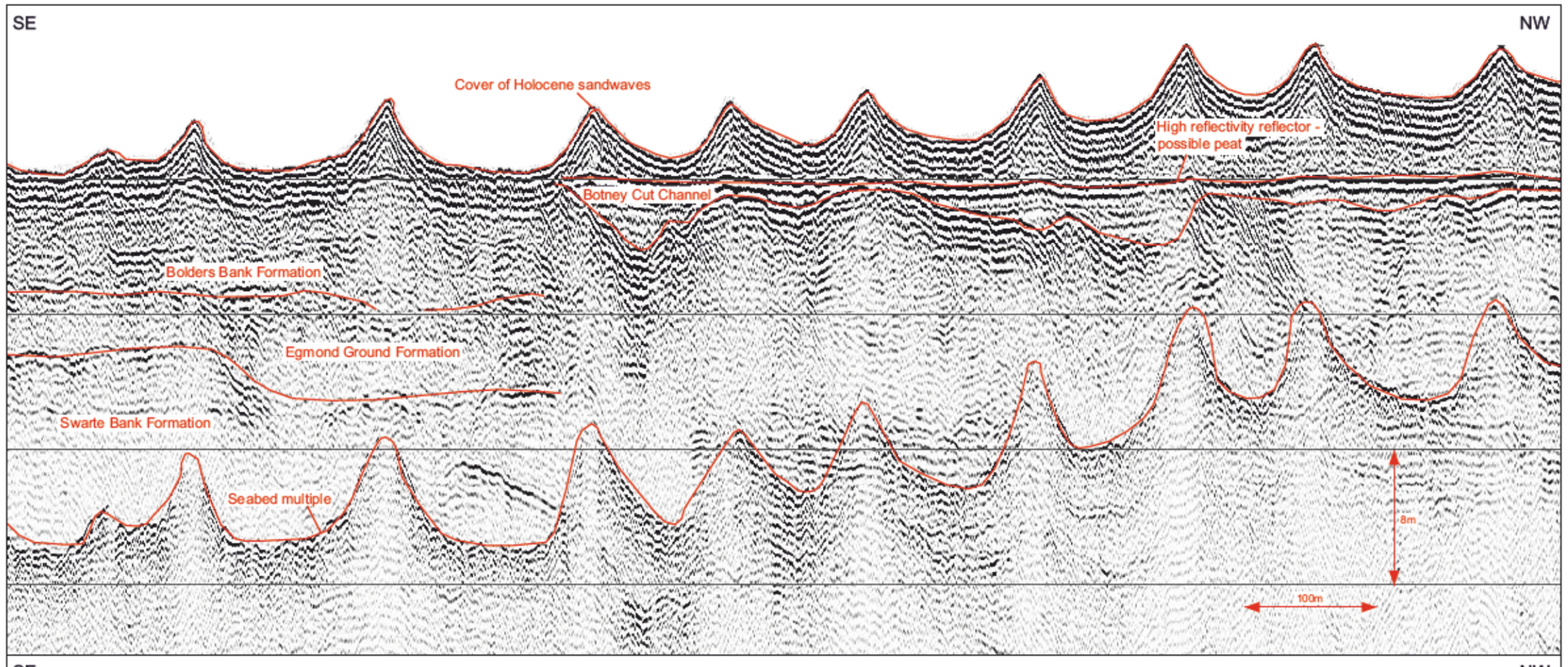

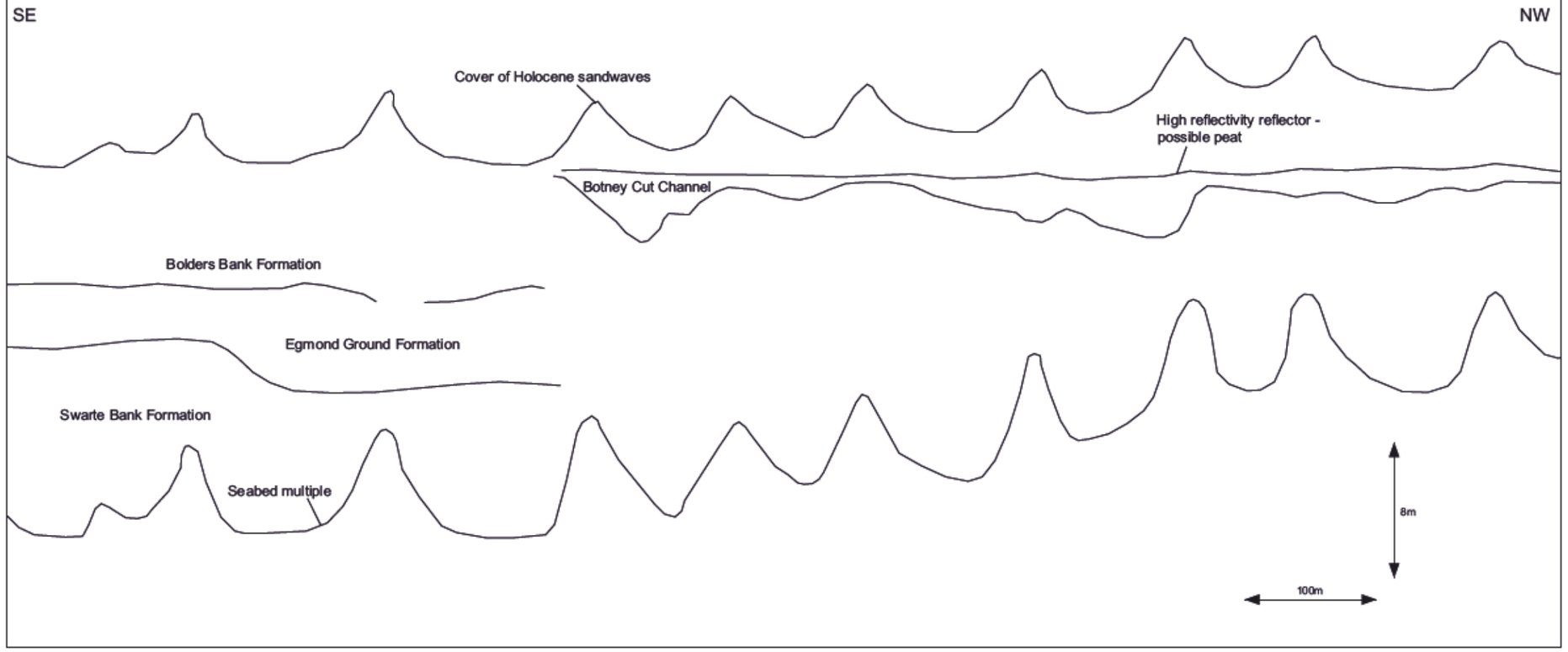

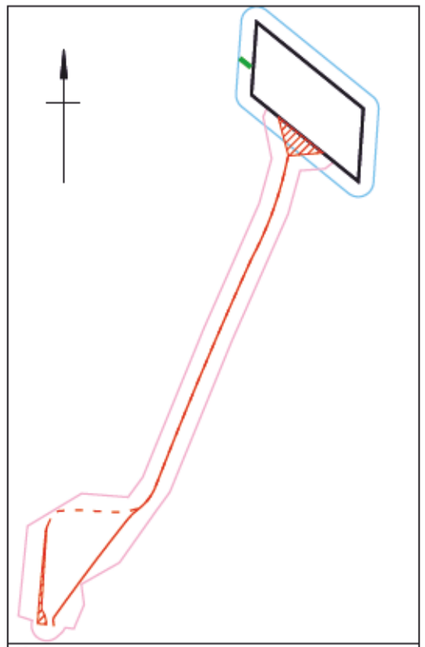

Key:
- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Location of data example

Drawing projection: UTM WGS84 z31N

Title:
Sub-bottom Profiler Data Example
(WA 7025, 7026)

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:3000 horizontal (inset 1:400,000)

Figure:	Drawn:	Rev.:
11	KJB	3

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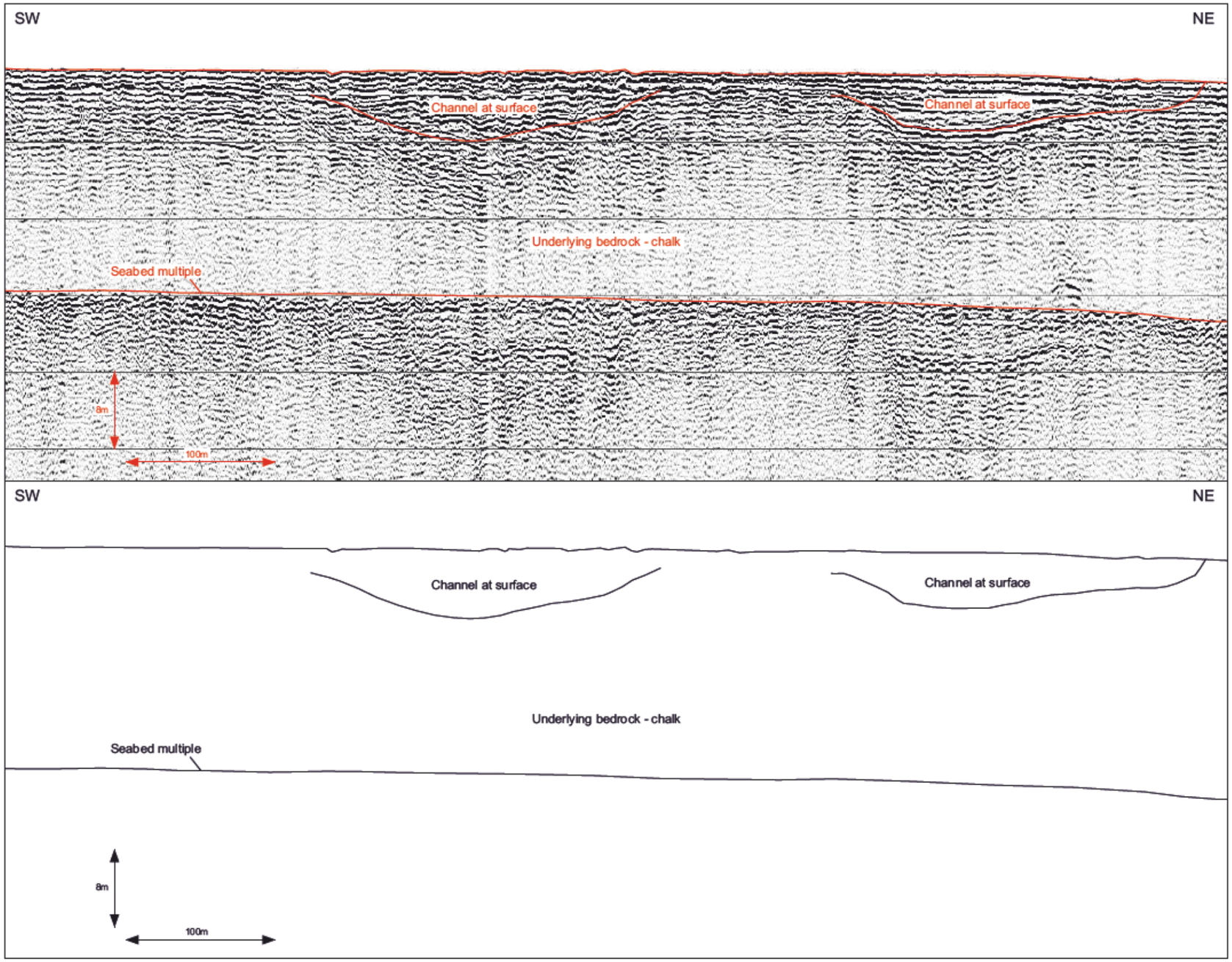

Key:
- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Location of data example

Drawing projection: UTM WGS84 z31N

Title:
Sub-bottom Profiler Data Example
(WA 7003, 7004)

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:		
22/05/09	1:3000 horizontal (inset 1:400,000)		
Figure: 12	Drawn: KJB	Rev.: 3	

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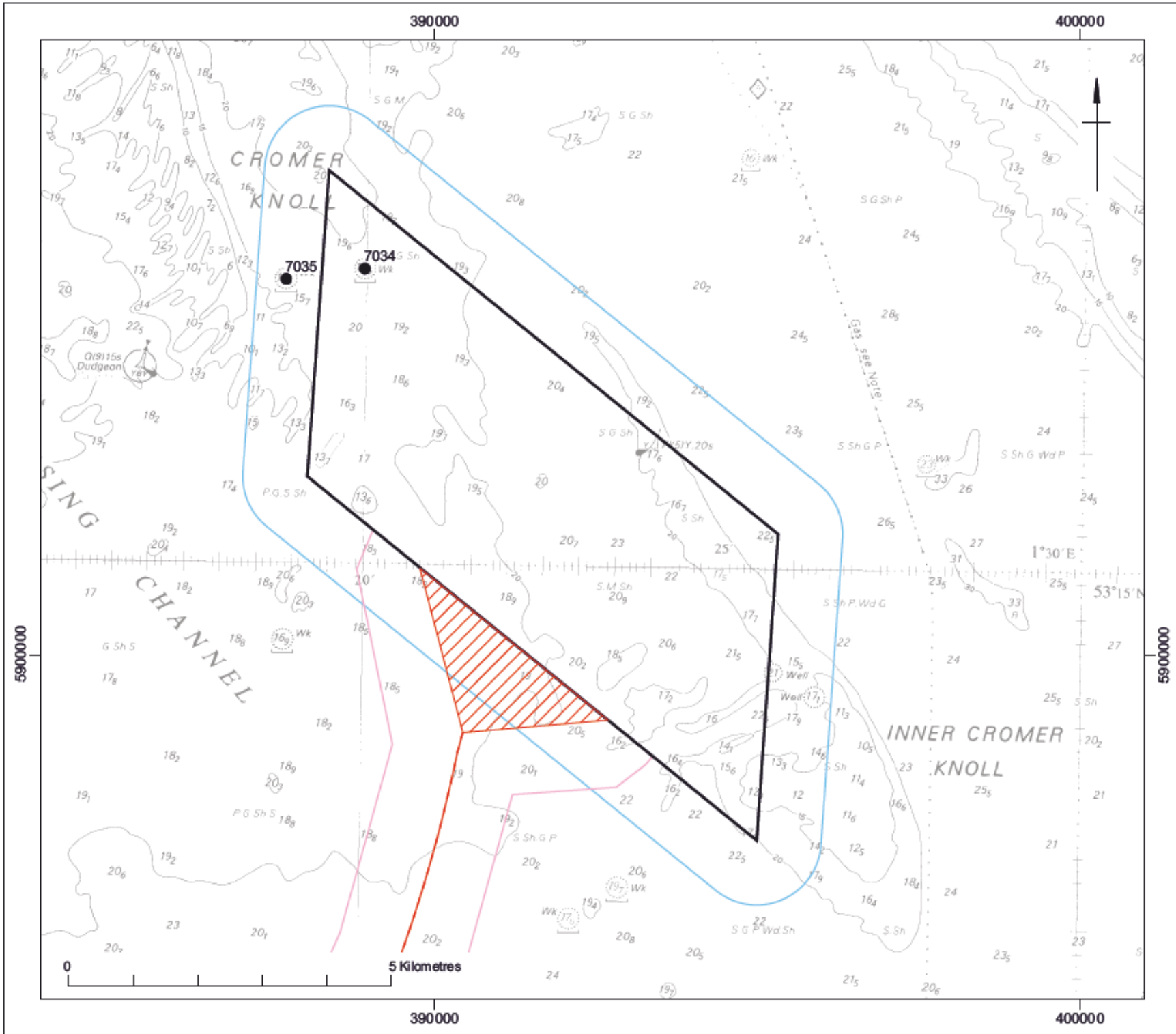

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Known wreck

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 (dated 2008)

Title:
Dudgeon Offshore Wind Farm Marine Study Area, wrecks recorded in UKHO database

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:80,000

Figure:	Drawn:	Rev.:
13	KJB	3

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370000 380000 390000 400000

5900000 5890000 5880000 5870000

INNER CROMER KNOLL

SHERINGHAM SHOAL

NLO1 NLO2 NLO3

7036 7037 7038 7039 7040 7041 7042 7043 7044 7045

0 5 Kilometres

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Known wreck
- Recorded losses

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105, 106 and 108
(dated 2008, 2006 and 2000)

Title:
Cable Route Marine Study Area, wrecks recorded in UKHO and NMR databases

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:125,000

Figure:	Drawn:	Rev.:
14	KJB	3

Wessex Archaeology

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374000 375000 376000

5868000 5867000

Key:

- Export Cable Route (eastern landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Known wreck
- Prehistoric
- Palaeolithic
- Neolithic
- Mesolithic
- Bronze Age
- Iron Age
- Iron Age to Roman
- Roman
- Roman to Medieval
- Saxon
- Medieval
- Post-medieval
- World War One
- World War One to World War Two
- World War Two
- Modern
- Multiperiod
- Unknown

Drawing projection: UTM WGS84 z31N

Title:
Cable Route Coastal Study Area

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:8000

Figure:	Drawn:	Rev.:
15	KJB	3

Wessex Archaeology

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0 500 Metres

374000

375000

376000

5868000

5867000

Key:

- Export Cable Route (eastern landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Findspot
- Site
- Listed Building
- Scheduled Monument

Drawing projection: UTM WGS84 z31N

Title:
Cable Route Coastal Study Area – Scheduled Monuments, Listed Buildings, Sites and Finds

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:8000

Figure:	Drawn:	Rev.:
16	KJB	3

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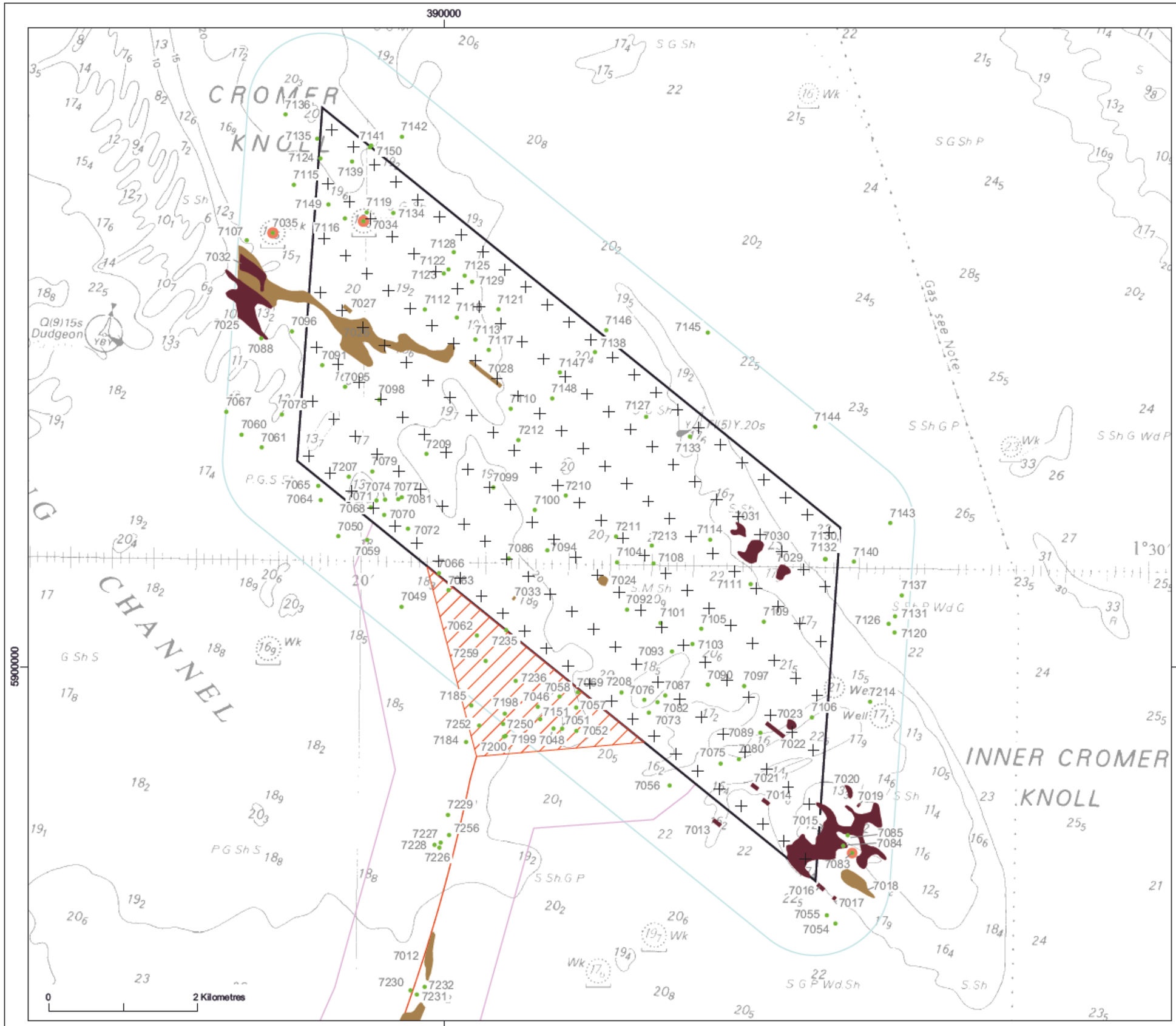
0 500 Metres



Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Proposed WTG location
- Geophysical anomalies
- Archaeological Exclusion Zones (AEZs)
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Offshore Wind Farm Marine Study Area
WTG Impact; 168 x 3.0MW WTGs

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:50,000

Figure:	Drawn:	Rev.:
17	KJB	3

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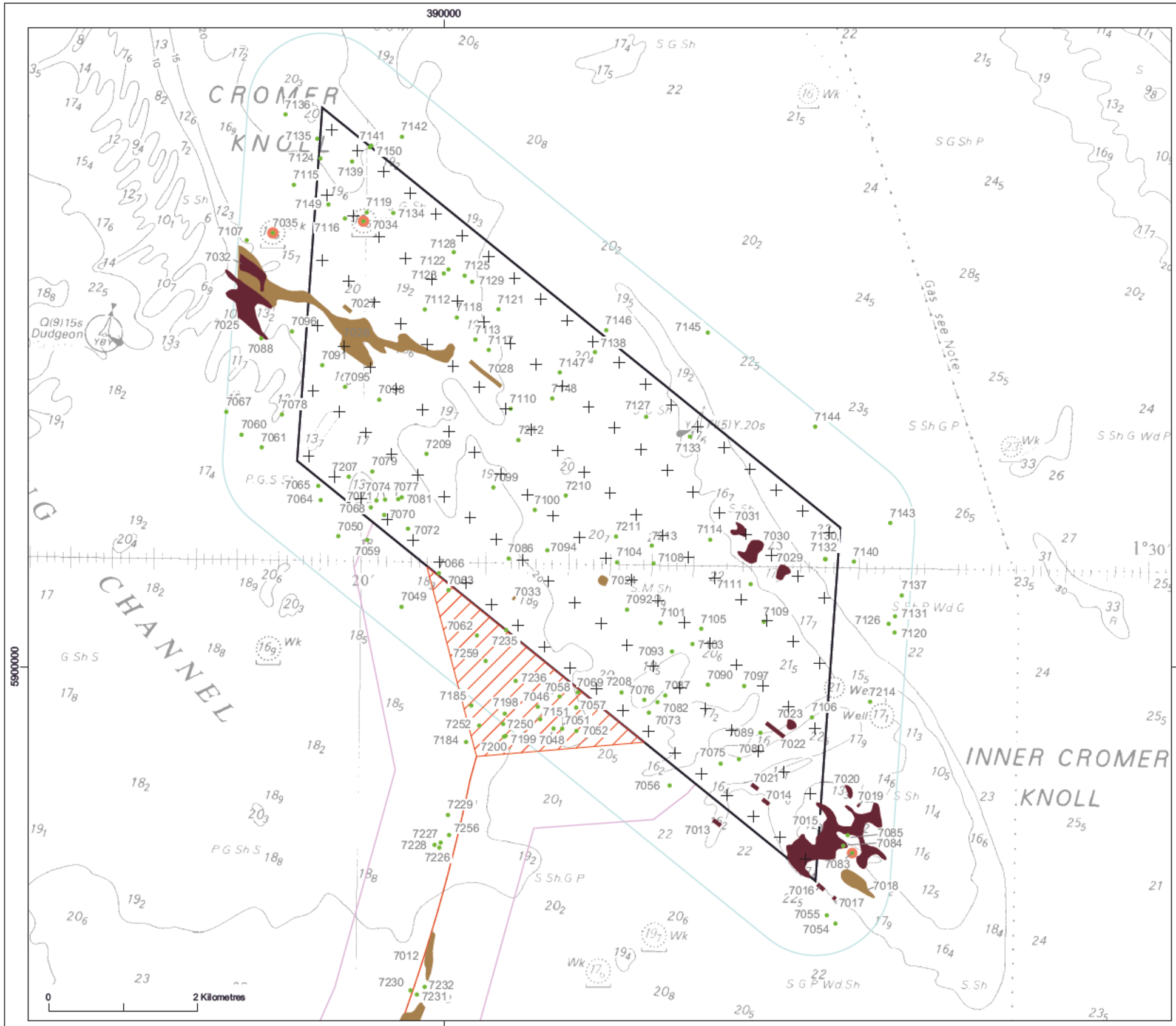

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Proposed WTG location
- Geophysical anomalies
- Archaeological Exclusion Zones (AEZs)
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Offshore Wind Farm Marine Study Area
WTG Impact; 120 x 3.6MW WTGs

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:50,000

Figure:	Drawn:	Rev.:
18	KJB	3

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390000

5900000

CROMER KNOLL

INNER CROMER KNOLL

CHANNEL

Q(9)15s Dudgeon

Gas see Note

0 2 Kilometres

390000

5900000

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Proposed WTG location
- Geophysical anomalies
- Archaeological Exclusion Zones (AEZs)
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Offshore Wind Farm Marine Study Area
WTG Impact; 90 x 5.0MW WTGs

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:50,000

Figure:	Drawn:	Rev.:
19	KJB	3

Wessex Archaeology

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390000

5900000

CROMER KNOLL

INNER CROMER KNOLL

G CHANNEL

Q(9)15s Dudgeon

Gas see Note

0 2 Kilometres

390000

5900000

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Proposed WTG location
- Geophysical anomalies
- Archaeological Exclusion Zones (AEZs)
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Offshore Wind Farm Marine Study Area
WTG Impact; 85 x 6.0MW WTGs

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:50,000

Figure:	Drawn:	Rev.:
20	KJB	3

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390000

5900000

CROMER KNOLL

INNER CROMER KNOLL

CHANNEL

Q(9)15s Dudgeon

Gas see Note

Wk

S G Sh

S G Sh P

S Sh

S Sh G P

S Sh G Wd P

P G S Sh

S G P Wd Sh

S M Sh

S Sh P Wd G

0 2 Kilometres

1°30'

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Proposed WTG location
- Geophysical anomalies
- Archaeological Exclusion Zones (AEZs)
- SBP features: cuts and fills
- SBP features: possible peat

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Offshore Wind Farm Marine Study Area
WTG Impact; 56 x 10MW WTGs

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:50,000

Figure:	Drawn:	Rev.:
21	KJB	3

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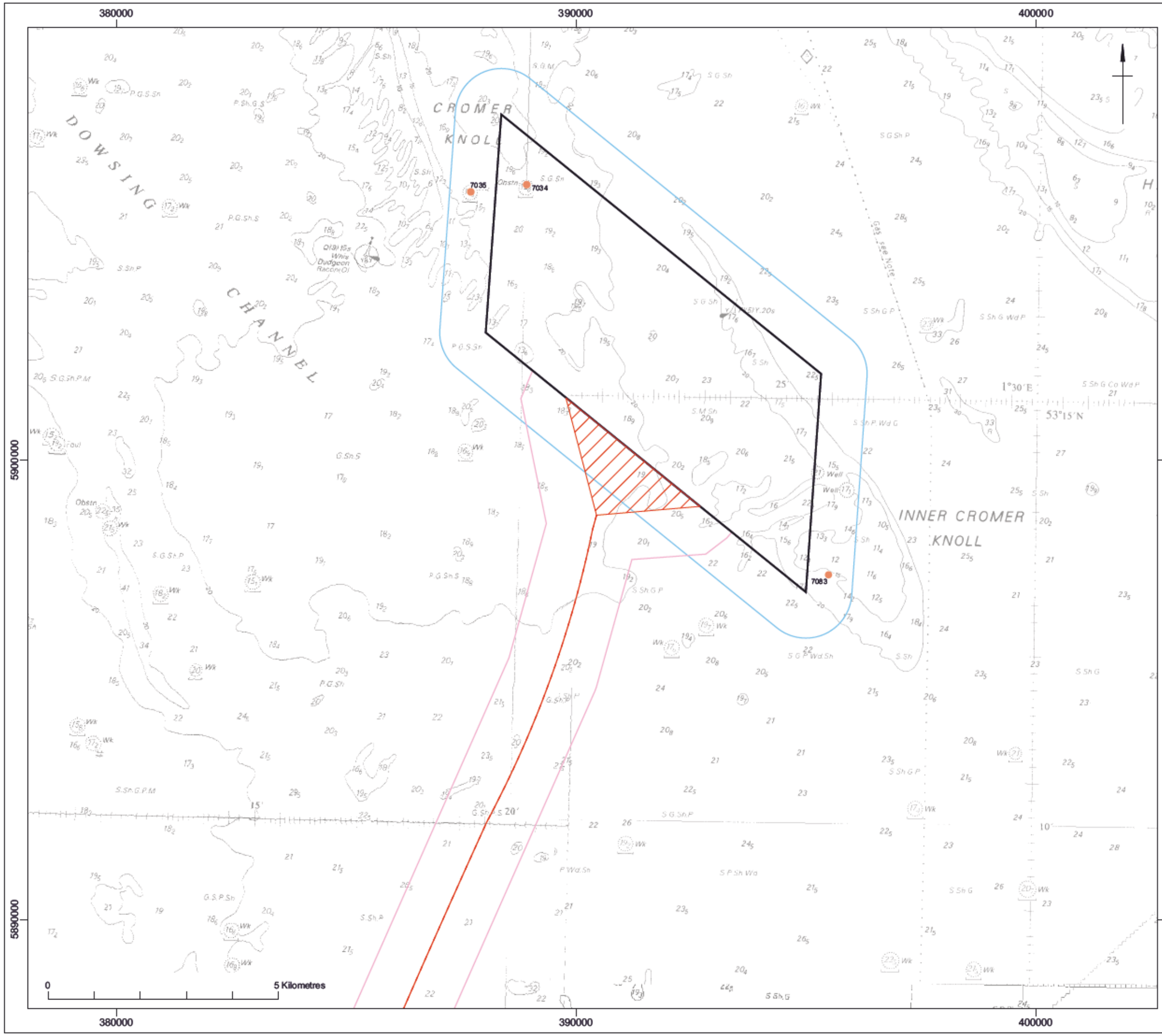

Key:

- Dudgeon Offshore Wind Farm
- Offshore Wind Farm Marine Study Area
- Export Cable Route
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Archaeological Exclusion Zones (AEZs)

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 105 and 108
(dated 2008 and 2000)

Title:
Cable Route (north end) exclusion zones

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:80,000

Figure:	Drawn:	Rev.:
22	KJB	3

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370000

380000

390000

5880000

5870000

7036

7037

7193

7173

7175

7044

SHERINGHAM SHOAL

W Sheringham WB

E Sheringham

Blakeney Overfalls

Pollard

Cley next the Sea

Weybourne

Sheringham

Foulness

0 5 Kilometres

Key:

- Export Cable Route (eastern landfall)
- Export Cable Route (western landfall)
- Export Cable Route Corridor
- Cable Route Marine and Coastal Study Areas
- Archaeological Exclusion Zones (AEZs)

Drawing projection: UTM WGS84 z31N

Admiralty Chart: 106 and 108
(dated 2006 and 2000)

Title:
Cable Route (south end) exclusion zones

Project:
Dudgeon Offshore Wind Farm

Date:	Scale:
22/05/09	1:80,000

Figure:	Drawn:	Rev.:
23	KJB	3

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